Lembaga Penelitian dan Pengabdian Masyarakat
Institut Teknologi Telkom Purwokerto
Jl. D.I. Panjaitan No. 128 Purwokerto 53147 Telp. (0281) 641629

SURAT TUGAS

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No	NIDN	Nama	Status Peneliti
1	-	Rizky Dwi Santoso	Author
2	0604039001	Zein Hanni Pradana, S.T., M.T.	Co-Author
3	0627087901	Gunawan Wibisono, S.T., M.T.	Co-Author

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"Fault Identification in Honda Scoopy 110CC Continuous Variable Transmission Using Backpropagation Neural Networks"

Selanjutnya kepada personil yang ditugaskan agar dapat segera menyampaikan hasil pelaksanaan kegiatan.

Demikian surat tugas ini diberikan untuk dilaksanakan sebaik-baiknya dengan penuh rasa tanggung jawab.

Purwokerto, 12 Oktober 2023.
Kepala Bagian LPPM,

LPPM
Lembaga Penelitian dan Pengabdian Masyarakat

Dr. Ridwan Pandiya, S.Si., M.Sc.
NIDN. 0625088202

Tembusan:
1. Yth Rektor IT Telkom Purwokerto
2. Arsip

Fault Identification in Honda Scoopy 110CC Continuous Variable Transmission Using Backpropagation Neural Networks

Rizky Dwi Santoso
Electrical Engineering
Institute Technology Telkom Purwokerto
Central Java, Indonesia
19107020@ittelkom-pwt.ac.id

Zein Hanni Pradana
Telecommunications Engineering
Institute Technology Telkom Purwokerto
Central Java, Indonesia
zeindana@ittelkom-pwt.ac.id

Gunawan Wibisono
Electrical Engineering
Institute Technology Telkom Purwokerto
Central Java, Indonesia
wibisono@ittelkom-pwt.ac.id

***Abstract*— Intensive research in the field of signal processing has driven remarkable advancements in communication technology, particularly in the realm of voice recognition. Voice recognition concepts find application across various domains, with one such application being sound recognition within the context of Continuous Variable Transmission (CVT) for 110cc motor scooters.This study aims to identify potential issues in CVT systems by employing artificial neural networks using Learning Predictive Coding (LPC), Mel Frequency Cepstral Coefficient (MFCC), the Artificial Neural Network (ANN) Backpropagation method to classify distinct sounds emanating from Honda Scoopy 110cc motor scooters. The dataset used comprises 100 CVT engine sound recordings, equally distributed between 50 samples of normal engine sounds and 50 samples of damaged engine sounds.The research findings reveal the highest level of accuracy achieved with order 16 and 16 hidden neurons, resulting in a testing accuracy of 81.3%, a validation accuracy of 100.00%, and a testing accuracy of 90%. This data strongly supports the effectiveness of the backpropagation artificial neural network method for precise CVT issue identification.**

Keywords—ANN, Backpropagation, CVT, LPC, MFCC

I. INTRODUCTION

The automotive world, especially the motorcycle sector, has been experiencing rapid growth in recent years, accompanied by advancements in various supporting components. This significant development has been met with a high level of interest from the Indonesian community. Unfortunately, the limited knowledge of motorcycle users often leads to negligence in performing the routine maintenance they should carry out. As a result, the motorcycles they own quickly experience damage[1].

Motorcycle workshop mechanics have a deep understanding and extensive experience, often being able to diagnose motorcycle issues simply by listening to the engine sounds it produces[2] The recognition of sound itself is not detached from intensive research in signal processing, which has led to rapid advancements in communication technology. There are various sound patterns in motorcycle engines that can indicate various types of engine malfunctions. Therefore, this research aims to develop an application capable of classifying motorcycle engine sounds based on their characteristics.

II. LITERATURE REVIEW

The research conducted by several students in 2018 from the Department of Electrical Engineering at Diponegoro University explained the identification of emotions using real-time sound signals with Linear Predictive Coding (LPC) and Backpropagation methods. In this study, it was concluded that in the LPC analysis order testing, an accuracy rate of 91% was achieved with 150 trained test data[3]

The research, also conducted by students in 2019 from Universitas Negeri Yogyakarta, is related to the development of an intelligent sound detection system to classify heart diseases using artificial neural networks. This study concluded that by implementing the Backpropagation artificial neural network method, it successfully detected two types of heart sounds, normal and murmur, with a training accuracy rate of 100%[4].

In this research, the data utilized consists of audio recordings obtained from the Easy Voice Recorder application in the .wav audio format. The dataset includes sound recordings of the CVT engine of a Honda Scoopy 110cc under two conditions: normal and damaged. We collected a total of 50 audio recordings for the normal engine condition and 50 for the damaged engine condition, resulting in a total of 100 CVT engine sound recordings. All audio recordings were uniformly adjusted to a 10-second duration with a sampling frequency of 48kHz.

