



BUKU ABSTRAK

KONFERENSI NASIONAL MATEMATIKA XXI 2022

"Peranan Matematika di Era Smart
Society 5.0 dalam Implementasi
Program Merdeka Belajar"

Diselenggarakan oleh
IndoMS bekerjasama dengan
Universitas Mataram

18-19 OKTOBER 2022

Mitra:



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Daftar Isi

Jadwal Kegiatan	11
Pembagian Ruangan Sesi Paralel	13
Daftar Abstrak	16
Keynote and Invited Speakers	16
(Keynote Speaker) Nor Haniza Sarmin: <i>DNA Splicing System: Mathematical Biology in Computation</i>	16
(Invited Speaker) I. Adhiguna, I.S.N. Arifin, I. Muchtadi-Alamsyah, F. Yuliawan: <i>On Orthogonal Circulant MDS Matrices</i>	17
(Invited Speaker) Supama: <i>On A C*- Module Normed Space</i>	18
(Invited Speaker) Wamiliana: <i>Analisis Perbandingan Beberapa Algoritma untuk Menyelesaikan Masalah Instalasi Jaringan Multi Tahap</i>	19
(Invited Speaker) I Nengah Suparta: <i>Strongly Graceful Characterization on Unicyclic Graphs</i>	20
(Invited Speaker) Budi Nurani R., Atje Setiawan A., Devi Munandar: <i>Spatio-Temporal Machine Learning Approach for Forecasting Various Aspects of Daily Life</i>	21
(Invited Speaker) Novriana Sumarti, Michele Josephine, Rashiekavanya M. Benardi: <i>Pemodelan Dan Penentuan Premi Risiko Asuransi Siber</i>	22
Aljabar	23
(A-1) D.A. Yuwaningsih, I.E. Wijayanti, B. Surodjo: <i>The Product of Elements of Free R-Modules with Infinite Dimension</i>	23
(A-2) M.N. Husni, H. Syafitri, A.M. Siboro, A.G. Syarifudin, Q. Aini, I.G.A. Wisnu Wardhana: <i>The Harmonic Index and The Gutman Index of Coprime Graph of Integer Group Modulo With Order of Prime Power</i>	24
(A-3) G.S. Ismail, N.H. Sarmin, N.I. Alimon, F. Maulana: <i>The First Zagreb Index of Zero Divisor Graph for the Ring of Integers Modulo Power of Primes</i>	26
(A-4) I.A. Wijaya, N.P. Puspita, Suryoto, T. Udjiani, S.R.R.M: <i>Modification of Caesar Cipher Using Modular Arithmetic</i>	27
(A-5) D. Anastasya, S. Wahyuni: <i>Presimplifiable and Weakly Presimplifiable Rings</i>	29
(A-6) H. Muhammad, S. Wahyuni: <i>Generalization of Von-Neumann Regular Rings to Von-Neumann Regular Modules</i>	31

(A-7)	M.R. Gayatri, A.U. Azmi, Nurhabibah, I.G.A.W. Wardhana: <i>Bilangan Clique dan Bilangan Kromatik dari Graf Koprime dari Grup Generalized Quaternion</i>	33
(A-8)	N.P. Puspita, Suryoto, T.U. SRRM: <i>The Introduction of The Neutrosophic Concepts on Comodules Category</i>	34
(A-9)	A.S. Bawana, A. Sutjijana, Y. Susanti: <i>Girth, Independence Number, and Wiener Index of Coprime Graph of Dihedral Group D_{2n}</i> .	36
(A-10)	Y. Khairunnisa, N.W. Switrayni, F. Maulana, I.G.A.W. Wardhana: <i>Gelanggang Noether dan Gelanggang Polinomial Yang Dibangun dari Gelanggang Noether</i>	37
(A-12)	D.P. Malik, F. Maulana, N.W. Switrayni, I.G.A.W. Wardhana: <i>A Note on Nilpotent Graph of Ring Integer Modulo</i>	40
(A-28)	F.A. Agusfianto, Fitriani, N.P. Puspita: <i>Some Properties of Rough Semirings Using Praba Concept</i>	54
(A-29)	B.P. Pradipta, A. Sutjijana, Y. Susanti: <i>Designing DNA Codes from Reversible-Self-Dual Codes over $GF(4)$</i>	56
(A-30)	Z.B. Ikhtiyar, N.P. Puspita, T. Udjiani SRRM: <i>Weakly Prime Ideal On The Ring $End_Z(M_n(R))$</i>	57
(A-31)	E. Asriani, M. Intan Detiena, A. Purwarianti: <i>The Use of DCT-DST Algorithm on Block Circulant Matrices-Vector Multiplication for Transformers</i>	58
(A-32)	S. Sylviani, F.C. Permana: <i>Orthogonality in Krein Spaces</i>	59
(A-34)	Respitawulan, F. Yuliawan, P. Astuti W.: <i>Bounded Linear Functionals on Semi-Inner Product Spaces</i>	60
(A-35)	E. Kurniadi: <i>The Intertwining Operators of Unitary Representations of A Lie Group Between The Mackey and The Blatter Models</i>	61
(A-37)	T. Suparwati, Y. Susanti, S. Wahyuni: <i>Prime Cubic Order Cayley Graph of Cyclic Groups</i>	62
(A-38)	N. Hidayat, V.H. Krisnawati, Z. Fitriah, S. Anam, D.M. Mahanani, I. Yanti: <i>Himpunan Lunak Fuzzy Phythagorean: Tinjauan Aplikasi pada Penentuan Destinasi Wisata</i>	63
(A-39)	N. Dahoklory: <i>Korespondensi Grup Galois pada Lapangan Perluasan atas Q</i>	64
(A-40)	F.O. Haning, M. Lobo: <i>Petri net and Max-Plus Algebra model on Counter Registration Queue System in A Hospital in Kupang City</i>	65
(A-41)	D.M. Mahanani, N. Hidayat, S. Anam, I. Yanti, Z. Fitriah: <i>Exact Sequences of Heaps and Their Morphisms</i>	66
	Analisis	69
(B-1)	R. 'Abid Aadilah, D. K. Sari, A. Zulijanto: <i>On Composition of Equi-Baire 1 Family of Functions on Metric Spaces</i>	69
(B-2)	D. K. Sari : <i>Equi-AO Separated Family of Functions</i>	71

Kombinatorika	72
(C-1) M.N. Huda, Y. Susanti: <i>On Total Edge Irregularity Strength of Triangular Grid Graphs and Related Graphs</i>	72
(C-2) W.R. Fadhillah, Y. Susanti: <i>On the Edge Irregularity Strength of Banana-Tree $B(x, y)$ and Coconut Tree $CT(3, y)$</i>	75
(C-3) Siti Khabibah, Lucia Ratnasari, Nikken Prima Puspita: <i>The Domination Number of Sierpinski Star Graph SS_n</i>	76
(C-4) Y. Susanti: <i>On the Exact Value of Edge Irregularity Strength of Generalized Arithmetic Staircase Graphs</i>	77
Komputasi	78
(D-1) S. Anam, M.R.A. Putra, Z. Fitriah, I. Yanti, N. Hidayat, D.M. Mahanani: <i>Health Claim Insurance Prediction Using Support Vector Machine with Particle Swarm Optimization</i>	78
(D-2) Z. Fitriah, U. Habibah, K. A. Arta Wijaya: <i>Random Forest Classifier for Diabetes Mellitus Prediction</i>	81
(D-3) Zuraidah Fitriah, Komang Agus Arta Wijaya: <i>Prediksi Penyakit Stroke Menggunakan Machine Learning</i>	82
Matematika Terapan	83
(E-1) P.W. Yubelian, N.Y Megawati: <i>A Mathematical Modeling of Election in Indonesia</i>	83
(E-2) I.S Machfiroh, W.A.A. Sur, J. Permadi, W. Aprianti, H. Rhomadona: <i>Determination of The Best Koperasi Using SAW (Simple Additive Weighting)</i>	86
(E-3) Afifurrahman: <i>Neuronal dynamics: from complexity to simplicity</i>	88
(E-4) E.A. Syifa, T.N. Istiqomah, N.P. Puspita, L. Ratnasari, S. Khabibah: <i>Application of Linear Programming in Optimizing The Profits of PT. Naruna With The Simplex Method</i>	89
(E-5) A.D. Miranda, S. Yosmar, S. Damayanti: <i>APPLICATION OF FUZZY TIME SERIES WITH FIBONACCI RETRACEMENT FOR FORECASTING STOCK PRICE PT.BANK RAKYAT INDONESIA</i>	91
(E-6) D. Lesmono, T. Limansyah, I.A. Sandy: <i>A Mathematical Model for Inventory System with Price- and Stock-Dependent Demand and Backorder</i>	93
(E-7) T. Joviani, T. Limansyah, D. Lesmono, I.A. Sandy: <i>Optimal Ordering Policy for Multi Item Inventory Model with Various Demand Function, Deterioration, and Partial Backlogging</i>	96
(E-8) T. Tasmi, P. Rahmayanti, M. Abdillah: <i>Implementasi Algoritma Archimedes Optimization untuk Menyelesaikan Permasalahan Economic Load Dispatch</i>	98

(E-9)	P. Monika, D. Munandar, A.B. Salsabila, S.T. Tresna, B.N. Ruchjana, A.S. Abdullah: <i>Forecasting the Spread of Diseases of Cocoa Attacks in East Java using the Spatio-Temporal Model</i>	99
(E-10)	S.I. Goenawan, K. Indriati, E.Y.C. Milano: <i>The Stock Price Prediction Formula Using the Concept of Equality in the Amount of Data Between the Average Difference of Order One and Two at Levels n and $n + 1$</i>	102
(E-11)	S. Bahri, L. Awalushaumi, N. Fitriyani: <i>Enhanced Performance of Dynamic Neural Network Model using Wavelet Functions as Activation Function</i>	105
(E-12)	O.A. Amalia: <i>Optimal Hospital Bed Allocation Under Indonesia's Health Insurance Scheme</i>	108
(E-15)	K. Azmi, S. Bahri, M.R. Alfian: <i>Modeling of Wave Height with Neural Network (Studi Case: Mandalika Beach Central Lombok)</i>	109
(E-16)	H. Gifty, G. Sarah, I. Sukarsih: <i>Tuberculosis Spread Model with Consideration of Nutritional Factors</i>	111
(E-19)	R.W. Dewanti: <i>Optimal Control of Vaccination on the Spread of COVID-19</i>	113
(E-20)	Lilis Sriwahyuni, Marwan, Zata Yumni Awanis: <i>Optimization of water flow on PDAM-network of Jonggat Lombok Tengah Regency using Ford Fulkerson Algorithm and Dinic Algorithm</i> . .	114
(E-21)	Nurwan, M.R.F. Payu, D. Wungguli: <i>Petri Net Application to Analyze Ship Arrival Service System</i>	116
(E-22)	L. Aryati: <i>On the Reaction-Diffusion model of Covid-19 with Vaccination</i>	118
(E-23)	Y. Basani, R.Y. Damanik, M. Simamora, A.F. Hutapea: <i>Rice Planting Schedule for Optimizing Rice Yield Improvement with Genetic Algorithms in the Ajibata</i>	120
(E-24)	M.A. Yunus, Marwan, M.R. Alfian: <i>OPTIMIZATION OF PRODUCTION PROCESS SCHEDULING ON MATARAM CONVECTION USING CDS METHOD AND HC METHOD</i>	122
Riset Operasi	124
(F-1)	N. F. Rahayu, F. Muhtarulloh, D. Nuraiman: <i>Solusi Optimal Masalah Transportasi Biaya Tetap Menggunakan Metode Pendekatan Tangga</i>	124
(F-2)	A. Pradjaningsih, A.N. Vidatiyasa, K.A. Santoso: <i>Application of Markov Chain in Predicting Sugar Production at Candi Baru Sugar Factory, Sidoarjo</i>	127
(F-3)	S. Fahrinisha, L. Awalushaumi, Z.Y. Awanis, M.R. Alfian: <i>A Depth-First Branch and Bound Algorithm for Integer Knapsack Problem in Freight Transportation</i>	130

(F-4) M. Pasaribu: <i>Penentuan Waktu Tunda Optimal di Persimpangan Jalan Adi Sucipto Mayor Aliyang</i>	131
(F-5) N. Sulistia, Marwan, Irwansyah: <i>Solving Traveling Salesman Problem Art Using Clustered Traveling Salesman Problem</i>	132
Pendidikan Matematika	135
(G-1) Susanti, R. Fitriani: <i>Analysis of Requirements for the Development of Google-Site Web-Based Learning Media in Multivariable Calculus Courses</i>	135
(G-2) D. Hamdani, C. Sa'dijah, Subanji: <i>Development of ACERA Learning Model Based on Proof Construction Analysis</i>	136
(G-3) D. Ratnasari, N. Aisyah: <i>Analysis Of Student Character Value On Problem Based Learning Model Climate Change Context Social Arithmetic Materials in SMP</i>	140
(G-4) Jumrah, S. Rahmayani, A. K. Ahmad: <i>Mathematical Problem Solving Ability of Rational Personality Students</i>	146
(G-5) S. Rahmayani, Jumrah, A. K. Ahmad: <i>The Application Jigsaw Type Cooperative Learning Model To Improve Students' Mathematics Learning Outcomes</i>	147
(G-6) E. F. Rerendo, N. Aisyah: <i>Application of the Open Ended Approach in Learning Three Dimensional Materials in Class XII to See Students' Character Values</i>	148
(G-7) D. Maharani, N. Aisyah: <i>Analysis of Creative Character Value of SMP Students Using PBL Model with Open Ended Problems on SPLDV Materials</i>	150
(G-8) I. Ariska, Darmawijoyo: <i>Development of Student Worksheet (LKPD) Based on Mathematical Modelling Using an Water Supply Context</i>	156
(G-9) N. M. I. Kertiyan: <i>Pengembangan Modul Project Based Learning untuk SMK Berorientasi Peningkatan Kemampuan Berpikir Kritis</i>	160
(G-10) N. P. Wulandari, N. Kurniati, N. Hikmah, Wahidaturrahmi: <i>The Development of AKM Numerical Practice Question Book for Junior High School Students</i>	161
(G-11) W. Umar, H. Usman: <i>Desain Didactical Engineering Berbasis Konteks Matematika Realistik untuk Meningkatkan Kemampuan Pemahaman Matematis Siswa Sekolah Menengah Pertama</i>	164
(G-12) M. Febrianti, N. Aisyah: <i>Analysis of Character Values toward Junior High School Students in Learning Mathematics Using Blended Learning Model on SPLDV Material</i>	165
(G-13) R. Pradani, L. Hayati, Wahidaturrahmi: <i>Scaffolding Berdasarkan Kesulitan Siswa Dalam Menyelesaikan Masalah Matematis</i>	169
(G-14) R. S. Utari, Zulkardi, R. I. I. Putri: <i>How Technology Can Support Students' Statistical Literacy Skills In Learning: A Systematic Literature Review</i>	170

(G-15)	K. Sarjana: <i>Implementasi Petunjuk Penggunaan Alat Peraga untuk Penentuan Luas Daerah Jajaran Genjang dan Luas Daerah Segitiga Bagi Siswa Sekolah Dasar</i>	171
(G-16)	E. B. Rahaju, S. Khabibah, A. H. Rosyidi, N. R. Prihartiwi, I. Kurniasari: <i>Students' Critical Reasoning Regarding the Relationship Between Shapes</i>	172
(G-17)	Baharullah, A. K. Jaelani, M. Hasbi: <i>Critical Thinking Profile of Mathematics Education Students in Solving Ill-Structured Problem based on Mathematical Ability</i>	173
(G-18)	N. F. Anwar: <i>Deskripsi Efektivitas Pelaksanaan Proses Belajar dari Rumah (BDR) pada Pembelajaran Matematika di Masa Pandemi Covid-19 di MAN 1 Kota Gorontalo</i>	174
(G-19)	Y. Suryaningsih, N. Fajriah: <i>Geometry Exploration for The Development of Ethnomathematics LKP Based on The Ornament of Jingah River Jami Mosque</i>	177
(G-20)	E. Kholipah, I. Asyura, Linda, B. Munawar: <i>Development Of Audiovisual Learning Media Based Powtoon On Number Pattern for Students Class VIII In Junior High School</i>	178
(G-21)	S. Khabibah, E. B. Rahaju, R. Ekawati, A. H. Rosyidi, Masriyah, Y. Fuad, D. K. Fardah: <i>The Knowledge of Mathematics Teachers About Numeracy and Their Ability to Design Student Worksheets Supporting it</i>	181
Statistika	182
(H-1)	M. Ardani, I. Anggriani, S.A.W. Dinata: <i>Prediksi Jumlah Penumpang Pesawat Domestik dengan Menggunakan Long Short-Term Memory (Studi Kasus: Bandar Udara Internasional Sams Sepinggan Balikpapan)</i>	182
(H-2)	S. Hamidah, A. Bachrudin, L. Noviyanti: <i>Pengukuran Expected Shortfall Portofolio Menggunakan Arima-Garch Dengan Pendekatan Copula</i>	185
(H-3)	S. Damayanti, S. Yosmar, N. Afandi: <i>Implementation of Chen's Fuzzy Time Series for Forecasting Indonesia's Oil and Gas Import Value</i>	186
(H-4)	I.M. Taraly, N. Satyahadewi, H. Perdana, R. Tamtama: <i>The Calculation Of Life Insurance Premiums With A Multiple-State Model On Critical Illness Insurance</i>	188
(H-5)	M. Silfiani, F.N. Hayati, M. Azka: <i>Forecasting Stock Using Double Seasonal Autoregressive Integrated Moving Average</i>	190
(H-6)	E. Yanti, F. Virgantari, Y.E. Faridhan: <i>Comparison of Ward Method and Average Linkage Method in Clustering Indonesia's Provinces Based on Stunting Factors</i>	192

(H-7)	F. Virgantari, M. Widyastiti, N. Meidia: <i>Comparison of Some Weights in The Weighted Least Square Method For Handling Heteroscedasticity on Multiple Regression Model</i>	194
(H-8)	R.F. Ananda, L. Harsyah, M.R. Alfian: <i>Multivariate Adaptive Regression Splines (MARS) For Classification Of Ntb Public Perceptions on Covid-19 Vaccine</i>	195
(H-9)	S.L. Lestari, Irwansyah, N. Fitriyani: <i>The Application Of Genetic Algorithm For Estimating Nonparametric Regression Truncated Spline</i>	197
(H-10)	I.D. Sumarni, N. Fitriyani, Z.W. Baskara: <i>Modeling of Factors Affecting Poverty in West Nusa Tenggara Province in 2020 With Geographically Weighted Logistic Regression</i>	199
(H-11)	Hairunnisa, M. Hadijati, N. Fitriyani: <i>Application of Geographically Weighted Lasso Method in The Case of Gross Regional Domestic Product For The Bali Nusra Region</i>	200
(H-12)	J.A. Pembargi, E. Setiawana, R. Wahidatussolihah, N. Fitriyani: <i>Nonparametric Regression Approach to Tax Revenue Model in Central Lombok</i>	202
(H-13)	J.A. Pembargi, M. Hadijati, N. Fitriyani: <i>Kernel Nonparametric Regression on Forecasting of Total Receiving Regional Original Revenue in Central Lombok</i>	204
(H-14)	A.M. Safi'i, P. Hasanah, S.A.W Dinata: <i>Text Mining Classification of Smartphone Product's Reviews Using Multinomial Naïve Bayes (Case Study : Review of Asus ROG)</i>	206
(H-15)	Danardono: <i>Additive Hazard Models for Analyzing Multi-state Data</i>	208
(H-16)	H.J. Wattimanela: <i>Application of Maximum Likelihood Method and Gutenberg-Richter Law in analyzing Earthquake Activity Levels in North Sulawesi Province and its surroundings</i>	209
(H-17)	H.J. Wattimanela, A. Setiawan: <i>Analysis of Earthquake Activity Levels in Simeulue Regency with the Ordinary Least Square Method and the Guttenberg-Richter Law Approach</i>	210
(H-18)	S.H. Prabowo, A. Saputra, L.Sumara: <i>Comparison of Parameter Estimation Based on OLS And Sur on Gstarx Total Model Positive Case of Corona-19 in Java Island (Case Study in Three Provinces of DKI Jakarta, Jabar, Jatim)</i>	211
Aktuaria	212
(I-1)	A. R. Effendie: <i>Health Insurance Valuation Models with Dynamic Interest Rate and Multistate Risk Approach</i>	212
(I-2)	A.S.E. Hidayat: <i>Accuracy Comparison of Arima Model and Holt Winters Seasonal Smoothing in Predicting Stock Price</i>	216

(I-3) O. Rohaeni: *Implementation Of The Accrued Benefit Method In Determining The Size Of The Retirement Liability Model 217*

Jadwal Kegiatan

Hari 1 : Selasa, 18 Oktober 2022

No	Waktu	Uraian	Keterangan
1	07.00 – 07.45 WIB	Persiapan – Registrasi	Panitia
2	07.45 – 08.00 WIB	Kesenian pembuka: Tarian Daerah (Tari Kembang Sembah)	Mahasiswa Matematika (Yuna dan Sinta)
3	08.00 – 08.10 WIB	Menyanyikan lagu Indonesia Raya	Panitia
4	08.10 – 09.25 WIB	Pembukaan: <ul style="list-style-type: none"> • Laporan Ketua Panitia KNM XX Dr. I Gede Adhitya Wisnu Wardhana, M.Si. • Sambutan Presiden IndoMS Prof. Dr. Indah Emilia Wijayanti, M.Si. • Sambutan Dekan FKIP Universitas Mataram sekaligus membuka KNM XXI tahun 2022 Prof. Dr. A. Wahab Jufri, M.Sc. 	MC: Nur Asmita Purnamasari
5	09.25 – 09.35 WIB	Doa	Ustad: Agus Kurnia
6	09.35 – 09.50 WIB	Break (Coffee break Symposium Aljabar)	
7	09.50 – 10.50 WIB	Sesi Pleno: Pembicara Utama Prof. Dr. Nor Haniza Sarmin Universiti Teknologi Malaysia	Moderator: Zata Yumni Awanis
8	10.50 – 11.10 WIB	Penyerahan Sertifikat, Sesi Foto Bersama, dan Penyerahan Penghargaan dari IndoMS	MC: Nur Asmita Purnamasari
9	11.10 – 12.00 WIB	Sesi Paralel: Pembicara Tamu <u>Aljabar</u> Pembicara Tamu : Dr. Intan Muchtadi-Alamsyah Institut Teknologi Bandung	Moderator: Abd. Gazir S.
		<u>Analisis dan Geometri</u> Pembicara Tamu : Prof. Supama Universitas Gadjah Mada	Moderator: Dwi Novitasari
		<u>Kombinatorik</u> Pembicara Tamu : Prof. I Nengah Suparta Universitas Pendidikan Ganesha	Moderator: Nilza Humaira S

No	Waktu	Uraian	Keterangan
		<u>Matematika Terapan</u> Pembicara Tamu : Prof. Komang Dharmawan Universitas Udayana	Moderator: Nuzla N.R.
		<u>Riset Operasi & Kontrol</u> Pembicara Tamu : Prof. Wamiliana Universitas Lampung	Moderator: Junaidi
		<u>Statistika</u> Pembicara Tamu : Prof. Budi Nurani Universitas Padjajaran	Moderator: Dara Puspita A
		<u>Aktuaria</u> Pembicara Tamu : Novriana Sumarti, Ph.D. Institut Teknologi Bandung	Moderator: Lailia Awalushaumi
		<u>Pendidikan Matematika</u> Pembicara Tamu : Prof. Tatag Yuli Eko Siswono Universitas Negeri Surabaya	Moderator: Tabita Wahyu T
		<u>Komputasi Numerik</u> Pembicara Tamu : Prof. Basuki Widodo Institut Teknologi Sepuluh November	Moderator: Bulqis Nebula S
10	12.00 – 13.00 WIB	ISHOMA	
11	13.00 – 16.00 WIB	Sesi Paralel	Moderator
12	16.00 – 16.10 WIB	Penutup	MC: Nur Asmita Purnamasari

Pembagian Ruangan Sesi Paralel

Offline

No.	Nama
A-1	Dian Ariesta Yuwaningsih
A-2	Muhammad Naoval H
A-3	GHAZALI SEMIL ISMAIL
A-4	Ivan Adrian Wijaya
A-5	Deby Anastasya
A-6	Hubbi Muhammad
A-7	Marena Rahayu Gayatri
A-8	Nikken Puspita
A-9	Agista Surya Bawana
A-10	YUNITA KHAIRUNNISA
A-11	Abdul Gazir S
A-12	Gustina Elfiyanti
A-13	Suma Inna

Offline

No.	Nama
A-12	Deny Malik
A-13	Yunita Septriana Anwar
A-14	Rifky Satyana
A-15	Khoirun Nisa'
A-16	Puguh Wahyu Prasetyo
A-17	Naelufa Syifna Wifaqotul Muna
A-18	Sri Wahyuni
A-19	Indah Emilia Wijayanti
A-20	Evi Yuniartika Asmarani
A-21	Hindani Kusuma Ningrum
C-3	Siti Khabibah
E-4	Eka Auliya Syifa
A-44	Ricky Aditya

Room 1 (online)

No.	Nama
A-28	Fakhry Asad Agusfianto
A-29	Benediktus Panji Pradipta
A-30	Zakaria Ikhtiyar
A-31	Euis Asriani
A-32	Sisilia Sylviani
A-33	soleha
A-34	R. Respitawulan
A-35	Edi Kurniadi
A-36	Any Muanalifah
A-37	Titik Suparwati
A-38	Noor Hidayat
A-39	Novita Dahoklory

Room 2 (online)

No.	Nama
A-40	Farly Oktriany Haning
A-41	Dwi Mifta Maharani
B-1	Rifdah 'Abid Aadilah
B-2	Dewi Kartika Sari
C-1	Muhammad Nurul Huda
C-2	Widya Rizky Fadhillah
C-4	Yeni Susanti
C-5	Rizal Afgani
D-1	Syaiful Anam
D-2	Zuraidah Fitriah
D-3	Zuraidah Fitriah

Room 3 (online)

No.	Nama
E-1	Noorma Megawati
E-2	Ines Saraswati Machfiroh
E-3	Afifurrahman
E-5	Anggel Dwi Miranda
E-6	Dharma Lesmono
E-7	Taufik Limansyah
E-8	Tasmi
E-9	Putri Monika
E-10	Stephanus Ivan Goenawan
E-11	Syamsul Bahri

Room 4 (online)

No.	Nama
E-12	Oki Almas Amalia
E-15	Kamalatul Azmi
E-16	Hilwa Gifty
E-19	Retno Wahyu Dewanti
E-20	Lilis Sriwahyuni
F-1	Nizmi Fitri Rahayu
F-2	Agustina Pradjaningsih
F-3	Sasha Fahrnunisha
F-4	Meliana Pasaribu
F-5	Nadya Sulistia

Room 5 (online)

No.	Nama
G-1	Susanti
G-2	Deni Hamdani
G-3	Dita Ratnasari
G-4	Jumrah
G-5	Sitti Rahmayani
G-6	Egitia Fitri Rerendo
G-7	Diva Maharani
G-8	IIS ARISKA
G-9	Ni Made Intan Kertiyani
G-10	Nourma Pramestie W

Room 6 (online)

No.	Nama
G-11	Wahid Umar
G-12	Mutiara Febrianti
G-13	Rizkia Pradani
G-14	Rahma Siska Utari
G-15	Ketut Sarjana
G-16	Endah Rahaju
G-17	Abd. Kadir Jaelani
H-1	Syalam Simatupang
H-2	Siti Hamidah
I-1	Adhitya Ronnie Effendie
I-2	Agus Sofian Eka Hidayat
I-3	Onoy Rohaeni

Room 7 (online)

No.	Nama
H-3	Septri Damayanti
H-4	Millennia Taraly
H-5	Mega Silfiani
H-6	Fitria Figantari dan Elgi Yanti
H-7	Fitria Figantari dan Elgi Yanti
H-8	Rizki Fitri
H-9	Suci Lukfyana Lestari
H-10	Ika Dewi Sumarni
H-11	Hairunnisa
H-12	Joji Pembargi
H-13	Joji Pembargi
H-18	Soekardi Hadi Prabowo

Room 8 (online)

No.	Nama
E-21	Nurwan
E-22	Lina Aryati
E-23	Yuniarta Basani
E-24	Muhammad Ahladi Yunus
G-18	Nurlaila Fathimah Anwar
G-19	Noor Fajriah
G-20	Eli Kholipah
G-21	Dini Fardah
H-14	Primadina Hasanah
H-15	Danardono
H-16	Henry Junus Wattimanela
H-17	Henry Junus Wattimanela

Keterangan:

A : Bidang Aljabar

B : Bidang Analisis dan Geometri

C : Bidang Kombinatorik

D : Bidang Komputasi

E : Bidang Matematika Terapan

F : Bidang Riset Operasi

G : Bidang Pendidikan Matematika

H : Bidang Statistika

I : Bidang Aktuaria

Keynote and Invited Speakers

DNA Splicing System: Mathematical Biology in Computation

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The mathematical modelling of DNA splicing system has first been introduced in 1987 which is simulated by the technique of recombinant DNA molecules that relies on restriction enzymes in the study of formal language theory. In this presentation, variants of splicing models that have been developed over the years will be presented. Furthermore, the splicing systems will be shown as graphically represented using the concepts of automata. Also, molecular works for splicing systems which are conducted through wet-lab experiments will be shared to validate the existence of splicing languages. Besides, the idea of DNA splicing system in graph theory will also be presented. Lastly, a graphical user interface will be shown to understand the concept of DNA splicing system.

On Orthogonal Circulant MDS Matrices

Ichlas Adhiguna, Izdihar Salsabila Noor Arifin, Intan Muchtadi-Alamsyah, Fajar Yuliawan¹ 

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In 2019 Cauchois and Loidreau gave a necessary and sufficient condition for circulant MDS matrices using q -polynomial rings. In this paper, we prove the non-existence of certain orthogonal circulant MDS matrices. Then we give a necessary and sufficient condition for orthogonal θ -circulant matrices using q -polynomial rings.

On A C^* - Module Normed Space

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Hilbert and complete normed spaces have important roles in many area, such as statistics, quantum mechanics, etc. In 1953, Irving Kaplansky generalised the notion of Hilbert spaces. He introduced C^* -module Hilbert spaces by defining an inner product like function on a left module, which take values in a C^* -algebra. In this work, inspired by the Kaplansky's, we construct a notion of a C^* -module normed space. Further, we observe some topological properties of the spaces as well.

Analisis Perbandingan Beberapa Algoritma untuk Menyelesaikan Masalah Instalasi Jaringan Multi Tahap

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Masalah instalasi jaringan adalah masalah yang sering sering dihadapi dalam kehidupan misalnya instalasi jaringan listrik, telekomunikasi, komputer, dan sebagainya. Akan tetapi, seringkali proses tersebut memerlukan beberapa tahap agar seluruh titik/komponen dalam jaringan terhubung karena adanya beberapa kendala, seperti keterbatasan dana, cuaca, dll. Sehingga, proses instalasi harus dilakukan dalam beberapa tahap. Dalam jaringan yang berbentuk pohon (tree) masalah ini dikenal dalam desain jaringan dengan masalah Instalasi Jaringan Multi Tahap atau Multi Period Minimum Spanning Tree. Jika koneksi pada tiap titik dibatasi untuk menjaga agar jaringan tersebut dapat diandalkan (reliable) maka masalah tersebut disebut dengan Multi Period Degree Constrained Minimum Spanning Tree (MPDCMST). Pada penelitian ini akan didiskusikan analisis perbandingan dari beberapa algoritma untuk menyelesaikan masalah MPDCMST.

Strongly Graceful Characterization on Unicyclic Graphs

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Let the graph $G(V, E)$ be undirected finite simple graph of order $|V|$ and of size $|E|$. Consider a matching M in G , that is a non empty subset M of E such that any two elements of M are not adjacent in G . If every vertex of G is an end vertex of an element of M , then M is called perfect matching. Let f be an injective function from the vertex set V into the set $0, 1, \dots, |E|$. If the set $\{f(u)f(v) : uv \in E = 1, 2, \dots, |E|\}$, then f is called graceful labeling for G , and G is called graceful graph. If M is some perfect matching in a graceful graph G with graceful labeling f , such that $f(u) + f(v) = |E|$ for every $uv \in M$, then f is called strongly graceful labeling for G , and the graph G is called strongly graceful. A unicyclic graph is a connected graph containing exactly one cycle. In this talk, we will introduce some strongly graceful characterizations of unicyclic graphs.

Spatio-Temporal Machine Learning Approach for Forecasting Various Aspects of Daily Life

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The development of the spatio-temporal model based on time series analysis continues to increase to accommodate solutions to problems in data that are quite complex, especially in big data. Dependency location and time variables in multivariate time series can be modeled both at homogeneous locations in the Space-Time Autoregressive (STAR) model and heterogeneous characteristics of sample locations in the Generalized Space-Time Autoregressive (GSTAR) model. Integrating the spatio-temporal model with Machine Learning (ML) is the subsequent development for a simultaneously forecasting based on data phenomena. We proposed the Multilayer Perceptron as part of the Neural Network of ML for forecasting with an error of the spatio-temporal model as an input and called as the GSTAR-Neural Network (GSTAR-NN). The input layer accommodates the GSTAR model following the Box-Jenkins procedure. While the hidden layer receives the results of the input process with various activation functions, then the results are sent to the output layer. Forecasting accuracy requires choosing the architecture of the built GSTAR-NN. Selection of the most refined model using Mean Square Error (MSE), Root Mean Square Error (RMSE), and Mean Average Percentage Error (MAPE) to show the minimum error significance of the model. Implementation of GSTAR- NN on climate forecasting can provide solutions as decision support. In this study, integrating the spatio-temporal model with a Deep Neural Network with multi-hidden layers uses the Rectified Linear Unit (ReLU) activation function to acquire climate forecasting outputs in the future. Implementing the spatio-temporal model using GSTAR-NN on climate phenomena for forecasting at several interconnected locations in the future time at West Java region produces the model with the satisfactory performance accuracy and it has the minimum value of MAPE.

Pemodelan Dan Penentuan Premi Risiko Asuransi Siber

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Dengan semakin tingginya tingkat penetrasi internet di Indonesia, yang diiringi dengan semakin banyak data yang disimpan secara digital, memunculkan risiko serangan siber yang semakin besar pula yang dapat menyebabkan kerugian sangat besar bagi perusahaan dan konsumen. Tingginya risiko serangan siber, besarnya kerugian terhadap individu dan instansi perusahaan akibat serangan siber, serta masih sedikitnya produk asuransi siber menyebabkan pasar produk asuransi siber masih sangat besar di Indonesia. Namun di sisi lain, produk asuransi siber yang tergolong baru ini mempunyai beberapa kendala salah satunya adalah dalam menentukan premi risiko. Riset ini ingin mengetahui alur penyebaran dan peluang terinfeksi virus komputer untuk suatu sistem jaringan tertentu, untuk selanjutnya dapat menentukan topologi jaringan paling efektif untuk digunakan oleh perusahaan dalam meminimalisir risiko infeksi dan kerugian dari serangan siber, model kerugian finansial, serta premi risiko asuransi siber. Perumusan model asuransi siber menggunakan pendekatan model Markov Lebih lanjut, kerugian finansial yang ditimbulkan dari serangan siber diasumsikan merupakan suatu proporsi yang mengikuti distribusi Beta. Dari model kerugian finansial tersebut, premi risiko asuransi siber akan dihitung untuk beberapa topologi jaringan berdasarkan data hasil simulasi Monte Carlo. Premi risiko asuransi siber untuk setiap topologi jaringan akan dihitung menggunakan 2 prinsip, yakni prinsip standar deviasi dan prinsip equivalent utility. Hasil dari penelitian ini menyatakan bahwa jenis topologi jaringan yang digunakan dapat memengaruhi besarnya kerugian finansial akibat risiko serangan siber. Besarnya kerugian finansial juga dapat dipengaruhi oleh parameter-parameter yang digunakan pada skenario asuransi siber

Aljabar

The Product of Elements of Free R -Modules with Infinite Dimension

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Let R be a ring with identity and M be a left unital R -module. Previous researchers have defined the product of submodules of module M over commutative rings with identity. However, the product of the element of a module has not been determined yet. In this research, we define one of the product forms of elements of the free R -module structure with infinite dimension. Then, we present some properties of them. Furthermore, we show that M forms an R -algebra when R is a commutative ring.