In this research, LPC and MFCC analyses are employed as feature extraction methods, with Backpropagation in Artificial Neural Networks (ANN) utilized as the classification method for CVT engine sound recognition.

III. WAV FILE

WAV files represent a standardized audio format developed by IBM and Microsoft for personal computers (PCs). Typically, this file format employs PCM (Pulse Code Modulation) encoding. WAV files are characterized by their uncompressed data nature, signifying that all sound samples are stored directly on the hard disk. Analog sounds can be recorded using applications such as Windows Sound Recorder. However, due to their relatively substantial file size, these files are infrequently employed, and their size can reach up to 2GB.

Various formats and structures exist for audio files, with the WAV file adhering to a structure as depicted in Fig. 1[5].

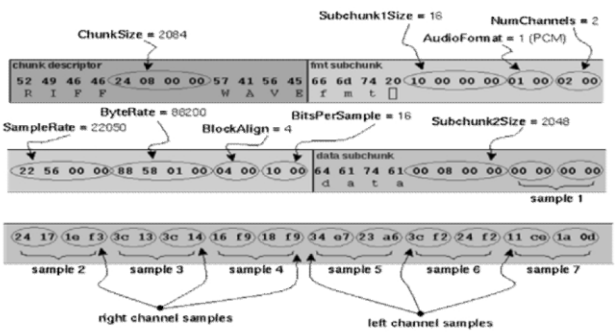

Fig. 1. The WAVE File Structure in Hexadecimal Form

IV. FEATURE EXTRACTION

Feature extraction is the process of deriving specific characteristics or information from objects within images or audio recordings, facilitating their identification and differentiation from other entities. The Mel Frequency Cepstral Coefficient (MFCC) method stands as one of the prevailing techniques in the domains of speaker recognition and speech recognition. The principal function of MFCC feature extraction lies in the transformation of sound waveforms into a diverse set of parameters, including cepstral coefficients, which effectively encapsulate pertinent information within an audio file. Beyond waveform transformation, MFCC has the capacity to generate feature vectors instrumental in the identification of sound, achieved through the conversion of sound signals into a sequence of vectors[6].

V. LEARNING PREDICTIVE CODING (LPC)

Learning Predictive Coding (LPC) represents one of the feature extraction methodologies employed to furnish precise forecasts of speech parameters and to model high-quality speech under low bit rates. LPC engages in analysis by segregating formants and appraising them within the signal, a stage denoted as the inverse filter process. Furthermore, within the LPC method, the capability exists to compute the frequency and intensity of the residual audio signal, denominated as the "Residue." Given that audio signals exhibit continual temporal variation, estimations are generated for each discrete signal segment, referred to as a "frame" [7].

VI. MEL FREQUENCY CEPSTRAL COEFFICIENT (MFCC)

MFCC is a feature extraction method that transforms audio waveforms into various parameters, including cepstral coefficients that represent audio files. The MFCC feature extraction process encompasses the following stages [8]

A. Pre-Emphasis

Pre-emphasis constitutes the primary stage in the MFCC feature extraction process. This initial step is imperative due to the susceptibility of signals to noise interference, necessitating the reduction of noise. One elementary approach to mitigate noise-related challenges involves the application of pre-emphasis filtering. The pre-emphasis process can be delineated using the following equation[9]

$$A(k) = B(k) * 0.97\, B(k-1) \qquad (1)$$

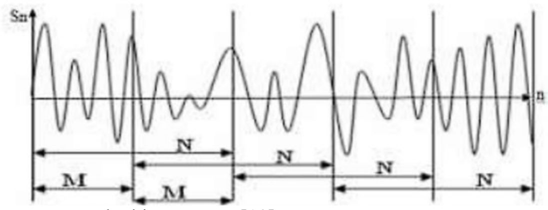

Fig. 2. Frame Blocking Process[10]

In this context, A(k) signifies the outcome of the signal post pre-emphasis, whereas B(k) represents the signal prior to pre-emphasis[9].

B. Frame Blocking

Frame Blocking is a procedure in which an audio signal is partitioned into distinct segments to simplify sound analysis and computational processes. As illustrated in Fig. 2, each segment of the audio signal is denoted as a "frame." The dimensions of each frame are contingent upon the number of samples taken per second, known as the sampling frequency[11]

The computation of the frame blocking quantity is determined by the following equation [10]:

$$Number\ of\ Frame = ((I - N)/\, M + 1) \quad (2)$$

C. Hamming Window

Windowing functions with the aim of imparting a refinement effect to the spectrum following the frame blocking process. Its primary goal is to attenuate discontinuity effects that occur at the edges of frames generated by the frame blocking process. In this research, the Hamming window is selected for its property of exhibiting minimal side lobes and a prominent main lobe, ensuring a smoother outcome of the windowing process. The windowing function is determined using the following equations [12]:

$$x(n) = f\_1\,(n).w(n) \qquad (3)$$

In this context, the function x(n) represents the result of the windowing process, where f1 signifies the outcome of frame blocking, and n ranges from 0 to N-1. The symbol N denotes the number of samples in each frame, while w(n) denotes the windowing function. Conversely, the Hanning windowing function is computed using the following equation [12]:

$$w(n) = 0{,}5(\,1 - cos\left(\frac{2\pi n}{M-1}\right)\,) \qquad (4)$$

In this case, W(n) is the windowing function employing the Hanning window, with n ranging from 0 to M-1, where M signifies the length of each frame.