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The Harmonic Index and The Gutman Index of Coprime Graph of Integer Group Modulo With Order of Prime Power

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In the field of mathematics, there are many branches of study, especially in graph theory, mathematically a graph is a pair of sets, which consists of a non-empty set whose members are called vertices and a set of distinct unordered pairs called edges. One example of a graph from a group is a coprime graph, where a coprime graph is defined as a graph whose vertices are members of a group and two vertices with different x and y are neighbors if only if $(|x|, |y|) = 1$. In this study, the author discusses the Harmonic Index and Gutman Index of Coprime Graph of Integer Group Modulo n . The method used in this research is a literature review and analysis based on patterns formed from several case studies for the value of n . The results obtained from this study are the coprime graph of the group of integers modulo n has the harmonic index of $2((n-1)/n)$ and the Gutman index $(n-1)(2n-3)$ for $n = p^k$ where p is prime and k is a natural number.

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The First Zagreb Index of Zero Divisor Graph for the Ring of Integers Modulo Power of Primes

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Let Γ be a simple graph with the set of vertices and the set of edges. The first Zagreb index of a graph is defined as the sum of the degree of each vertex to the power of two. Meanwhile the zero-divisor graph of R , denoted by $\Gamma(R)$, is defined as a graph with vertex set $Z(R)^*$ in which two vertices x and y are adjacent if and only if $x \neq y$ and $xy = 0$. In this paper, the general formula of the first Zagreb index of zero divisor graph for the commutative ring of integers modulo p^n is considered, where p is a prime number and n is a positive integer is determined. A few examples are then given to illustrate the main results.

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Modification of Caesar Cipher Using Modular Arithmetic

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The process of securing data does found, both classic and modern. The classic algorithm already well-known is the Caesar cipher algorithm, and the figure who pioneered this algorithm is Julius Caesar. In Caesar's cipher, the inventor shifts the corresponding letters of the alphabet to the proper three steps so that data confidentiality has easily broken. This paper will modify the Caesar cipher using modular arithmetic concepts. Given two parameters, for example, a and b . Encryption has done by multiplying the first parameter with the original code letters a to z (in this case, its use is only limited to letters a to z). Then, the results are summed with the second parameter and operated with modular 26. The thing that is of concern is that the first parameter and modular 26 must have a gcd (greatest common division) of 1 to have an inverse and can return the result of the encryption (ciphertext) to the description that aims to return to the original writing (plaintext). Then, in the description process, the process is similar to the encryption process. That process is the inverse of the first parameter multiplied by the first code in the ciphertext, then reduced by the product of the inverse of the first parameter with the second parameter and operated with modular 26.

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Presimplifiable and Weakly Presimplifiable Rings

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Let R be a commutative ring with identity. Two elements a and b in R are called to be associates if $a|b$ and $b|a$, or equivalently, if $Ra = Rb$. The generalization of associate relation in R has given the idea for definitions of presimplifiable and weakly presimplifiable rings. First of all, it will be given definitions of very strong associate relation, strong regular associate relation, very strongly associate ring, and strongly regular associate ring. The presimplifiable ring is a commutative ring with the condition that every the nonzero element is a unit element. While the weakly presimplifiable ring is a commutative ring with the condition that every nonzero element is regular element. Furthermore, it is shown that the relationship between very strongly associate ring with presimplifiable ring and the linkage between strongly regular associate ring and weakly presimplifiable ring. It is obtained that R is a presimplifiable ring if and only if R is a very strongly associate ring. Meanwhile, R is a weakly presimplifiable ring if and only if R is a strongly regular associate ring. Then, it is shown that the correlation between presimplifiable and weakly presimplifiable rings to its polynomial ring $R[X]$ and its the formal power series ring $R[[X]]$. If R is a weakly presimplifiable ring, then $R[X]$ and $R[[X]]$ are also weakly presimplifiable rings. However, if R is a presimplifiable ring, then $R[[X]]$ is also a presimplifiable ring but always not valid for $R[X]$.

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Generalization of Von-Neumann Regular Rings to Von-Neumann Regular Modules

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An element r in a commutative ring R is called regular if there exist $s \in R$ such that $rsr = r$. Ring R is called vN (von-Neumann)-regular ring if every element is regular. Recall that for any ring R always can be considered as module over itself. Using the fact, it is natural to generalize the definition of vN -regular ring to vN -regular module. Depend on the ways in generalizing there will be some different version in defining the vN -regular module. The first who defined the concept of regular module is Fieldhouse (1969). According to Fieldhouse (1969), module M over R is vN -regular if every submodule in M is pure submodule. Secondly Ramamuthi and Rangaswamy (1973) defined the concept of strongly regular module of Fieldhouse by giving stronger requirement. Afterward Jayaram and Tekir (2018) defined the concept of vN -regular module by generalizing the regular element in ring to regular element in R -module M . Jayaram and Tekir (2018) defined vN -regular module as follow. Module M over R is regular if for any $m \in M$ there exist element $M - vn$ regular $a \in R$ such that $Rm = aR$. Lastly Anderson, et al. (2019) defined the concept of weak regular module of Jayaram and Tekir by weakening the requirement. In this paper we investigate the properties of each module regular. The results are: if M finitely generated module over R then MvN -regular module of Jayaram and Tekir version if and only if every submodule of M also vN -regular module of Jayaram and Tekir version. If M finitely generated over R then M vN -regular module of Jayaram and Tekir version if and only if M is vN -regular module of Fieldhouse version. In general we have the following result: M is vN -regular module of Ramamuthi and Rangaswamy version \Rightarrow M is vN -regular module of Fieldhouse version \Rightarrow M is vN -regular module of Anderson, et al. version.

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Bilangan Clique dan Bilangan Kromatik dari Graf Koprime dari Grup Generalized Quaternion

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Group theory and graph theory are two theories that are often combined in research. The generalized quaternion group ($\Gamma_{Q_{4n}}$) is one of the interesting things to study. In this research, we find the clique number and chromatic number of the coprime graph of the generalized quaternion group. The method used is by reading references related to the generalized quaternion group ($\Gamma_{Q_{4n}}$), coprime graphs, clique number, and chromatic number. Results that obtained from this study show that the clique number of $\Gamma_{Q_{4n}}$ is same as the chromatic number of $\Gamma_{Q_{4n}}$ for each case of n .

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The Introduction of The Neutrosophic Concepts on Comodules Category

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Let R be a commutative ring with multiplicative identity [1,2], C a coassociative and counital R -coalgebra, and M is a right C -comodule. For any R -coalgebra C , C^* is the set of module homomorphisms from C to R , where C^* is called the algebra dual of C by the addition and convolution operation. Moreover, the right C -comodule M is a left C^* -module [3]. Here, we defined the notion of neutrosophic on comodules theory by this fact. A right C -comodule is called strong neutrosophic if M is a left module over the neutrosophic ring $\langle C^* \rangle$ or M is a strong neutrosophic module [4-10], where I is an indeterminate idempotent. Since C can be considered a comodule over itself, we can also define the neutrosophic concept for coalgebra when C is a trivial neutrosophic C -comodule.

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Girth, Independence Number, and Wiener Index of Coprime Graph of Dihedral Group D_{2n}

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The coprime graph of a finite group G is a graph with vertex set G such that two distinct vertices x and y are adjacent if and only if $\gcd(|x|, |y|) = 1$ where $|x|$ is order of x . In this paper, it is presented some properties of the coprime graph of a dihedral group, including girth, independence number, and Wiener index.

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Gelanggang Noether dan Gelanggang Polinomial Yang Dibangun dari Gelanggang Noether

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The main idea of a principal ideal, where each ideal is built by one element is often untenable in constructing a new ring. For example, the ring of integers is the principal ideal domain, but when constructing the polynomial integer, the ideal characteristics built by one element are not successfully maintained. But the characteristic of the finitely generated ideal remains valid in the construction of a new ring. Even for any Noetherian ring, the construction of a new ring can maintain its character as a Noetherian ring. In other words, if R is a Noetherian ring, then the polynomial ring $R[x]$ is also Noetherian. Furthermore, the ring $R[x]$ is also a Noetherian ring.

Topological Indices of Prime Ideal Graph of Commutative Ring

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Let R be a commutative ring with identity and P prime ideal of R . A prime ideal graph denoted by Γ_P is the set of every element $R - \{0\}$ as vertices in a graph with two vertices are adjacent if only if the product of two vertices is in P . In this study, several prime ideal graph topological indices of commutative rings will be discussed. The topological indices related to the degree of vertices and the diameter of the prime ideal graph of the commutative ring can be determined.

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A Note on Nilpotent Graph of Ring Integer Modulo

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In algebraic theory, there is an interesting topic about graph representation of a ring, where each element in the ring is a vertex in the graph and is connected by some rule. An element x of a ring R is said to be a nilpotent element, if and only if $x^m = 0$, for some $m \in \mathbb{N}$. The nilpotent set is a subset of the ring whose elements are nilpotent in the ring, denoted by N_R . In this study, we will discuss the graph representation of the integers modulo (Z_n) ring that calls the nilpotent graph, where every two vertices in the graph are said to be adjacent if the product of the two vertices in the ring is a nilpotent element of the ring. This graph is named a nilpotent graph of ring Z_n and denoted by $N(G)$. Some of the results are, characteristic of a nilpotent element of the ring Z_n , the constructor of a nilpotent set of ring Z_n , vertices adjacent to $N(G)$, and $N(Z_n)$ is a subring of Z_n .

Injectivity of Topological Direct Sum

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Let R be a topological ring and U be a topological R -module. U is called a topological injective module if for every continuous monomorphism $f : K \rightarrow M$, where K is an open submodule of M , and for every continuous homomorphism $g : K \rightarrow U$, there exists a continuous homomorphism $h : M \rightarrow U$ such that $hf = g$. It is known that the direct sum of injective modules is not necessary injective. Many researchers have tried to find necessary and sufficient conditions for the direct sum of injective module to be injective. Goldman and Sah (1969) proved that the direct sum of topological injective modules with trivial topology in the compact ring is injective. However, the discrete topology is trivial, so there is an opportunity to develop Goldman and Sah's results on nontrivial topologies in the direct sum of topological injective modules. In this paper, we prove that the direct sum of topological injective modules is also topological injective in any topological ring if the direct sum is an open submodule of the product of topological injective modules.

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On the Speed of a New NTRU Variant: GTRU

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NTRU has been an interesting topic to discuss as it has many variants. One of a new NTRU variant is GTRU (Group-based NTRU-like) public-key cryptosystem. Xu and friends constructed GTRU by generalizing NTRU into the group structure. Later on, they applied GTRU on a special poly- Z group and claimed that GTRU has better encryption and decryption speeds compares to RSA. In this paper, we will simulate GTRU on a special poly- Z group on a real computation calculations using Python and we will see that there exist a problem for the key generation process. We will also find that the claim made by Xu and friends on their paper turns out to be invalid here.

Brute Force Attacks and Meet-in-The-Middle Attacks on Matrix NTRU Cryptosystem

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Cryptography's purpose is to maintain the security of information sent to the message recipient. Hoffstein, Pipher, and Silverman (1996) introduced the NTRU cryptosystem using polynomial rings. Then Nayak, Sastry, and Pradhan (2008) introduced the Matrix NTRU cryptosystem using matrix rings as a modification of the NTRU cryptosystem. The security of a cryptosystem is relative to the types of attacks. There are several attacks on the NTRU cryptosystem, including brute force attacks, meet-in-the-middle attacks, multiple transmission attacks, lattice reduction attacks, and reaction attacks. Nayak, Sastry, and Pradhan (2011) investigated the security of the Matrix NTRU cryptosystem against reaction attacks. In this paper, we explain how the brute force attacks and the meet-in-the-middle attacks in attacking the private key of the Matrix NTRU cryptosystem and also simulate those attacks on Google Colab using the Python programming language.

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NL and *Nβ* Ring Construction

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Let A be a ring. The set of all nilpotent elements of A is denoted by $N(A)$. The ring A is called an *NL* ring (respectively, *Nβ*) if $N(A) = L(A)$ (respectively, $N(A) = \beta(A)$), where $L(A)$ is the Levitzki radical of A (respectively, $\beta(A)$ is the prime radical of A).

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Beberapa Kongruensi Bipartisi dengan Penjumlah Ditandai

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Partisi bilangan bulat merupakan salah satu cabang di bidang teori bilangan yang banyak dikembangkan. Hal yang menarik untuk dikaji pada penelitian terkait partisi adalah partisi dengan sifat khusus. Salah satu partisi dengan sifat khusus tersebut adalah partisi dengan penjumlah ditandai yang diperkenalkan oleh Andrews, Lewis dan Lovejoy. Selain itu, konsep partisi dapat dikembangkan lebih lanjut menjadi konsep pasangan partisi, yaitu bipartisi. Pada artikel ini, akan dibahas salah satu varian partisi yang menggabungkan konsep bipartisi dan partisi dengan penjumlah ditandai, yaitu bipartisi dengan penjumlah ditandai. Selanjutnya, akan dibuktikan beberapa hubungan kongruensi yang muncul khususnya modulo pangkat dari 2 dan pangkat dari 3.

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On Almost von Neumann Regular Rings

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A ring R is an almost von Neumann regular ring (AVN-ring for short) if, for any two elements a and b in R , there exists a positive integer n such that the ideal (a^n, b^n) is generated by an idempotent element. Recall that a ring R is called von Neumann regular if every finitely generated ideal is generated by an idempotent element. Clearly, a von Neumann regular ring is an AVN-ring, while the converse fails. Let A be a ring and E an A -module. The trivial ring extension of A by E (also called idealization of E over A) is the ring $R := A\Delta E$ whose underlying group is $A \times E$ with multiplication given by $(a, e)(a', e') = (aa', ae' + ea')$. The purpose of this paper is to investigate the possible transfer of the notions of almost von Neumann regular rings to the ring $R := A\Delta E$.

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C^* -Algebras and Compact Quantum Semigroups: Some Contributions to Algebraic Structures

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From complex numbers we can make the abstraction to C^* -algebra. Together with the notion of quantum semigroup we present the motivation of coalgebra and comodule structure. Moreover, some research further of these structures are also presented.

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The First Zagreb Index, The Wiener Index, and The Gutman Index of The Power Graph of Dihedral Group

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Research on graphs combined with groups is an interesting topic in the field of combinatoric algebra where graphs are used to represent a group. One type of graph representation of a group is a power graph. A power graph of the group G is defined as a graph whose vertex set is all elements of G and two distinct vertices a and b are adjacent if and only if $a^x = b$ or $b^y = a$ for a positive integer x and y . In addition to mathematics, graph theory can be applied to various fields of science, one of which is chemistry, which is related to topological indices. In this study, the topological indexes will be discussed, namely the Zagreb index, the Wiener index, and the Gutman index of the power graph of the dihedral group D_{2n} where $n = p^m$ with p prime numbers and an m natural number. The method used in this research is a literature review. The results obtained from this study are the first Zagreb index, Wiener index, and Gutman index of the power graph of the dihedral group D_{2n} where $n = p^m$ where p is prime and an m natural number respectively is $n^2(n-1)$, $(7n^2)/2 - 5n/2$, $1/2(n^4 + n) + 3/2(n^3 - n^2)$.

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Graf Ideal Prima Dari Gelanggang Z_n

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Graf ideal prima Γ_p didefinisikan sebagai himpunan setiap elemen $R \setminus \{0\}$ sebagai titik-titik pada graf dengan r_1 dan r_2 terhubung jika dan hanya jika $r_1, r_2 \in P$. Tujuan dari penelitian ini yaitu untuk merepresentasikan bentuk graf terutama graf ideal prima dari gelanggang Z_n dimana n merupakan bilangan prima P dan pangkat prima P^k . Metode yang digunakan dalam penelitiannya ini yaitu menggunakan metode literatur atau penelitian kepustakaan. Hasil dari penelitian ini yaitu didapatkan graf ideal prima yang memiliki subgraf berupa graf bintang pada $n = p^k$ dengan banyak subgraf yang didapatkan yaitu $p^k - 1$ dimana p^k merupakan pangkat prima dan untuk n bilangan prima tidak memiliki graf.

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Some Properties of Rough Semirings Using Praba Concept

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The concept of rough set was originally introduced by a polish scientist, Pawlak, in 1982. Furthermore, the researcher linked the concept of rough set with algebraic structure so that a concept called rough algebraic structure was obtained. Some concepts on rough algebraic structures are rough groups, rough rings, rough semiring, and rough modules. Since research on rough sets is mostly done simultaneously, there are different definitions. In this paper, the discussion will focus on rough semiring. Furthermore, the concept of Praba join (Δ) and Praba meet (*nabla*) was introduced by Praba in 2013. The concepts of Praba join and Praba meet can be used in defining rough lattice, rough monoid, and rough semiring. The purpose of this paper is to provide properties that have not been discussed in previous studies related to rough semiring with the Concept of Praba. These properties include zerosumfree rough semiring, rough band, rough left singular, rough left singular band, rough rectangular band, Boolean like rough semiring, and viterbi rough semiring.

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Designing DNA Codes from Reversible-Self-Dual Codes over GF(4)

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In this work, we present a method for designing DNA codes from Euclidean reversible self-dual codes over GF(4). The first concept that we present here is the construction method of reversible self-dual codes over GF(4) and some properties in the connection of DNA codes. We also present an algorithm for designing DNA codes from reversible self-dual codes over GF(4). This algorithm benefits from the reversibility and self-duality of the reversible self-dual codes. Finally, we discuss the distribution of GC-Weight content from the DNA codes that we obtained.

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Weakly Prime Ideal On The Ring $End_Z(M_n(R))$

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Given the ring endomorphism over the Z -module $M_n(R)$, denoted by the ring $End_Z(M_n(R))$, is a non-commutative ring. The definition of weakly prime ideal on non-commutative ring have known. Ring $End_Z(M_n(R))$ contains the zero divisor element. Therefore, in this article, the existence of a weakly prime ideal in the ring $End_Z(M_n(R))$ is shown. In addition, the characteristics of the weakly prime ideal and its relationship with the prime ideal in the ring $End_Z(M_n(R))$ are shown.

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The Use of DCT-DST Algorithm on Block Circulant Matrices-Vector Multiplication for Transformers

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Transformer is one of the artificial neural network models whose working mechanism is dominated by the multiplication of weight matrices with their input vectors. Selection of the right weight matrices and matrices-vector multiplication algorithm is one approach can be taken to improve transformer performance. This study aims to explore the use of block circulant matrices and the DCT-DST (Discrete Cosine Transform-Discrete Sine Transform) algorithm for multiplication of the block circulant matrices with any vector. The DCT-DST algorithm has been proven more effective for circulant matrices compared to the commonly used multiplication algorithm, namely the FFT algorithm (Liu et al., 2019). By adapting the procedure as carried out by Liu et al (2019), it is found that the DCT-DST algorithm can be applied to the multiplication of the block circulant matrices with any vector. Furthermore, it is possible to be implemented to the transformer mechanism so that its performance can be better.

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Orthogonality in Krein Spaces

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An indefinite inner product space is said to be a Krein space if it can be represented in a canonical decomposition. The standard orthogonality in Krein spaces is defined as in the inner product space. Two vectors in Krein spaces are said to be orthogonal if the indefinite inner product between them is zero. In this paper, we discuss the generalization of the standard orthogonality concept in Krein spaces. They are Birkhoff-James Orthogonality, Pythagorean Orthogonality, Isosceles Orthogonality, and Bisectrix Orthogonality. This paper also discusses the relationship between the five types of orthogonality in Krein spaces.

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Bounded Linear Functionals on Semi-Inner Product Spaces

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A semi-inner product space is a vector space equipped with a semi-inner product (SIP), a generalization of an inner product by substituting the positive definite condition in the inner product with a positive semi-definite. The paper aims to study necessary and sufficient conditions of bounded linear functionals on a SIP space. Let U be a finite dimensional SIP space with a SIP $[x, y]$, for all $x, y \in U$. In this case, one can define a seminorm on U by $\|x\|_A = [x, x]^{1/2}, \forall x \in U$. The set $U_0 = \{x \in U \mid [x, x] = 0\}$ forms a subspace of U and so one gets a quotient space U/U_0 which can be formed as an inner product space. A linear functional T on U is called bounded if there exists a positive real number $c \neq 0$ so that $|T(x)| \leq c\|x\|_A, \forall x \in U$. In this paper we show a linear functional f is bounded if and only if U_0 is contained in the kernel of f so that using Riesz theorem on the inner product space U/U_0 it is proven that there is an element $a \in U$ such that $f(x) = [x, a]$ for all $x \in U$.

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The Intertwining Operators of Unitary Representations of A Lie Group Between The Mackey and The Blatter Models

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In this paper, we study intertwining operators of a unitary representation of a Lie group. We introduce for this Lie group representation the Mackey and Blatter models. The research aims to prove that representation Lie groups realized both the Mackey Model and the Blatter Model are equivalent. We start a representation of a Lie group in the induced representation. We realized this representation in the Mackey and the Blatter models then we compute a linear isomorphism of these representation spaces. Furthermore, we constructed an operator for these representations and as the result, we showed that this operator is intertwining. In the other words, the Mackey and the Blatter models are equivalent.

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Prime Cubic Order Cayley Graph of Cyclic Groups

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In this paper we consider prime cubic order Cayley graph $Cay_{P_3}(G, S)$ of cyclic group G of order p^3q^3 where p and q are two different prime numbers. We give some properties of the graph $Cay_{P_3}(G, S)$ including its regularity number, its Eulerianity and its girth. We prove that the graph $Cay_{P_3}(G, S)$ is $(p^3 + q^3 - p^2 - q^2)$ -regular, Eulerian and has girth 3.

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Himpunan Lunak Fuzzy Phythagorean: Tinjauan Aplikasi pada Penentuan Destinasi Wisata

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Pythagorean fuzzy set is a set that is equipped with membership and non-membership functions with the sum of the squares of the degree of membership and non-membership less than one. This set is the development of the intuitionistic fuzzy set. Pythagorean fuzzy soft set is a development of the Pythagorean fuzzy set by involving a set-valued function from a set of parameters. The development of theory and application of the Pythagorean fuzzy soft set has been carried out by many researchers. The application of this concept is mainly carried out in a multi criteria decision making (MCDM). In this article, we will discuss the selection of 4 tourist destinations based on 10 criteria from each destination. In this study, primary data was collected from respondents through filling out questionnaires distributed using Google Form. The population in this study is an unlimited number of Indonesian people, while the sample is set at 115 people. Respondents (sample) are divided into 2 types, namely expert respondents and general respondents. Expert respondents are people who are seen to understand the characteristics of the four tourist destinations so that they can provide an assessment/level of importance for all criteria for each destination. General respondents are intended to be people who can provide an assessment of all the criteria used. The questionnaire data is then processed into pythagorean fuzzy data using the fuzzification function, so that the degree of membership and non-membership of each criterion is obtained. Furthermore, by using the normalized Euclidean distance formula, the magnitude of the distance from each destination for each general respondent is obtained. By comparing the distances between these destinations, the recommended tourist destinations for tourists are obtained. Data processing using excel software.


Korespondensi Grup Galois pada Lapangan Perluasan atas \mathbb{Q}

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Diberikan lapangan perluasan K/F dengan $[K : F]$ merupakan dimensi dari lapangan K atas F . Diberikan grup automorfisma $Aut(K/F)$ dengan order dinotasikan dengan $|Aut(K/F)|$. Secara khusus, lapangan perluasan K/F disebut sebagai perluasan Galois jika $|Aut(K/F)| = [K : F]$. Diketahui bahwa untuk setiap sublapangan E dalam K dengan $F \subseteq E \subseteq K$ dapat dibentuk $Aut(K/E)$ yang merupakan subgroup dalam $Aut(K/F)$. Dalam penelitian ini akan ditunjukkan adanya korespondensi satu-satu antara himpunan semua sublapangan E dalam K yang memuat F dengan himpunan semua subgroup dalam $Aut(K/F)$. Pada penelitian akan dibahas beberapa sifat terkait korespondensi grup Galois khususnya pada subgroup normal dalam $Aut(K/F)$. Lebih lanjut, dalam penelitian ini akan diberikan contoh korespondensi grup Galois pada suatu lapangan perluasan atas lapangan \mathbb{Q} .

Petri net and Max-Plus Algebra model on Counter Registration Queue System in A Hospital in Kupang City

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Queuing systems can occur in health services for outpatients who need specialist doctor services. The classic problem in the queuing system is caused by units that require more services than service sources. The queuing system is an example of a discrete event system (SED) that can be modeled using a petri net. Every event that occurs in SED is represented by a transition and the conditions for the event to take place are represented by a place. Petri net can be viewed as a bipartition graph with the set of nodes on the graph consisting of the set of Transitions and the set of Places. Next, the max plus algebra is used to model the time of each event and the processing time of each service event. The model is formed in the maxplus algebraic matrix starting from the patient entering the registration counter, being served to leaving. By observing the length of time the process of an event takes place, calculations are carried out to get the time of each event.

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Exact Sequences of Heaps and Their Morphisms

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In [1], it is said that there are some relations between heaps and groups. We can construct a group from a heap by defining new binary operation involving the ternary operation of the heap, and vice versa. Moreover, Brzezinski discusses some properties of heaps which are similar to those of groups, such as normal sub-heaps and its characterizations, quotient heaps, some properties related to morphism of heaps. Besides some relation between heaps and groups, there are also some properties which connect morphism of heaps and homomorphism of groups. This article studies the development of some properties concerning morphism of heaps and homomorphism of groups and the exact sequences of heaps.

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Application of MDS Codes in Solving Problem of Distributing Exam Questions

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In online learning, giving an objective assessment is quite tricky task. Most of exams in online learning are done as take-home exams. Unlike in face-to-face onsite class, in which the students can be observed directly when doing the exam, in online class the students have chance to cheat and work together to gain unfair advantage. To tackle this, the teachers need to modify the exam format. One possible solution is to create some variations of exam questions and distribute them to the students such that they do not get the same set of questions. However, we cannot create too many variations since it would make the grading process more difficult for the teacher. Thus, we need to find an optimal way to do so. In this article, we will discuss how Maximum Separable Distance (MDS) Codes in coding theory can be applied to provide a solution for this problem. Moreover, distribution patterns for class of size 27, 64 and 125 students will also be presented.

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Analysis

On Composition of Equi-Baire 1 Family of Functions on Metric Spaces

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Equi-Baire 1 family of functions is a generalization of the equi-continuous family of functions. In this paper, we study the families of functions whose composition with an equi-Baire 1 are still an equi-Baire 1. We obtain a result that the class of left equi-Baire 1 compositors is the class of equi-continuous.

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Equi-AO Separated Family of Functions

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In [3], Lecomte introduced a generalization of the concept of equi-continuity, namely equi-Baire one family of functions. A family of functions is equi-Baire one if all functions are Baire one and their neighbourhood are defined using a same positif function. In this talk, we will introduce a new family of functions, namely equi- AO separated, by replaced the role of the positive functions with the neighbourhood assignments. Furthermore, we explore what the characterization of equi- AO separated and the relationship between equi- AO separated with equi-Baire one.

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Kombinatorika

On Total Edge Irregularity Strength of Triangular Grid Graphs and Related Graphs

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An edge total irregular k -labeling on a graph Γ is a function from the union of vertex and edge sets to the set of first k positive integers such that for any two distinct edges have distinct weights. The minimum k for which the graph Γ satisfies that property is called the total edge irregularity strength of Γ , denoted by $tes(\Gamma)$. In this paper, we determine the exact value of total edge irregularity strength of all triangular grid graphs, some spanning subgraphs of triangular grid graphs, and some Sierpiński gasket graphs. An edge total irregular k -labeling on a graph Γ is a function from the union of vertex and edge sets to the set of first k positive integers such that for any two distinct edges have distinct weights. The minimum k for which the graph Γ satisfies that property is called the total edge irregularity strength of Γ , denoted by $tes(\Gamma)$. In this paper, we determine the exact value of total edge irregularity strength of all triangular grid graphs, some spanning subgraphs of triangular grid graphs, and some Sierpiński gasket graphs.

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On the Edge Irregularity Strength of Banana-Tree $B(x, y)$ and Coconut Tree $CT(3, y)$

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Let $G = (V(G), E(G))$ be a finite simple graph with vertex set $V(G)$ and edge set $E(G)$. For arbitrary positive integer k , a vertex k -labelling $\delta : V(G) \rightarrow \{1, 2, \dots, k\}$ on G is called an edge irregular k -labeling, if all the edge weights are distinct. For any edge $pq \in E(G)$, the edge weight of pq is defined as $w_\delta(pq) := \delta(p) + \delta(q)$. The minimum k for the graph G has an edge irregular k -labeling is called the edge irregularity strength of G , denoted by $es(G)$. In this paper, we prove that the exact value of edge irregularity strength of banana-tree graph $B(x, y)$ is equal to $es(B(x, y)) = \lceil \frac{xy+1}{2} \rceil$. Moreover, we prove that the exact value of edge irregularity strength of coconut-tree graph $CT(3, y)$ is equal to $es(CT(3, y)) = \lceil \frac{xy+1}{2} \rceil$.

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The Domination Number of Sierpinski Star Graph SS_n

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A domination set for graph $G(V, E)$ is a subset D of V such that every element of V is either in D or is adjacent to at least one element of D . The domination number $\gamma(G)$ is the number of vertices in a smallest dominating set for G . In this paper, we study the domination number of Sierpinski Star Graph SS_n . For $n \geq 2$ the domination number of SS_n is $\frac{1}{2}(3^{n-1} - 1)$.

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On the Exact Value of Edge Irregularity Strength of Generalized Arithmetic Staircase Graphs

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For any simple undirected connected graph Γ , the edge irregularity strength of Γ is defined as the minimum biggest label can be used to construct an edge irregular vertex labelling on Γ . The irregularity is due to the condition that all edge weights are distinguished, where the weight of an edge is defined as the sum of the labels of its end vertices. In this paper it is given the exact value of edge irregularity strength of the generalized arithmetic staircase graph with arbitrary initial grids and difference. Furthermore, it is given also the construction of the corresponding labelling for the graph.

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Komputasi

Distance-based Topological Indices of Conjugacy Class Graph Associated to Some Finite Groups

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The number of claims plays an important factor in determining the profit achievement of health insurance companies. Predicting the number of claims is a critical challenge for insurers. It gives the significant implications for managerial, financial and underwriting decisions of health insurance companies. The number of claims received in a year needs to be considered appropriately and accurately to prepare the annual financial budget of the insurance company and to determine the premium. An increase in the number of claims will directly increase the company's total expenses, thus affecting the profit margins generated by the insurance company. Therefore, the prediction of claim submission by insurance users in that year needs to be done by insurance companies. Claim prediction of the health insurance users can be done using machine learning methods. Several machine learning methods that can be used to predict insurance claims include the Naïve Bayes method, Decision Tree (DT), Neural Networks (NN), K-Nearest Neighbor (KNN), and Support Vector Machine (SVM). The results of previous studies show that the solution of SVM is global and unique. SVM gives good results even if there is not enough information about the data. It also works well with unstructured data, has ability to solve the complex problems with a convenient kernel solution function, and has relatively good scaling of high dimensional data. The performance of the SVM is determined by the selection of the right parameters. Parameter selection from SVM is usually done by trial and error so that the performance is less than optimal. To overcome these problems in SVM, an optimization algorithm is used to determine the best parameter values. Some optimization algorithms that can be used include Particle Swarm Optimization (PSO), and Genetic Algorithm (GA). The swarm intelligence algorithm has the ability to find the global optimum from many local optimums, does not require derivatives, is robust, easy to apply. One of the swarm intelligence methods is Particle Swarm Optimization (PSO). All the individuals in the PSO can quickly converge to the global position and a near-optimal position. For these reasons, this article proposes the health claim insurance prediction using SVM with PSO. The experimental results show that the SVM with PSO give the great performance in the health claim insurance prediction.

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Random Forest Classifier for Diabetes Mellitus Prediction

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Diabetes mellitus is a degenerative disease that can lead to various complications for the patient to death. According to WHO data, the number of people with diabetes rose from 108 million in 1980 to 422 million in 2014. Prevalence has been rising more rapidly in low- and middle-income countries than in high-income countries. Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation. Between 2000 and 2019, there was a 3% increase in diabetes mortality rates by age. In 2019, diabetes and kidney disease due to diabetes caused an estimated 2 million deaths. An early identification of diabetes is much important in controlling diabetes. Machine learning has several classification methods offer fast and low-cost diagnosis such as random forest and naïve bayes classifier. This article using data from the laboratory of Medical City Hospital and (the Specializes Center for Endocrinology and Diabetes-AI-Kindy Teaching Hospital). Patients' files were taken and data extracted from them and entered in to the database to construct the diabetes dataset. The data consist of medical information, laboratory analysis. The simulation get accuracy 97% using random forest and 84%, 84%, and 94% using Multinomial, Bernoulli, Gaussian naïve bayes classifier, respectively. So, the proposed classification model using random forest used to predict diabetes mellitus.

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Prediksi Penyakit Stroke Menggunakan Machine Learning

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Berdasarkan data yang diperoleh dari WHO, stroke merupakan penyakit yang menempati urutan kedua penyakit paling mematikan. Stroke merupakan penyakit kardioserebrovaskular yang digolongkan ke dalam penyakit katastropik karena mempunyai dampak luas secara ekonomi dan sosial. Bentuknya dapat berupa lumpuh sebelah (hemiplegia), berkurangnya kekuatan sebelah anggota tubuh (hemiparesis), gangguan bicara, gangguan rasa (sensasi) di kulit sebelah wajah, lengan atau tungkai. Teknik pembelajaran pada machine learning membuat prediksi penyakit stroke menjadi lebih mudah dan fleksibel. Penelitian ini menggunakan Stroke Prediction Dataset yang bersumber dari situs Kaggle, terdiri dari 10 atribut terkait faktor resiko stroke. Hasil simulasi menggunakan metode klasifikasi pada machine learning menghasilkan akurasi yang cukup tinggi sehingga dapat disimpulkan bahwa metode ini layak digunakan sebagai alat prediksi penyakit stroke yang cepat dan rendah biaya.

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Matematika Terapan

A Mathematical Modeling of Election in Indonesia

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Citizen participation in elections represents the level of public trust in the government. In this paper, a mathematical model describing the dynamics of the behavior of citizen on the election process is proposed. The total population is divided into three compartments, the potential electors, the people who used their voting rights, and the abstainer. The abstainer free equilibrium point, the abstainer equilibrium point and the basic reproduction number are determined. Moreover, by constructing Lyapunov functions, the global and local stability of equilibrium points are analyzed. Numerical simulations are carried out to verify the theoretical analysis.

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Determination of The Best Koperasi Using SAW (Simple Additive Weighting)

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Dinas Koperasi, UKM, dan Perdagangan Tanah Laut conducts the health of Koperasi by manually checking the financial report data of each Koperasi. It takes precision and a long time to carry out Koperasi health checks with manual calculations. This study aims to determine the best Koperasi performance using a decision-making system with the Simple Additive Weighting (SAW) method. The criteria to determine the best Koperasi performance were based on the attributes of the governance, risk profile, financial performance, and capital of Koperasi. The SAW method was used to select the best Koperasi by adding up each attribute, then multiplying by the weight of the related attributes. Based on the calculations using the SAW method, Koperasi 33 was selected as the best Koperasi with the highest vector value ($V(i) = 0.944719$). This means that Koperasi 33 can be categorized as the best Koperasi.

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Neuronal dynamics: from complexity to simplicity

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
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A single neuron is an elementary processing unit in the central nervous system. The neuron dynamics is described by the evolution of membrane potential. If the membrane potential exceeds a certain threshold, we say the neuron fires a spike (or pulse). At the same time, the membrane potential re-polarizes before the next spike is fired. In this paper we review the basic models for neuronal systems. We discuss the models for a single neuron, starting from the realistic Hodgkin-Huxley model to a simple phase oscillator. We then introduce the interaction between two or more neurons mediated either through phase difference or the pulse emission, leading to the concept of phase response curve (PRC) and connectivity matrix. PRC is a typical function used to describe the phase dependent response of neuronal oscillator to the external stimulus while the connectivity matrix describes mathematically the connection from presynaptic neurons to postsynaptic ones.

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Application of Linear Programming in Optimizing The Profits of PT. Naruna With The Simplex Method

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Naruna is a ceramics factory located in Salatiga. All products in naruna ceramics is a handmade product with contemporary designs, and have a high artistic value in terms of shape and color. The focus of this research is on glass products with three different types according to the price. The aims of the research is optimize the profits by determining the composition of the number of products produced. The method used is a linear programming with a simplex method that uses an objective function and a constraint function. The constraint functions used include the number of products, the number of workers, the amount of clay, and time for productions. The results showed that maximum profit can be achieved when producing glass type 1 < type 3 < type 2.

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APPLICATION OF FUZZY TIME SERIES WITH FIBONACCI RETRACEMENT FOR FORECASTING STOCK PRICE PT.BANK RAKYAT INDONESIA

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Stock can be defined as securities that indicate the ownership of a person or legal entity to the company issuing the shares. Good stocks for long-term investment are stocks that have good fundamentals and large market capitalization. The purpose of investing is to make a profit. In investing in stocks, investors need to know the risk management that can affect the ups and downs of a stock. Forecasting or forecasting is an analysis to predict everything related to the production, supply, demand, and use of technology in an industry or business. One of the forecasting methods is using fuzzy time series. The primary purpose of fuzzy time series is to predict time series data that can widely use on any real-time data, including capital market data. In this study, we will discuss the evolution of the time series model in overcoming fluctuations that often occur in stock prices by using a fuzzy time series that combines a stock analysis approach, namely Fibonacci retracement. The stock data used in this study is the close price of BBRI for October 2021 to March 2022. Forecasting results for 1 April 2022 are IDR 4660.49 with a Mean Absolute Percentage forecasting accuracy value of 1.034%.

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A Mathematical Model for Inventory System with Price- and Stock-Dependent Demand and Backorder

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In the inventory management system, questions about time and quantity are crucial in order to maintain the balance among the costs involved in inventory. Adding the complexity to time and quantity is the demand, which is an external factor that influences the number of goods should be prepared by a retailer. In fact, demand varies from time to time and is affected by many factors, such as price, time and the number of inventory available at that time. Having a mathematical model that can describe the dynamics of this condition can help a retailer to manage the inventory system. In this paper, we develop a mathematical model for inventory system with price- and stock-dependent demand and considering backorder to handle the shortage. From the model, we determine the cycle length and the time when inventory drops to zero as the decision variables in order to minimize the total inventory cost. Sensitivity analysis is performed to study the effect of parameters' changes in the model to the decision variables. We found that in general that changes in parameters' values will have either slight or substantial effect on the decision variables of the model. Having that information, retailer can determine which parameters that should be managed in order to minimize the total inventory cost.

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Optimal Ordering Policy for Multi Item Inventory Model with Various Demand Function, Deterioration, and Partial Backlogging

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Inventory is several goods that are stored to be used or sold within certain period. Good organized inventory management is one of the important factors to be considered by a company, such as how many optimal order quantities and when ordering time should the company place order, which minimize the total cost inventory. In this paper, we develop three mathematical models of inventory with various demand function, deterioration, and partial backlogging. First, we develop a model with inventory-dependent demand, followed by the time-dependent demand, and lastly a model with an exponential decreasing demand function. For each model, our objective is to determine a replenishment cycle and the optimal ordering quantity that minimize the total cost inventory. This policy is called an individual replenishment policy. Using the same model, we also determine a replenishment cycle that determines an optimal ordering time for all the products, which is called a joint replenishment policy. We then compare the total cost of the individual and the joint replenishment policy and determine a policy that gives minimum total cost inventory. Our numerical show that in general the joint replenishment policy is preferable than the individual replenishment policy.

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Implementasi Algoritma Archimedes Optimization untuk Menyelesaikan Permasalahan Economic Load Dispatch

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Setiap hari, energi listrik selalu digunakan untuk berbagai macam keperluan manusia, sehingga kebutuhan energi ini terus meningkat setiap tahunnya. Salah satu penyebab peningkatan kebutuhan listrik ini adalah pertumbuhan populasi penduduk yang semakin bertambah, sehingga pemukiman/perumahan semakin banyak dan tentunya konsumen yang membutuhkan listrik juga semakin banyak. Dengan semakin banyaknya penggunaan energi listrik, maka perusahaan penyedia energi ini juga harus berusaha untuk menyediakan kebutuhan listrik yang memenuhi kebutuhan konsumen, namun tetap harus mempertimbangkan biaya seminimum mungkin. Salah satu strategi untuk memenuhi kebutuhan listrik sesuai dengan permintaan dan tetap mempertimbangkan biaya yang minimal merupakan permasalahan optimisasi yang disering disebut sebagai *Economic Load Dispatch* (ELD). Salah satu cara untuk mendapatkan solusi optimal dari masalah ini adalah dengan menggunakan metode metaheuristik. Terdapat banyak metode metaheuristik diantaranya *Genetic Algorithm* (GA), *Particle Swarm Optimization* (PSO), *Spiral Optimization*, *Archimedes Optimization Algorithm* (AOA), dan masih banyak metode metaheuristic yang lainnya. Pada penelitian ini, permasalahan ELD akan diselesaikan menggunakan metode AOA. Kelebihan dari metode ini adalah mampu menyelesaikan permasalahan optimasi yang cukup kompleks. Percobaan dilakukan beberapa kali, sehingga diperoleh solusi yang optimal. Selain itu, solusi optimal yang diperoleh akan dibandingkan dengan metode yang lainnya.

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Forecasting the Spread of Diseases of Cocoa Attacks in East Java using the Spatio-Temporal Model

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Pest attacks on crops are very detrimental to farmers. One of them is the spread of cocoa plant diseases caused by Plant Pest Organisms such as *Conopomorpha cramerella*, *Helopeltis antonii*, and *Phytophthora palmivora*. Control of this pest attack is challenging because the pathogen can survive. Forecasting is needed for the future to reduce disease in cocoa plants and material losses. Data on the spread of cacao plant diseases in Trenggalek Regency, East Java, which consists of 14 sub-districts, can be sorted by location and time so that it is called Spatio-Temporal data. The Spatio-Temporal Model, which assumes heterogeneous characteristics between locations, is the Generalized Space-Time Autoregressive (GSTAR) Model. Forecasting cacao plant disease with the GSTAR model is carried out using three weight matrices: the inverse distance, the cross-correlation, and the uniform weight matrix. Data processing results show that forecasting cocoa plant disease using the inverse distance weight matrix has a minimum MAPE value. Furthermore, the results of cocoa plant disease forecasts for the future are shown with a choropleth map. Quantitatively, the forecast results can recommend relevant agencies to control pest attacks on cocoa plants in East Java.

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The Stock Price Prediction Formula Using the Concept of Equality in the Amount of Data Between the Average Difference of Order One and Two at Levels n and $n + 1$

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Technological developments are getting faster, as is the dissemination of existing information, especially on the capital market. In order for investors to avoid losses from the capital market, a method is needed that is able to analyze the movement of the stock price. This study focuses on the application of the Data Scales Analysis (DSA) method which uses a formula with the concept of the same amount of data between the first and second order average differences at levels n and $n + 1$ for predicting the stock price of issuers, in predicting stock prices in the capital market. The resulting formula is named JIC-FLY 2 which is a new formula used to predict stock prices in the capital market. The population used in this study are issuers who are members of IDX 30 from the banking sub-sector with the sample used is the issuer of BBCA (PT Bank Central Asia Tbk). The results of this study note that the DSA method with this formula is able to produce the best predictive value, namely DSA 12 with an error percentage of 0.035%.

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Enhanced Performance of Dynamic Neural Network Model using Wavelet Functions as Activation Function

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The Adaptive neural networks have been widely used as a tool for numerical mathematical modeling, both static and dynamic models of neural networks. The aim of this research is to improve the performance of Dynamic Neural Networks (DNN) models through the application of the wavelet functions as an activation function. A case study on the intensity of solar radiation modeling and forecasting in Mataram City shows that the application of the B-Spline and Morlet wavelet functions type together as an activation function can significantly improve the performance of the DNN model. Wavelet-DNN (W-DNN) model with the same architecture, the best results provide an increase in model performance, for in-sample data of 0.7596 points and for out-sample data of 0.8502. Especially for out-sample data, by using the W-DNN⁺ intervention model, the model's performance can be increased by 4.0492 points.

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Optimal Hospital Bed Allocation Under Indonesia's Health Insurance Scheme

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Currently, in Indonesia's National Health Insurance Scheme (Jaminan Kesehatan Nasional - JKN), patients are divided into three classes of treatments. In practice, patients often find the bed of their class full and are transferred to a higher class. In this research, we develop a model for bed allocation problems under JKN managed by the Social Security Organising Body (Badan Penyelenggara Jaminan Sosial - BPJS). We use overflow queueing model with repacking: when a patient arrives and finds all beds in its treatment class occupied, according to the BPJS-JKN the patient will be put in the first higher class bed and transferred immediately to its original class as soon as a bed is available in that class. We obtain a product form expression for the stationary distribution of bed occupancy which allows explicit evaluation of various performance measures, including the blocking probabilities. Furthermore, we obtain the expected revenue of the hospital under the BPJS-JKN health insurance. Using the model, we develop a capacity planning tool to maximize the total revenue.

Modeling of Wave Height with Neural Network (Studi Case: Mandalika Beach Central Lombok)

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Indonesia is an archipelagic country with enormous maritime potential. Its position at the equator causes the conditions of tides, winds, waves, and ocean currents to be quite large. Modelling of marine characteristics based on computational intelligence, such as the model of wave height at Mandalika Beach, is very important to avoid traffic accidents at sea, including social and economic losses to sectoral and regional development carried out by the government and private sector which take place intensively in coastal areas. All about activities to take advantage of the potential of the sea is also influenced by natural conditions, climate, and weather, one of which is the sea waves on Mandalika Beach. Mandalika is one of the Special Economic Zone (SEZ) located in the southern part of Lombok Island, which continues to grow rapidly in the development of tourism supporting infrastructure and the sustainable use of marine resources to implement the blue economy concept. Compared to traditional empirical or numeric-based forecasting models, soft computing approaches including machine learning and deep learning have shown much success in recent years. Among the various of "soft computing" methods, Neural Network is the most popular and widely used learning model, because NN has the ability to create complex nonlinear mappings to fit arbitrary functions. Neural Network model in this research, using backpropagation with 3-200-1 architecture, the experimental show quite significant result based on the root mean square error (RMSE) indicator in the training process of 0.0277339143. For the testing and prediction process, the RMSE value is 0.11504347. This shows that the variation of the resulting wave height model is close to the actual wave height value and the predictions made using the model can be said to be quite valid.

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Tuberculosis Spread Model with Consideration of Nutritional Factors

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Tuberculosis (TB) is an infectious disease caused by a potentially serious infection, especially in the lungs. This disease is 1 in 10 causes of death caused by a bacterial infection called Mycobacterium tuberculosis with the medium of transmission through the air. This occurs when a person inhales bacteria from an infected person who is coughing, sneezing, talking or spitting. In addition, nutritional status also affects the likelihood of contracting tuberculosis. Poor nutritional status affects the immune system, causing an increased risk of tuberculosis. This study developed a model of the spread of tuberculosis using the SIR model by considering nutritional status. The results of the model analysis at the disease-free equilibrium point and the endemic equilibrium point are asymptotically stable if the spread rate is less than the death rate and the recovery rate is influenced by nutritional factors. This shows that tuberculosis disease will disappear.

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Optimal Control of Vaccination on the Spread of COVID-19

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The global spread of COVID-19 has not been effectively controlled, posing a huge threat to public health and the development of the global economy. Currently, a number of vaccines have been approved for use and vaccination campaigns have already started in several countries. This paper designs a mathematical model considering the impact of vaccination to study the spread dynamics of COVID-19. Method that is used is Pontryagin Minimum principle. The analysis and simulations in this paper can provide some useful suggestions for the prevention and control of COVID-19 with minimum cost.

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Optimization of water flow on PDAM-network of Jonggat Lombok Tengah Regency using Ford Fulkerson Algorithm and Dinic Algorithm

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Clean water is essential for humans which must be fulfilled for humans survival. The population in Jonggat Lombok Tengah, increases from year to year which causes the using of clean water get an increase too. The necessity of rising clean water is not in line with the availability of water in nature, therefore the PDAM (Regency Municipality Waterworks) manages existing water resource. Then, it will be distributed to consumers. The purpose of this research is to determine the optimal solution in the distribution of clean water in Jonggat using Ford Fulkerson algorithm and Dinic algorithm. Both Ford Fulkerson algorithm and Dinic algorithm are methods used to calculate the maximum flow in a network. Based on the results of research using Python software on the Ford Fulkerson algorithm, the maximum current is 133 liters/second, while using the Dinic algorithm, the maximum current is 133.49 liters/second. Meanwhile, the average water flow is delivered by PDAM is 95 liters/second. It means, it can be added the amount of flow in the clean water distribution pipe by the PDAM. It's for facilitating the flow of water that reaches consumers with the addition of a flow that cannot exceed 133.49 liters/second.

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Petri Net Application to Analyze Ship Arrival Service System

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The Port is one of the facilities business used by most of the state in the world including indonesia. The existence of the port is very supportive of economic progress. The problem for the arrival of the ship at the port can be described in Discrete Event System (DES). One of the DES models used to this problem was a petri net model. This article deals the application of petri net to analyze ship arrival service system. The article deal with the calculation incidence matrices, firing sequence and reachability of petri net.

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On the Reaction-Diffusion model of Covid-19 with Vaccination

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As Covid-19 is a human-to-human disease transmission, the people's movement can not be neglected, therefore we consider a reaction-diffusion model of Covid-19 with vaccination. Data shows that mobility can increase the spread of Covid-19. Therefore, this paper is focused on studying the effect of citizen mobility as well as the effect of giving vaccines on the dynamics of the spread of Covid-19. We have built a model that takes into account the presence of vaccination and uses diffusion to represent individual mobility. With certain conditions, it can be proven that the presence of diffusion has no effect on the stability of the Covid-19 free equilibrium point. Thus, if these conditions are met, social restrictions do not need to be carried out, because Covid-19 will disappear from the population. On the other hand, different conditions cause diffusion to have no effect on the stability of the global stationary state equilibrium (SSE) as well. The basic reproduction number shows that social restrictions cannot repress the spread of Covid-19 unless we simultaneously speed up the vaccination process and reduce the transmission rate from infected individuals.

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Rice Planting Schedule for Optimizing Rice Yield Improvement with Genetic Algorithms in the Ajibata

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Rice farming is one of the livelihood sectors for the Ajibata community. The success of rice farming depends on weather and climate conditions, especially rainfall. Planting rice in a timely manner will support the success of rice farming to produce optimal yields. With uncertain climate conditions throughout the year, rainfall forecasting is needed which can help farmers determine the right time to grow rice. In this study, forecasting rainfall will be done using genetic algorithms. The data used are Ajibata rainfall data obtained from BMKG station Deli Serdang in 2009-2018. The forecast error value is calculated using the RMSE. Based on the RMSE calculation performed, a small RMSE value is obtained so that it can be said that the results of the rainfall forecasting process are good. However, because the genetic algorithm generates a regression model randomly, the results obtained are also not the same for each experiment so another algorithm is needed that can help create a model for prediction.

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OPTIMIZATION OF PRODUCTION PROCESS SCHEDULING ON MATARAM CONVECTION USING CDS METHOD AND HC METHOD

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Konveksi Mataram (Djagoan Kaos dan Seragam) is one of the industries that is engaged in the manufacture of various types of clothing models with the basic material of cloth. So far, the scheduling method used by the company is the FCFS method in which the completion of production is based on the order in which the order is received. In this case, with high order intensity, companies often have difficulty in completing orders in accordance with the predetermined pick-up time limit. The problems experienced by the company are caused by the scheduling of the production process that is not optimal. Based on the problems faced, the purpose of this study is to obtain the optimal scheduling sequence by determining the smallest makespan of the application of the method in the production process. The method used in this research is the CDS method and the HC method and from these two methods it can be seen that the total time of completion of the production process is optimal. Based on the results of calculations using the CDS method, the optimal job sequence is $J9 - J4 - J2 - J6 - J7 - J5 - J8 - J11 - J10 - J12 - J1 - J3$ with the smallest makespan of 39163 minutes or the production process will be completed in 85 working days. While the results of calculations using the HC method, the optimal job sequence is $J9 - J1 - J12 - J4 - J8 - J10 - J11 - J7 - J6 - J2 - J5 - J3$ with the smallest makespan of 38660.50 minutes or the production process will be completed in 84 working days. From the makespan of the two methods, the HC method is superior to the CDS method with a difference of 502.50 minutes or about 1 working day, while when compared to the company's initial method, namely FCFS, the HC method can streamline the completion time by a difference of 4365 minutes or about 9 working days.

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Riset Operasi

Solusi Optimal Masalah Transportasi Biaya Tetap Menggunakan Metode Pendekatan Tangga

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Salah satu kasus khusus pada masalah transportasi adalah masalah transportasi biaya tetap, di mana pada masalah transportasi ini terdapat dua komponen biaya yaitu biaya tetap dan biaya variabel. Kesulitan yang dihadapi saat menyelesaikan permasalahan biaya tetap disebabkan oleh perilaku biaya tersebut yang tidak bergantung pada jumlah unit yang dimuat/angkut pada rute yang dilalui. Tujuan penelitian ini untuk menentukan solusi optimal masalah transportasi biaya tetap. Penelitian ini menggunakan pendekatan linear Balinski yaitu Metode Pendekatan Tangga. Studi kasus yang digunakan adalah data tidak seimbang berukuran 3×8 , dimana biaya tetapnya biaya sewa kendaraan dan biaya variabelnya bahan bakar. Solusi optimal yang diperoleh sebesar Rp 11.511.411.768.000,- (sebelas triliun lima ratus sebelas juta lima ratus sebelas milyar empat ratus sebelas juta tujuh ratus enam puluh delapan ribu rupiah). Sehingga dapat disimpulkan bahwa Metode Pendekatan Tangga dapat digunakan untuk mencari solusi optimal masalah transportasi biaya tetap.

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Application of Markov Chain in Predicting Sugar Production at Candi Baru Sugar Factory, Sidoarjo

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Granulated sugar is a sugar commonly used daily to manufacture food and beverages. The demand for granulated sugar continues to increase, but the number of sugar factories and the area of sugar cane in Indonesia is decreasing. This causes a gap between the demand for sugar which continues to increase, and the production of granulated sugar continues to decline, resulting in Indonesia being the largest country for importer of sugar. The imbalance between demand and production of granulated sugar At Candi Baru Sugar Factory, Sidoarjo, East Java, resulted in not achieving the target to meet these needs. Therefore, predictions are made to get an overview of production planning to optimize granulated sugar production so that sugar needs can be met. The prediction method used at the Candi Baru sugar factory, Sidoarjo, East Java, for the 2022 milling period is the Markov Chain method with a four-state divisor, namely drastically down, down, up, and up drastically. Predictions using the Markov Chain method produce predictions of sugar production which are influenced by the area of harvested land, sugar cane raw materials, and yield. The application of the Markov Chain in the case study at Candi Baru Sugar Factory, Sidoarjo resulted in the prediction that sugar production for May–December will be in an upward condition. This is influenced by the area of harvested land increasing from May–September, the condition increasing drastically in May–August influenced by sugar cane raw materials, and the yield factor increasing from May–December.

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A Depth-First Branch and Bound Algorithm for Integer Knapsack Problem in Freight Transportation

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E-commerce growth so rapidly in Indonesia and giving great opportunity for logistics service in order to give easiness for customer to make deliveries. Pos Indonesia (Persero) is an Indonesian state-owned companies engaged in delivery of goods and letter. In sending a goods, its important to choose the right goods that will be lifted into the freight transportation. The more optimal load of goods, the more income will be gotten. To find an optimal selection of solution, it can be modeled as Integer Knapsack problem by optimizing the maximum capacity of knapsack. The purpose of the research is to get an optimal solution by selecting a right goods based from weight using Depth-First Branch and Bound in freight transportation of Pos Office Mataram. Total weight in august is 34, 583.17 kg and get Rp.47, 327, 170.00 income can be delivered in 34 days using Depth-First Branch and Bound. While the companies able to delivered all of goods in 35 days. Therefore, the accumulate of weight using Depth-First Branch and Bound more effective and it can be used as an alternative solution to get an optimal selection of goods in freight transportation.

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Penentuan Waktu Tunda Optimal di Persimpangan Jalan Adi Sucipto Mayor Alianyang

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Kemacetan panjang yang terjadi di persimpangan Jalan Adisucipto – Major Alianyang diakibatkan waktu tunda (time delay) yang kurang optimal. Kemacetan dan waktu tunda yang diberikan tentunya berdampak pada mobilitas dan lingkungan. Transportasi menjadi penyumbang terbesar konsumsi energi global yang tentunya akan berdampak pada perubahan iklim. Oleh karena itu, waktu tundaan di persimpangan jalan sangat mendesak untuk dipelajari dan dicari penyelesaiannya. Pada penelitian ini dikaji masalah lalu lintas di persimpangan jalan Adisucipto – Major Alianyang. Masalah lampu lalu lintas di persimpangan Jalan Adisucipto – Major Alianyang dimodelkan secara matematis. Selanjutnya model tersebut dianalisis serta dicari penyelesaiannya. Hasilnya skema waktu tunda yang lebih optimal.

Solving Traveling Salesman Problem Art Using Clustered Traveling Salesman Problem

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Traveling Salesman Problem (TSP) is a method to find the minimum path in a graph. In line with the development of TSP theory and its application, TSP Art shows up as the implementation of mathematics in an art. TSP Art is an art which represented in a graph. TSP Art consists of so many vertices that makes the solution is more complicated to be find. This problem has actually been solved using Parallel Genetic Algorithm with Edge Assembly Crossover algorithm (GA-EAX). However, there are few lacks of this algorithm e.g., the running time is too long and too much amount of RAM required to process hundreds thousands of these vertices. To solve those problems, one of the TSP variant is used, that is Clustered Traveling Salesman Problem (CTSP). CTSP is a modification of TSP by clustering number of points in a cluster, where each cluster must be visited contiguously. The purpose of this study is to determine the solution of TSP Art using CTSP method and to know the length of the CTSP's path on the TSP Art problem. In this study, the Nearest Neighbor Heuristic algorithm was used to find the TSP path of each cluster. Furthermore, the Kruskal's algorithm is used to connect the TSP paths of each cluster. Based on this study, the length of the CTSP path for Monalisa, Van Gogh and Venus writed in order were 6922023.22106868 distance units, 7902043.90173308 distance units, and 8210589.60220378 distance units. Meanwhile, based on the best research so far, the length of Monalisa's, Van Gogh's, and Venus's path are 5757191 units of distance, 6543609 units of distance, and 6810665 units of distance, respectively.

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Pendidikan Matematika

Analysis of Requirements for the Development of Google-Site Web-Based Learning Media in Multivariable Calculus Courses

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Learning media plays an important role in helping the smooth process of learning activities carried out, including when studying the Multivariable Calculus course. The purpose of this study is to analyze student needs for teaching materials in the form of Google-Sites Web-based learning media that can be accessed easily anywhere and can help students understand learning materials in the Multivariable Calculus course. This research is a descriptive study with the research subject being the third-semester students of the Mathematics Education study program at the Raja Ali Haji Maritime University. The research data were collected through observation sheets of lecture activities and questionnaires on student needs for teaching materials in the form of Multivariable Calculus learning media which were distributed via the google form link. The results of observations indicate that there is no available learning media that is attractive, can be accessed easily and can be used as a guide in the learning process in Multivariable Calculus courses such as the Google-Sites Web. The results of the questionnaire analysis show that students need learning media in the form of Web Google-Sites in the Multivariable Calculus course. Based on the research data, it can be concluded that it is necessary to develop learning media in the form of Web Google-Sites. This study is also part of an initial study on the development of learning media in the form of Web Google-Sites in the Multivariable Calculus course at the Raja Ali Haji Maritime University Mathematics Education study program.

Development of ACERA Learning Model Based on Proof Construction Analysis

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Proof constructing is the process of justifying a claim using the methods and concepts of proof to produce a mathematical proof. Proof constructing is also an aspect of proof, and is often the only way to assess student performance. However, in fact proof constructing is still a constant problem (difficulty) for every student. The cause of this difficulty is not only because of the content of proof in textbooks/sources, over-reliance on examples, understanding, underlying logic, the ability to use proof writing strategies, also due to the lack of proof discussion activities that train students to understand and answer proof practice questions, give proof reasoning against the proof that has been constructed, and validating own and other colleagues' answers. Thus, this study aims to develop a valid and practical ACERA (Activities, Classroom Discussion, Exercises, Reason, and Audience) learning model, and has a potential effect on students' ability to proof construct. This research consists of three stages, namely the preliminary phase, development or prototyping phase and assessment phase. The research subjects are 23 students' mathematics education study program, University of Mataram. Data collection is done by way of mentoring (walkthrough), observation, documentation, questionnaires, interviews and tests. This resulted in a valid and practical ACERA learning model, which has a potential effect in reducing students' difficulties in proof constructing.

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Analysis Of Student Character Value On Problem Based Learning Model Climate Change Context Social Arithmetic Materials in SMP

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This study aims to determine the value of students' character in learning using a problem based learning model in the context of climate change social arithmetic material in junior high school. Data collection methods in this study consisted of observation, interviews, tests, and questionnaires. This study focuses on four character values, namely environmental care, curiosity, conscientiousness, and hard work. This research will be carried out through three stages, namely introduction, implementation, and analysis. In the preliminary stage, the researcher prepares the research instruments needed to collect data. At the implementation stage, the researcher taught by conducting 3 meetings with students using the instruments that had been prepared. Then at the last stage, an analysis of the test results, questionnaire results, observation results and interview results was carried out. The results showed that the most dominant character value that emerged was curiosity. This is because students actively ask friends and teachers and actively find out how to solve problems about social arithmetic. While the character values that rarely appear are thorough, it happens because students only focus on what is given at school so that students are less able to develop their thoughts using other contexts.

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Mathematical Problem Solving Ability of Rational Personality Students

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This study aims to describe the ability of students who have personality tendencies in solving mathematical problems. This research is an exploratory study with a qualitative approach. Data was collected by giving problem solving ability tests and interviews to two subjects with rational personalities. Students' personalities were categorized based on David Keirsey's personality classification test, namely Artisan, Guardian, Idealist, and Rational. The results showed that (1) understanding the problem, in understanding the problem the subject visualized the information, this was in accordance with the characteristics of Rational who always needed something to help him in concretizing his ideas or thoughts through something, for example through pictures. (2) develop a strategy/completion plan, a) in formulating a strategy, the subject uses all the information and assumptions obtained from the problem and uses it to plan problem solving, b) in compiling a problem-solving plan, the subject does not write down the solution plan clearly, he only writes things that he deems necessary, according to his personality which has less intrapersonal ability so that they always do things as they please not based on generally agreed rules. (3) carry out the plan of completion, the subject always solves the problem according to the plan he has drawn up, this is indeed a characteristic of Rational who always does everything based on the goals he has set. (4) re-check, the subject checks the results of his work. This is in accordance with SR's personality which does not tolerate the slightest error.


The Application Jigsaw Type Cooperative Learning Model To Improve Students' Mathematics Learning Outcomes

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This study aims to determine the effectiveness of the implementation of the Jigsaw learning model in increasing student activity and learning outcomes. This type of research is class action research which is designed using three cycles with the following procedures: (a) planning, (b) implementation of action (action), (c) observation, (d) reflection (reflection) in each cycle, and each cycle is carried out for 3 meetings and at the end of each meeting an evaluation test is carried out to get an increase in student learning outcomes. The application of the jigsaw type learning model in increasing student learning activities is carried out using the following steps: (a) Division of tasks (b) Giving expert sheets (c) Holding discussions (d) Conducting quizzes. The jigsaw learning plan of this type of jigsaw is arranged instructionally as follows: (a) Reading where students get expert topics and read the material to get information. (b) Expert group discussion where students with the same expert topics meet to discuss the topic (c) Discussion in which the home group: the expert returns to his home group to explain the topic to his group (d) Quiz where students get an individual quiz that covers all topics. Students' mathematics learning outcomes after applying the jigsaw type learning model that the increase in students' mathematics learning outcomes can be seen from the increase in students' average mathematics learning outcomes from cycle I to cycle II, which is 70.38 in cycle I to 79.33 in cycle II. The increase in the percentage of students who finished learning from cycle I to cycle II was 78.1% in the first cycle to 93.8% in the second cycle. This means that the cycle II has been completed classically. Increased student activity in the learning process from cycle I to cycle II. Based on the results of the data analysis, it can be concluded that the application of the jigsaw type cooperative learning model to improve students' mathematics learning outcomes.

Application of the Open Ended Approach in Learning Three Dimensional Materials in Class XII to See Students' Character Values

Egitia Firi Rerendo¹, Nyimas Aisyah ¹ 

This study uses descriptive qualitative research and aims to describe the character values of class XII students who appear in three-dimensional learning material with the application of the Open Ended approach. The character values that are the focus of research are the values of hard work, curiosity, and creativity. This character value is still relatively low for students because teachers rarely include character values in the learning process. Mathematics subjects must be able to integrate character values in the learning process and when solving problems. The research subjects in this study were students of class XII IPA 1 SMAN 1 Indralaya Utara. Data were measured using LKPD, test questions, observations, and interviews. The results show that the character values that appear on the high ability subject are the character values of hard work and curiosity that often appear at every meeting and the value of creative characters does not often appear. For subjects of moderate ability, the character values of curiosity and hard work appear most often, and the values of creative characters appear very rarely. On the subject of low ability, the value of the character of hard work most dominantly appears, the value of the character of curiosity still rarely appears, and the value of the creative character very rarely appears.

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Analysis of Creative Character Value of SMP Students Using PBL Model with Open Ended Problems on SPLDV Materials

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This research is a qualitative descriptive study that aims to determine the value of the creative character of junior high school students that appears in the mathematics learning of SPLDV material using the PBL model with open ended problems. Data collection methods in this study consisted of observation, interviews, and tests. This study focuses on the creative value of students, namely fluent, flexible, original, and detailed. This research will be conducted in three stages, namely preparation, implementation, and analysis. In the preparation stage, the researcher prepares the research instruments and research subjects needed to collect data. At the implementation stage, the researcher collected data through 3 meetings, namely 2 learning meetings and 1 test and interview meeting. Then in the final stage, an analysis of the test results, observation results and interview results is carried out.

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Development of Student Worksheet (LKPD) Based on Mathematical Modelling Using an Water Supply Context

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Mathematical modelling is a process of converting real world problems into mathematical worlds to encounter solutions. This study aims to produce students worksheet (LKPD) based on mathematical modelling using water supply context that are valid, practical, and have a potential effect on students' mathematical perceptions. This research is a development research uses the ADDIE model (Analyze, Design, Develop, Implement, and Evaluate) and uses a formative evaluation from Tessmer which consists of the One To One, Expert Review, Small Group, and Field Test stages. Students worksheet are developed by using a mathematical modelling process based on the framework from Blum which consists of four stages, namely: Understanding Task, Searching Mathematics, Using Mathematics, and Explaining Result. Data collection techniques consisted of walkthroughs, questionnaires, observations and interviews. The subjects of this study were students at SMP Negeri 49 Palembang. This study produces students worksheet that are valid, practical, and have a potential effect on students' mathematical perceptions.

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Pengembangan Modul Project Based Learning untuk SMK Berorientasi Peningkatan Kemampuan Berpikir Kritis

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Several studies have examined the use of modules to improve critical thinking skills of vocational school's students. However, there are not many studies that examine the development of mathematics modules that are oriented towards improving critical thinking skills. On the other hand, preliminary studies that have been carried out show that the critical thinking skills of SMK students in Mataram City are still low. Though this ability is a necessary ability in the world of work. Therefore, this study intends to create and develop a mathematical module that is oriented towards critical thinking skills by applying a project-based learning model. This research and development model uses Thiagarajan's 4D development model, namely define, design, develop and disseminate. Data were collected through validation tests, questionnaires, observations, interviews and critical thinking skills tests. The results showed that the mathematics module for class XI in vocational school has met the criteria according to the assessment of material experts, media experts, practitioners, teachers, students and its effectiveness has been tested so that it can be concluded that this module meets the requirements for use in learning.

The Development of AKM Numerical Practice Question Book for Junior High School Students

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¹ **G-10**

Numeracy has become part of the Minimum Competency Assessment (AKM) used in the National Assessment (NA) since it was established in 2021. However, previous research shows that the numeracy skills of junior high school students are still in the low category. The purpose of this study was to obtain a prototype of a practice book about preparation for dealing with numeracy AKM for junior high school students that were valid, according to experts. This research is development research (RD) using the Plomp development model, which consists of a preliminary research, a prototyping phase, and an assessment phase. At the end of the development stage, there is a formative evaluation, one of which is to assess the validity of the product development by experts. The instrument used is the validation sheet for the numerical AKM exercise book. The results of this study obtained a prototype of the numeracy AKM practice book for junior high school students, which was categorized as valid with a score of 89 and an excellent classification. In conclusion, the practice book for numeracy AKM questions for JHS/Equivalent fulfills the valid criteria and is suitable for JHS/Equivalent students' preparation for the numeracy AKM.

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Desain Didactical Engineering Berbasis Konteks Matematika Realistik untuk Meningkatkan Kemampuan Pemahaman Matematis Siswa Sekolah Menengah Pertama

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This article presents the results of research on the development of a Didactical Engineering (DE) design based on a realistic mathematical context. This study aims to analyze students' learning obstacles on the flat shape material, develop a hypothetical learning trajectory, and design a learning design that is appropriate to the student's characteristics using a didactical engineering design based on a realistic mathematical context. The didactical engineering design based on a realistic mathematical context is considered capable of creating a learning environment setting (milieu) that can minimize the emergence of learning obstacles. This study uses a qualitative approach with descriptive data analysis methods. The subjects of this study were seventh grade students at one of the SMPN in Ternate City. Data were collected through test instruments in the form of description questions and non-test instruments in the form of participatory observation sheets, in-depth interviews, documentation studies, and a combination of the three or triangulation. The results of this study resulted in an alternative design using didactical engineering based on a realistic mathematical context that can be used in learning mathematics in junior high schools related to flat shapes. In addition, there is an increase in mathematical understanding ability (MUA) in most students after the implementation of learning designs using didactical engineering based on realistic mathematical contexts in a learning environment setting (milieu) which involves situations of action, formulation, validation, and institutionalization.

Analysis of Character Values toward Junior High School Students in Learning Mathematics Using Blended Learning Model on SPLDV Material

Mutiara Febrianti¹, Nyimas Aisyah¹  **G-12**

The 2013 curriculum is a curriculum that focuses on character education and has the aim of changing students' attitudes to become more polite through the character education values contained in it. One of the subjects that can be integrated into character education is mathematics. In mathematics learning the strategy used today by considering the development of globalization is the application of blended learning. Therefore, researchers conducted a study with the aim of knowing the character values of junior high school students in learning mathematics using the Blended Learning model on SPLDV material. This research is a qualitative descriptive study, with 3 stages of research, namely preparation, implementation, and data analysis. The research data were collected through observation, interviews and evaluation tests which were analyzed descriptively. The research subjects were 8th grade students of SMP Negeri 49 Palembang. This study focuses on 3 character values, namely conscientiousness, independence, and hard work. The results of this study based on the analysis carried out showed that the dominant character values that appeared in students when doing mathematics learning using blended learning on SPLDV material were the values of independent character and hard work. Meanwhile, conscientiousness is a character value that still rarely appears in students.

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Scaffolding Berdasarkan Kesulitan Siswa Dalam Menyelesaikan Masalah Matematis

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Masalah matematis adalah masalah yang menjadikan pemecah masalah merasa tertantang untuk memecahkannya, namun tidak dapat menyelesaikannya dengan segera karena bukan pekerjaan rutin. Aktivitas memecahkan masalah bukan hanya aktivitas menerapkan ide matematika, melainkan belajar ide matematika baru. Ketidakberhasilan dalam membangun ide baru matematika dalam memecahkan masalah ini diakibatkan oleh kesulitan dalam memahami ide-ide yang menjadi material pembangun dari ide baru tersebut. Sehingga tujuan dari studi ini adalah tindakan untuk mereduksi kesulitan dengan teknik scaffolding, yang terdiri dari 5 langkah yakni: 1) menawarkan penjelasan (*offering explanations*), 2) meminta/merangsang partisipasi siswa (*inviting student participation*), 3) verifikasi dan klarifikasi pemahaman siswa (*verifying and clarifying student understandings*), 4) memodelkan perilaku yang diinginkan (*modeling of desired behaviors*), dan 5) meminta siswa untuk mengungkapkan petunjuk soal (*inviting students to contribute clues*). Penelitian ini merupakan penelitian kualitatif, yang mengambil data dengan memberikan masalah yang berkaitan dengan materi integral kesejumlah siswa kelas XI SMAN 4 Praya Tengah yang berjumlah 33 orang. Hasil analisis kesulitan terhadap solusi dari masalah yang diberikan terdapat 4 jenis kesulitan, yakni: 1) kesulitan dalam memahami (*understanding the problem*), 2) kesulitan dalam menyusun rencana (*devising a plan*), 3) kesulitan dalam melaksanakan rencana penyelesaian (*carrying out the plan*), dan 4) kesulitan dalam memeriksa kembali solusi yang diperoleh (*looking back*). Reduksi kesulitan dengan scaffolding terhadap keempat jenis kesulitan ini diambil dari 3 orang siswa yang dianggap mewakili keseluruhan sampel, dan hasil scaffolding terhadap keempat kesulitan tersebut menyimpulkan bahwa scaffolding dapat membantu mereduksi kesulitan dalam menyelesaikan masalah matematis, membantu siswa dalam membangun pemahaman dan memperoleh pemahaman yang cukup dan benar, kemudian secara berangsur-angsur scaffolding makin lama dikurangi bahkan dihilangkan sama sekali.

How Technology Can Support Students' Statistical Literacy Skills In Learning: A Systematic Literature Review

Rahma Siska Utari ^{1,2}, Zulkardi ², Ratu Ilma Indra Putri ² **G-14**

In this era, technology was inseparable from various aspects of life. In the education field technology played an important role in the learning process, such as technology can support students to construct mathematical concepts, developing broader mathematical concepts, help students to do computing mathematics problems, and also help students to solve problems in mathematics. The rapid development of technology certainly had an impact on access to wide and unlimited information dissemination. This information is called data, which if not properly criticized and filtered first can lead to hoaxes. Students as global citizens must have statistical literacy skills in order to be able to validate the truth of information. Statistical literacy ability was the ability of students to collect data, process data, present data, and interpret data so that they can make conclusions from the data critically. This study used a systematic literature review method with the aim of describing how technology can support students' statistical literacy skills in learning.

Implementasi Petunjuk Penggunaan Alat Peraga untuk Penentuan Luas Daerah Jajaran Genjang dan Luas Daerah Segitiga Bagi Siswa Sekolah Dasar

Ketut Sarjana **G-15**

Tujuan penelitian ini untuk mengetahui bagaimana implementasi petunjuk penggunaan alat peraga menentukan luas daerah jajaran genjang dan luas daerah segitiga bagi siswa sekolah dasar di Kota Mataram. Alat peraga dan petunjuk penggunaan alat telah dihasilkan melalui penelitian, untuk melihat implementasi petunjuk penggunaan alat dilakukan pembelajaran di kelas mengenai luas daerah Jajaran genjang dan luas daerah segitiga untuk siswa kelas VI SD di Kota Mataram. Pada saat implementasi telah terjadi suasana pandemi COVID 19. Mengenai keperluan ini alat peraga disain menjadi video pembelajaran yang menggambarkan penggunaan alat peraga dan pedoman operasionalnya dinarasikan pada video tersebut. Berdasarkan hasil observasi dari 9 guru SD sebagai praktisi narasi dari pedoman operasional sangat tampak sesuai dengan petunjuk penggunaan alat peraga tersebut. Sampel dari penelitian ini adalah siswa SD kelas VI yang ada di Kota Mataram yang tersebar di 9 kelas yakni di wilayah Ampenan 3 kelas, di Mataram 3 kelas dan di Cakranegara sebanyak 3 kelas. Kelas - kelas ini dipilih karena telah siap melaksanakan pembelajaran dalam jaringan dan kelas - kelas di setiap wilayah homogen dari segi tempat yang sangat mudah terjangkau dan kemampuan siswa yang hampir sama. Setelah pembelajaran daring dilakukan oleh para guru SD, siswa diberikan tes evaluasi. Hasil evaluasi menunjukkan bahwa skor rata-rata yang diperoleh dari tiga pasang kelas di setiap wilayah tidak berbeda secara signifikan pada taraf signifikansi 5%. Untuk di wilayah Cakranegara, wilayah Mataram dan di wilayah Ampenan diperoleh $|t_h| < t_{tabel} = 2$. Disisi lain ketuntasan yang diperoleh siswa di setiap kelas di setiap wilayah $> 80\%$. Ini berarti bahwa siswa tuntas dalam belajar tentang luas daerah Jajaran genjang dan luas daerah segitiga dengan KKM = 70 untuk siswa-siswa di wilayah Mataram dan Ampenan dan KKM = 68 di Wilayah Cakranegara. Disisi lain pesan yang disampaikan sama karena nilai rata-rata yang diperoleh siswa setiap kelas untuk masing-masing wilayah tidak berbeda secara signifikan. Dengan demikian implementasi petunjuk penggunaannya alat peraga menentukan rumus luas daerah Jajaran genjang dan luas daerah segitiga konsisten dan penggunaan alat peraga efektif.

Students' Critical Reasoning Regarding the Relationship Between Shapes

Endah B. Rahaju¹, Siti Khabibah¹, Abdul H. Rosyidi¹, Nina R. Prihartiwi¹, Ika Kurniasari¹ **G-16**

Critical reasoning in this study is to categorize statements about relationship between shapes. This categorization process involves analysis and evaluation based on the definition or features of shapes. The purpose of this study is to classify students' arguments in categorizing statements about relationship between shapes. Data were taken from 104 first year students of a public university in Surabaya. The results were, (1) for the statement "an equilateral triangle is an isosceles triangle," 32.69% of students answered wrong, with the majority of the arguments based on the definition of the isosceles triangle and the equilateral triangle, and 12.50% of students answered sometimes true with arguments based on the number of their equal sides and the measure of their angles; (2) for the statement "a parallelogram is a rectangle," 16.35% of students answered true with the dominant argument is that a parallelogram is a rectangle, and 44.23% answered wrong with the dominant argument is that a rectangle is a parallelogram; and (3) for the statement "a square is not a rhombus," each 16.35% of students answered true and sometimes true. Students justify the statement with the most frequent arguments that a square is a rectangle and a rhombus is a kite. Students who think that statements are sometimes true, are generally supported by the argument that a square is a rhombus if all the angles are right angles.

Critical Thinking Profile of Mathematics Education Students in Solving Ill-Structured Problem based on Mathematical Ability

Baharullah ¹, Abd. Kadir Jaelani ¹, Muhammad Hasbi ² 

This study aims to describe the critical thinking profile of mathematics education students in solving ill-structured problems based on mathematical ability. The critical thinking profile in solving the described ill-structured problem consists of several stages, namely (1) Analyze; (2) Browse; (3) Create; (4) Decision-making; (5) Evaluate; (6) List or with the term A-B-C-D-E plus L based on critical thinking skills, namely (1) Interpretation; (2) Analysis; (3) Conclusion; (4) Evaluation; (5) Explanation; (6) Self-regulation. The subjects of this study consisted of one student of mathematics education who had high mathematical ability and one student of mathematics education who had moderate mathematical ability. This research used descriptive qualitative approach. The data obtained were validated, then analyzed with several steps, namely: reduction, data presentation, categorization, interpretation, and inference.

Deskripsi Efektivitas Pelaksanaan Proses Belajar dari Rumah (BdR) pada Pembelajaran Matematika di Masa Pandemi Covid-19 di MAN 1 Kota Gorontalo

Nurlaila Fathimah Anwar G-18

This study aims to describe the effectiveness of the implementation of the Learning From Home (BDR) process in terms of student learning activities and teaching teachers in learning mathematics. This type of research includes qualitative descriptive research. The research subjects were 36 students of class XI IPA which then the subject will be reduced to 6 people for observation of the learning process, then continued with the interview process. The techniques used in data collection are observation, interviews, and documentation. Data analysis techniques in this study are data reduction, data presentation, and conclusions. The results of the study based on observations made with students and teachers by looking at the percentage of achievement of teacher activities in teaching activities of 88.09% included in the very feasible category and the percentage of achievement of student activity activities in the learning process of 77.33% included in the feasible category. It is even seen from the results of interviews that the implementation of Learning From Home (BDR) for students and teachers which is quite varied helps the learning process of mathematics during the covid-19 pandemic is quite effective.

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Geometry Exploration for The Development of Ethnomathematics LKP Based on The Ornament of Jingah River Jami Mosque

Yuni Suryaningsih¹, Noor Fajriah¹  G-19

The Independent Curriculum allows educators to develop teaching materials tailored to the characteristics of each region. This study aims to create a Student Worksheet (LKPD) with an ethnomathematical exploration of the ornaments of the Sungai Jingah Jami Mosque. The research method used was the Plomp model development method which consists of four stages, namely: (1) initial investigation; (2) design; (3) construction; and (4) test, evaluation, and revision. In the fourth stage, the quality of Prototype 1 LKPD was reviewed by two experts: a mathematics education lecturer and a mathematics education teacher. Furthermore, six students represent low, medium, and high abilities to respond to the developed LKPD.

Development Of Audiovisual Learning Media Based Powtoon On Number Pattern for Students Class VIII In Junior High School

Eli Kholipah¹, Ira Asyura ¹, Linda ¹, Badri Munawar ² 

Learning resources from the internet as an educative learning media can help make learning more practical and make it easier for students to learn anytime and anywhere. Powtoon is an application that can make educational learning media easily. The purpose of this research is to produce Powtoon a valid, practical and effective. This research is a research that was developed using the Tjeer Plomp development model which in this development research goes through 3 stages, the first stage is preliminary research by conducting problem analysis, needs analysis and concept analysis. While the second stage is a portotype, at this stage the researcher plans learning media including making media designs, validating, evaluating one one or a small group. The last stage is the assessment at this stage an evaluation of the Powtoon. Data obtained from interviews, questionnaire observations and documentation.-based mathematics learning media Powtoon validated by material experts, linguists and media experts with a validity index of 89.83% categorized as very valid. Practicality seen through the results of the analysis of the learning implementation observation sheet with a practicality index of 91% is categorized as very practical. The effectiveness is seen through the results of the questionnaire analysis of student interest responses with an effective category at 72.67% and the results of the observation analysis of learning activities with a very effective category at 81.83%.

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
The Knowledge of Mathematics Teachers About Numeracy and Their Ability to Design Student Worksheets Supporting it

Siti Khabibah¹, Endah Budi Rahaju¹, Rooselyna Ekawati¹, Abdul Haris Rosyidi¹, Masriyah¹, Yusuf Fuad¹, Dini Kinati Fardah¹ 

Literacy with various types is becoming increasingly important and has become a standard goal in education. While numeracy, one part of it, is a minimum standard that must be mastered by all citizens. This study aims to describe the knowledge of Junior High School teachers and the teacher's ability to design learning that supports student numeracy. A total of 29 teachers were given a written interview to reveal their knowledge of numeracy. After that, the teacher was asked to design a Student Worksheet that supports student numeracy. The results of the interviews were analyzed qualitatively and the student worksheets designed by the teacher were analyzed using numeracy indicators and described qualitatively. The results of the study show that: 1) Teachers' knowledge regarding numeracy is still lacking. Many of them define the scope of numeracy only in terms of numbers. However, teachers feel that this ability is important and can be practiced; 2) The design of the worksheet made by the teacher has partially implemented numeration, but the context used is still mostly camouflage, not real context. In addition, according to the knowledge they have, the numeration that is integrated in the worksheet is mostly only related to numbers only. The worksheets developed by the teacher have not explored many tables, graphs, and have not involved much decision making. This research is an initial study to design the development of training teaching materials for junior high school teachers to design learning that supports numeracy.

Statistika

Prediksi Jumlah Penumpang Pesawat Domestik dengan Menggunakan Long Short-Term Memory (Studi Kasus: Bandar Udara Internasional Sams Sepinggang Balikpapan)

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Pemindahan ibu kota negara Indonesia ke Kalimantan timur akan memberikan dampak di berbagai sektor sehingga dapat menunjang pertumbuhan ekonomi. Salah satu dampak positif dari pemindahan ibu kota negara yaitu terjadi peningkatan pada sektor transportasi udara. Meningkatnya sektor transportasi dapat dilihat dari kenaikan jumlah penumpang yang menggunakan transportasi udara. Selain pemindahan ibu kota negara, dengan hadirnya pandemi COVID-19 juga memiliki dampak yaitu terdapat penurunan jumlah penumpang pesawat saat dilakukan pembatasan aktivitas, akan tetapi dengan adanya pelonggaran aktivitas pasca COVID-19 dapat diperkirakan akan terjadi peningkatan jumlah penumpang. Oleh karena itu, untuk memperkirakan bagaimana peningkatan jumlah penumpang dapat dilakukan dengan melakukan peramalan terhadap jumlah penumpang. Dalam penyelesaian permasalahan peramalan tersebut diperlukan suatu metode, yaitu metode Long Short-Term Memory (LSTM). Hasil penelitian dengan metode ini yaitu diperoleh parameter terbaik jumlah pola time series sebesar 3, neuron hidden 5, max epoch sebesar 50 dan batch size sebesar 64. Selain itu, nilai RMSE sebesar 910,08 dan MAPE sebesar 10,82%. Hasil nilai MAPE tersebut dapat dikategorikan bahwa hasil dari prediksi jumlah penumpang pesawat domestik dengan menggunakan metode LSTM memiliki akurasi yang baik.

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Pengukuran Expected Shortfall Portofolio Menggunakan Arima-Garch Dengan Pendekatan Copula

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Investasi pada saham terkenal dengan risikonya yang cukup tinggi jika dibandingkan dengan investasi pada instrumen keuangan lainnya. Sehingga, para investor akan berupaya untuk meminimumkan risiko dengan cara membentuk portofolio optimal. Salah satu metode untuk membentuk portofolio optimal adalah dengan menggunakan metode Markowitz. Risiko portofolio optimal sering diukur menggunakan Value at Risk (VaR). Namun, VaR tidak memenuhi aksioma subadditivity, sehingga akan digunakan Expected Shortfall (ES) dalam pengukurannya. Pada suatu portofolio, memungkinkan adanya dependensi antarsaham. Pada kenyataannya, data return saham cenderung tidak berdistribusi normal serta memiliki dependensi non-linear dan fat-tails. Sehingga, akan digunakan copula untuk mengukur dependensi antarsaham. Data return saham seringkali memiliki autokorelasi temporal dan volatilitas yang tinggi. Sehingga copula akan dikombinasikan dengan ARIMA-GARCH. Penelitian ini akan menggunakan saham PANR.JK, AALI.JK, dan ICBP.JK. Berdasarkan hasil analisis, diperoleh model marginal PANR.JK : ARMA(2,2)-GARCH(1,2), AALI.JK : ARMA(1,3)-GARCH(1,1), dan ICBP.JK : ARMA(1,1)-ARCH(2). Struktur dependensi yang terbentuk adalah $c(u_1, u_2, u_3; \theta) = c_{11}^{CI}(u_2, u_3; \theta = 0.21) \cdot c_{12}^{CI}(u_1, u_2; \theta = 0.13) \cdot c_{21}^{CI}(F(u_3 u_2), F(u_1 u_2); \theta = 0.5)$. Dalam membentuk portofolio optimal, maka ditentukan bobot optimal untuk PANR.JK, AALI.JK, dan ICBP.JK secara berurutan adalah sebesar 0.1904, 0.2271, dan 0.6635. Dengan menggunakan ES, maka risiko berinvestasi pada portofolio optimal adalah sebesar 0.006712604. Artinya, jika dana yang diinvestasikan adalah sebesar Rp. 1.000.000.000,00, maka besar nilai harapan dari kerugian yang ditanggung adalah sebesar Rp. 6.712.604,00.

Implementation of Chen's Fuzzy Time Series for Forecasting Indonesia's Oil and Gas Import Value

Septri Damayanti¹, Siska Yosmar¹, Nur Afandi¹ **H-3**

Indonesia is one of the importing countries that often imports goods from abroad on an ongoing basis every year. Imported goods are oil and gas and non-oil and gas. Oil and gas include oil and gas. This oil and gas import value data is an example of time series data. Time series analysis is one method to predict an event that will come by looking at the data from the previous time. One of the newest methods of time series analysis used in this research is Chen's Fuzzy Time Series method. The purpose of this research is to find out the general description of Indonesia's oil and gas import value data from January 2015 - July 2022, to find out how the implementation of Chen's Fuzzy Time Series method in forecasting the value of Indonesian oil and gas imports and to find out the results of forecasting the value of Indonesia's oil and gas imports. In predicting the value of Indonesia's oil and gas imports using the Fuzzy Time Series Chen method, the results of forecasting the value of Indonesia's oil and gas imports in August 2022 are US\$3743.213 million dollars with a MAPE value of 19.969

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The Calculation Of Life Insurance Premiums With A Multiple-State Model On Critical Illness Insurance

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Based on the 2018 Basic Health Research (Riskesmas) data, the risk of developing a critical illness is increasing and is the highest cause of death for Indonesians. Currently the cost of disease treatment is not cheap, so maintaining health and preparing for the possibility of being diagnosed with a critical illness in the future is an important step. In this study, calculating Critical Illness insurance premiums including for cancer, stroke, heart, and diabetes mellitus. The benefits provided are in the form of death compensation, treatment costs when a critical illness is diagnosed, and there are also costs for angioplasty surgery. Angioplasty surgery is performed when the individual has a serious critical heart condition and surgery must be performed immediately a maximum of 24 hours after a heart attack occurs. The data information used is in the form of the 2019 Indonesian Mortality Table, and the prevalence of critically ill patients with angioplasty surgical conditions. Premium calculation is carried out for the insured male aged 40 years in good health, interest rate is 3.75%, premium payment period and the insurance period is 10 years. The annual net premium value obtained is IDR 5,859,788, of which the sum insured is IDR 500,000,000. There are 3 benefits obtained by the insured: (1) The cost of compensation received for Angioplasty surgery is 25% of the sum insured; (2) The cost of compensation for treatment which will be given annually until the end of the insurance period when the insured is diagnosed with a critical illness, which is 100% of the sum insured minus the cost of compensation when there is an angioplasty surgery; and (3) The value of compensation for death due to any cause, which is 100% of the sum insured minus the critical illness benefit for Angioplasty surgery.

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Forecasting Stock Using Double Seasonal Autoregressive Integrated Moving Average

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The aim of this study is to obtain the best model of double seasonal autoregressive integrated moving average (DSARIMA) for stock forecasting. This paper applied Unilever Indonesia, Tbk (UNVR)'s daily closing stock price, from January 1st, 2018 to July 31st, 2022. MASE (mean absolute scaled error) and MdAPE (median absolute percentage error) is used to compare forecasting accuracy. After carrying out each model, we found that the best models are $DSARIMA(0, 1, [4])([3], 1, 1)^5(1, 1, 0)^{253}$ which have MASE and MdAPE about 1.423 and 0.111. We limit this study by a test set for a month forecast horizons. Further studies should investigate combining forecast or hybrid approach to improve forecasting accuracy.


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Comparison of Ward Method and Average Linkage Method in Clustering Indonesia's Provinces Based on Stunting Factors

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This study aimed to conduct grouping and then mapping of 34 provinces in Indonesia based on the factors that cause stunting. Data used in this study were National Socio Economic Survey (SUSENAS) of 2020 organised by the Central Bureau of Statistics Indonesia. Variable used in this study were percentage of household with proper sanitation, percentage of household with proper drinking water source, percentage of children age 0-5 months who receive exclusive breastfeeding, percentage of mothers who gave live births in the last two years, percentage of children age 0-59 months who receive complete immunization, average household expenditure per capita per month, and average calorie consumption per capita per day. Mapping of stunting factors were carried out based on the best method of clustering between Ward method and average linkage method. The optimal number of clusters from this study were 3 clusters. The variance ratio of the Ward method was 0.852; while the average linkage method was 0.727, so the average linkage was the better method than Ward because it had smaller variance ratio. The results of clustering showed that the cluster1 members with low stunting factors consisted of 7 provinces; cluster 2 with moderate stunting factors consisted of 26 provinces, and cluster 3 with high stunting factor was Papua Province. Papua Province can be prioritized in stunting prevention in Indonesia.

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Comparison of Some Weights in The Weighted Least Square Method For Handling Heteroscedasticity on Multiple Regression Model

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Regression analysis is widely used to determine causality between one variable and another. In regression analysis there are several assumptions that must be considered, namely the error is normally distributed, there is no multicollinearity, and the variance is homogeneous. All of these assumptions must be held so that the property of the best linear unbiased estimator is still guaranteed. In fact, there are often violations of assumptions, including violations of the homoscedasticity assumption. The impact of heteroscedasticity in the regression model is that although the ordinary least square estimator is still linear and unbiased, but it no longer has a minimum variance. To handle this, weighted least square (WLS) regression is used instead, which assigns weights on the observations. But often encountered is the determination of weight in WLS method. This paper aimed to evaluate and determine the best weight in the WLS method. The data used were human development factors data, which were obtained from the Central Bueureau of Statistics Indonesia in 2021. The weights tested were $\frac{1}{X}$, $\frac{1}{Y}$ and $\frac{1}{S}$. The results of the analysis show that the best weight is $\frac{1}{S}$. Coefficient of determination was 98.7% indicating that the model was very good.

Multivariate Adaptive Regression Splines (MARS) For Classification Of Ntb Public Perceptions on Covid-19 Vaccine

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Indonesia is one of the countries infected with the covid-19 virus. The government has implemented many efforts to handle covid-19 virus, one of them is covid-19 vaccination. However, the covid-19 vaccination caused controversy for some people, many people refused to be vaccinated. Dissemination of wrong information can make some perceptions among the public. Public perception of the covid-19 vaccine can be categorized into two, namely positive and negative, this can be influenced by many factors. These factors are important to know so that to identify these factors can use classification method, one of a methods is the Multivariate Adaptive Regression Splines (MARS). The aim of this study is for classifying and analyzing perceptions of the covid-19 vaccine. The data used is primary data obtained through a questionnaire with predictor variables namely gender (x_1), age (x_2), employment status (x_3), last education (x_4), insurance ownership status (x_5), willingness to vaccinate (x_6), non contagious disease (x_7), dan education (x_8). The results obtained show that best mars model is obtained by using BF= 24, MI =3, MO= 1, and GCV=0.07340546. The resulting classification level is 91.5% with influencing factors yaitu gender (x_1), age (x_2), last education (x_4), willingness to vaccinate (x_6), education (x_8).

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The Application Of Genetic Algorithm For Estimating Nonparametric Regression Truncated Spline

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Nonparametric regression is a statistical method for describing the correlation between a response variable and one or more predictors. This study used a genetic algorithm to find optimal knot points of the truncated spline regression with a non-homogeneous order spline curve using the minimum of GCV values for the optimization knot point in the genetic algorithm. There are many operators in the genetic algorithm, including selection and crossover. This study also aims to determine the effect of average generalization crossover in the search of optimal knot points using a genetic algorithm and to determine the effects of average generalization crossover to determine the optimal knot points. Generalized IBAX crossover used as crossover operator. This process includes selecting two individuals based on the closest pair, then categorizing the pairs into segments. The segments are then crossed to create offspring. The Poverty Rate of West Nusa Tenggara (NTB) province in 2017 was used as data testing. Based on the results, the Boltzmann operator tends to reach the convergence point quickly, to overcome this situation, we used the generalized IBAX crossover operator. The results show that the smallest GCV value is 3,00193, and the MSE value is 0,35705.

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Modeling of Factors Affecting Poverty in West Nusa Tenggara Province in 2020 With Geographically Weighted Logistic Regression

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Poverty is a condition where an individual or group of people cannot fulfill their basic needs, which consist of food, clothing, shelter, education, and health, considered as certain standard needs. According to the Central Bureau of Statistics, West Nusa Tenggara Province is one of the provinces that is still experiencing poverty problems. The high poverty rate in several districts/cities in West Nusa Tenggara Province is caused by natural conditions in West Nusa Tenggara, which often experience drought and food insecurity in the community. This study aims to determine the percentage model of poverty in the Province of NTB and the factors that significantly influence the percentage of poverty in the Province of NTB using Geographically Weighted Logistic Regression (GWLR). The GWLR method is one of the regression methods developed from the GWR method, which is used to predict or predict a model from a data set with a binary dependent variable through a logistic model. GWLR is also a method that considers spatial factors to produce parameter values for each point or location in the observed data. Based on the analysis results, the data used does not contain multicollinearity, and there is the influence of spatial heterogeneity so that the requirements for the GWLR method are met, and the research can be continued. From the model obtained, there are two significant factors, namely Life Expectancy and Gini Ratio. Based on the analysis, it can be concluded that the model obtained provides a good predictor result, with an R^2 value of 97.17%.

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Application of Geographically Weighted Lasso Method in The Case of Gross Regional Domestic Product For The Bali Nusra Region

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The Central Bureau of Statistics stated that the economic growth in 2020 was still in the negative zone, with the least contribution to economic growth, namely the provincial group in the Bali Nusra region. Economic growth in Indonesia is measured based on Gross Regional Domestic Product (GRDP) value. GRDP is the gross added value generated by all business units in an area at a specific time. This study aims to apply and interpret the results of the Geographically Weighted Lasso (GWL) method in the case of GRDP in the Bali Nusra region. The GWL method is a development of the Geographically Weighted Regression (GWR) method by adding the Least Absolute Shrinkage and Selection Operator (LASSO) method. The GWL method simultaneously selects insignificant variables by reducing the regression coefficient value to zero using the LASSO approach. The data used has the influence of spatial heterogeneity and multicollinearity, which is required for modeling using the GWL method. Based on the analysis that has been carried out, there are 41 different models for the GRDP of each district/city in the Bali Nusra region. The GWL model obtained produces a coefficient of determination of 95,84%, so the model obtained is feasible to use and is considered valid.

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Kernel Nonparametric Regression on Forecasting of Total Receiving Regional Original Revenue in Central Lombok

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Tourism has a huge opportunity to take advantage of the local economy, improve the culture and values prevailing in the society, and move and even bring up new economic activities such as hotels, restaurants, transportation, recreational facilities, and tourism destination development. Hotel tax is one local tax with a high potential to increase the Original Local Government Revenue. The statement corresponds with the Original Local Government Revenue of Central Lombok in 2020; that is, hotel tax provides the third largest percentage reaching 11.12%, and in 2021, it only reached 38.90%. This study aims to estimate the kernel nonparametric regression curve on hotel tax revenue data in Central Lombok. The method used is kernel nonparametric regression analysis. The kernel estimator used is the Nadaraya-Watson estimator, and kernel functions used are Kernel Gaussian, epanechnikov, triangle, triweight, quartic, cossinus, and uniform. Based on the calculation, the optimal bandwidth value of each kernel function is obtained using the Generalized Cross Validation (GCV) criteria, and the bandwidth obtained varies. The estimation results of the nonparametric kernel regression curve obtained from the optimal bandwidth value are great since the estimated data pattern follows the actual data pattern. The MSE value of each kernel function is not entirely distinct.

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Kernel Nonparametric Regression on Forecasting of Total Receiving Regional Original Revenue in Central Lombok

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Regional Original Revenue is income earned by the region, which is collected based on regional regulations under statutory regulations. Regional Original Revenue aims to give authority to Regional Governments to fund the implementation of regional autonomy following regional potential. Every year, the Central Lombok Regency government sets Regional Original Revenue targets to assist the government in formulating regional policies. The targets set by the government are sometimes not following their realization. Therefore, this study aims to determine a model that can later be used in forecasting Regional Original Revenue targets in the future. One way to predict the value of Regional Original Revenue is by using a nonparametric regression approach. The advantage of the nonparametric regression method is that it is flexible since it is not dependent on a particular model. In this study, nonparametric kernel regression was used with the Nadaraya-Watson estimator, and the kernel function used was the Gaussian kernel. Based on the results of the study, the minimum GCV value was 1.769688931, with the optimum bandwidth value of h_1 of 0.212740452 and h_2 of 0.529682589. Modeling with optimum bandwidth produces a coefficient of determination (R^2) of 97.61%. The best model is used for forecasting and produces a MAPE value of 5.4%. Based on these measurements, it can be concluded that the modeling results are very good because $R^2 > 70\%$ and the forecasting results are accurate because they have a MAPE value of less than 10%.

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Text Mining Classification of Smartphone Product's Reviews Using Multinomial Naïve Bayes (Case Study : Review of Asus ROG)

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Online games have become popular activities nowadays. People can enjoy this activity everywhere and anytime using their smartphone. This trend is followed by smartphone producers to provide suitable device to support gamers. One of them was Asus ROG which is popular among gamers. Furthermore, since nowadays the increasing trend of online shopping, Asus ROG was also available in e-marketplace. By selling online, the manufacturer can read and analyze the reviews of the product. The reviews will inform the customer satisfaction which essential for increasing sales and market. However, reading reviews is not only time consuming for sellers but also for customer. Therefore, this research was conducted to analyze the reviews and comments for Asus ROG in order to classify the reviews into positive or negative. The Multinomial Naïve Bayes (MNB) approach was used in this study to analyze the reviews. The data used in this study were 201 data taken on 3-16 November 2020 and 3-16 March 2021. The data was divided into training testing data with the proportion of 85% and 15%, respectively. The purpose of this study is not only to determine the classification of Asus ROG's reviews but also to find the best accuracy of the process. The preprocessing stage consist of the process of case folding, cleaning, stop-wording and stemming. Moreover, the analysis was followed by the word weighting that it was done using the TF-IDF method. Based on the analysis result, the percentage of positive reviews was 80,64% while the percentage of negative reviews was only 19,35%. Furthermore, the accuracy of the analysis was calculated by 83,87%.

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Additive Hazard Models for Analyzing Multi-state Data

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Multi-state data frequently arise from dynamical events containing states that change over time. For example, chronic diseases such as heart disease, cancer, and diabetes are usually changing their states or stages from low levels to higher ones or vice versa. To model such dynamical data, multiplicative hazard models in the form of hazard regression such as the Cox Regression is usually employed. This regression model offers a simple summary of risk factors or treatment effects in terms of the hazard ratio. However, when the hazard rates are non-proportional the model may become problematic. Alternatively, a regression model based on additive hazard models may be used to analyze multi-state data. The use of the model is illustrated by analyzing multi-state data on childhood cancer concerning states: cancer, abandonment, progressive, and death. R statistical computing was used to facilitate the modeling procedures.

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Application of Maximum Likelihood Method and Gutenberg-Richter Law in analyzing Earthquake Activity Levels in North Sulawesi Province and its surroundings

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Tectonic earthquakes are disasters that often cause damage to buildings and loss of life. The area of North Sulawesi and its surroundings is an earthquake-prone area because it is located at the confluence of three major plates. This study analyzes the level of earthquake activity in North Sulawesi and its surroundings using the maximum likelihood method and the Gutenberg-Richter law. The distribution of earthquakes studied for the period 1941-2021 in North Sulawesi and its surroundings.

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Analysis of Earthquake Activity Levels in Simeulue Regency with the Ordinary Least Square Method and the Guttenberg-Richter Law Approach

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Earthquakes are natural disasters that cause many casualties and damage to buildings. The territory of Indonesia is an area that is prone to high earthquakes because it is located at the confluence of three major plates, namely the Indo-Australian, Eurasian and Pacific. The Simeule Regency area (Simeulue Island and its surroundings) which is part of the D.I. Aceh Province is one of the earthquake-prone areas in Indonesia. This study aims to analyze the level of earthquake activity predicted by using the Guttenberg-Richter Law approach in the Simeule Regency Region. The data used in this study area were obtained from ISC (International Seismological Center) online data taken from 1940-2020 at a depth of < 60km and a magnitude of 3SR. The research area is divided into 4 sub regions. Ordinary Least Square method is used to determine the value of parameters a and b.

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Comparison of Parameter Estimation Based on OLS And Sur on Gstarx Total Model Positive Case of Corona-19 in Java Island (Case Study in Three Provinces of DKI Jakarta, Jabar, Jatim))

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The purpose of this study is to find out the comparison of the efficiency of the Ordinary Least Square (OLS) method without considering the correlation between equations and Seemingly Unrelated Regression (SUR) by considering the correlation between the equations in the GSTARX(1,1) Model Parameter Estimation. The GSTARX(1,1) model is a the application of the data on the number of COVID-19 Positive Cases involves cured patients who are limited to lagtime 1 and spatial lag 1, because the research locations are in three provinces adjacent to the western part of Java, with intensive mobility of interaction between residents. This study uses secondary data on the number of positive cases of CORONA-19 in three provinces of DKI Jakarta, West Java and Banten. The results of the study by considering the aspect of contemporaneous correlation show that the parameter estimator of the GSTARX(1.1) model produced by the OLS method has a serial correlation between equations in the three provinces. so that it is not efficient. On the other hand, the existence of a serial correlation between the error equations actually accommodates the application of the SUR estimation method as an alternative to the OLS method, thereby increasing the efficiency of the model estimator. Thus, it can be concluded that the estimator of the SUR method is more efficient than the OLS estimator.

Aktuaria

Health Insurance Valuation Models with Dynamic Interest Rate and Multistate Risk Approach

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In this study, we price a health insurance policy that is appropriate for private medical practices using the Multistate model. Data were gathered from a clinic in Garut, West Java. Cases and variables were used to group the data. Cases are included in policies and patients' visits where variables include degree of illness, sex, blood pressure (systolic and diastolic), and tuberculosis status. To estimate model parameters, we utilized a multistate model using the Nelson-Aalen estimator. Additionally, we resampled the data along with the variables using the pseudo-value approach and the Jackknife method before using a specialized regression method to create the final model with premium calculations. We carried out this utilizing a generalized estimating equation (GEE). As a result, we provide a premium table rate categorized by the covariates.

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Accuracy Comparison of Arima Model and Holt Winters Seasonal Smoothing in Predicting Stock Price

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Implementation Of The Accrued Benefit Method In Determining The Size Of The Retirement Liability Model

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The size of the pension obligation, known in actuarial terms is actuarial liability. Actuarial Liability is the present value of pension benefit payments to be made by the Employer to Employees who are still working and who have retired, calculated based on the services provided. The size of the Pension Obligation is calculated based on the assumption that the Pension Fund will continue until all obligations to the Participants and Entitled Parties are fulfilled. Regarding the basic obligations of resigning or still following the program (on going) which is represented by a simple mathematical formula from the actuarial cost method used by pension funding programs, namely Plan Termination Liability and Plan Continuation Liability. Plan Termination Liability (PTL), which is defined as a person's obligation due to resigning from the pension program, is the present value of all accrued benefits, both for active employees and those who are no longer working, while Plan Continuation Liability (PCL) is for accrued benefits, which sometimes -sometimes referred to as on going liability, measures financial bonds based on the assumption that the program will continue. In connection with the above discussion, this paper will explain the formulation of a mathematical model for the size of pension funding obligations using the accrued benefit method

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