D. Discrete Cosine Transform

The windowing function is determined using the following equations [13]:

$$C(n) = \sum E_k * cos\,\left(n * (k - 0.5) * \frac{\pi}{40}\right) \qquad (5)$$

for n ranging from 0 to N, where N represents the count of triangular band-pass filters, and L signifies the quantity of mel-scale cepstral coefficients. The DCT is applied to the output from the band-pass filters to produce mel-scale coefficients. The signal in the frequency domain is converted into a time-domain signal. These features are also referred to as mel-scale cepstral coefficients or mel-frequency cepstral coefficients, which are utilized in speech recognition [13].

E. Mel-Frequency Wrapping

The human auditory perception of sound frequencies cannot be quantified on a linear scale. For each sound tone, defined by its actual frequency (f) measured in Hertz (Hz), the term "mel" denotes a measure of the high and low pitch of the sound within a quantifiable scale. The mel-frequency scale encompasses a low-frequency range, characterized by values below 1000 Hz, exhibiting a linear relationship, and a high-frequency range, characterized by values above 1000 Hz, displaying a logarithmic pattern [14].

F. Autocorrelation

Autocorrelation, commonly known as serial correlation, represents a departure from classical assumptions that is predominantly observed, particularly in the realm of linear regression analysis using time series data. It is worth noting that autocorrelation can also manifest in cross-sectional data[15].

VII. Artificial Neural Network Utilizing the Backpropagation Method

Backpropagation is one of the learning algorithms used in the context of artificial neural networks. The backpropagation learning process involves the adjustment of the neural network's weights through backward propagation based on error values observed during the learning process. The output generated from this layer is considered the outcome of the process [15].

In accordance with Fig. 3, the features of the backpropagation method encompass three core layers: (1) the input layer, which serves as the point of connection to the data source, (2) the hidden layer, where the neural network system can accommodate multiple hidden layers or none at all, and (3) the output layer, which represents the result of the input layer's output using a Sigmoid function. The result of this process is regarded as the product of the learning process [15].

VIII. Cofusion Matrix

The confusion matrix is a method used to assess the performance of a classification system. Essentially, it compares the classification results of a system with the expected classifications using the information in the confusion matrix. When evaluating performance using a confusion matrix, four terms indicate the outcomes of the

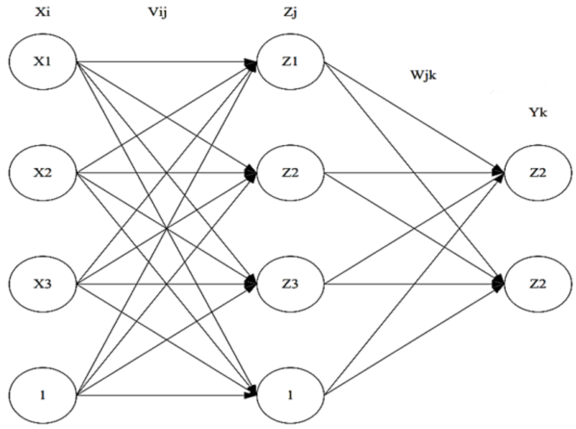

Fig. 3. The Architectural Structure of Backpropagation Artificial Neural Network

TABLE I. Confusion Matrix [16]

		Predicted Class	
		Positive	Negative
Actual Class	Positive	True Positive (TP)	False Negative (FN)
	Negative	False Positive (FP)	True Negative (TN)

classification process [16]. Here is the table and the confusion matrix.

IX. Structure of the Proposed Method

Data collection consists of 100 sound recordings from the Scoopy 110cc motorcycle, divided into 50 sound recordings in good condition and 50 sound recordings in a damaged condition.

As shown in Fig. 4, after completing the data collection, the next step is to design a system capable of detecting the condition of the Continuous Variable Transmission (CVT) in the motorcycle, whether it is in good or damaged condition.

First, sound data from recording is processed using LPC to obtain the LPC coefficients. Eighth order LPC yields 8 coefficients, tenth order LPC yields 10 coefficients and so on. The LPC coefficients are then used as the input layer of the artificial neural network. Eighth order LPC would correspond to 8 nodes of the input layer. The number of hidden layer nodes are also matched with the LPC order. In this research, LPC order 8th, 10th, 12th, and 16th are used.

The design process is carried out using the Matlab application, adopting an artificial neural network architecture, and the backpropagation method. Once the system design is completed, the next step is to conduct testing on the designed system. The testing process consists of three stages: training data testing, validation data testing, and new data testing. After testing is completed, the data obtained will

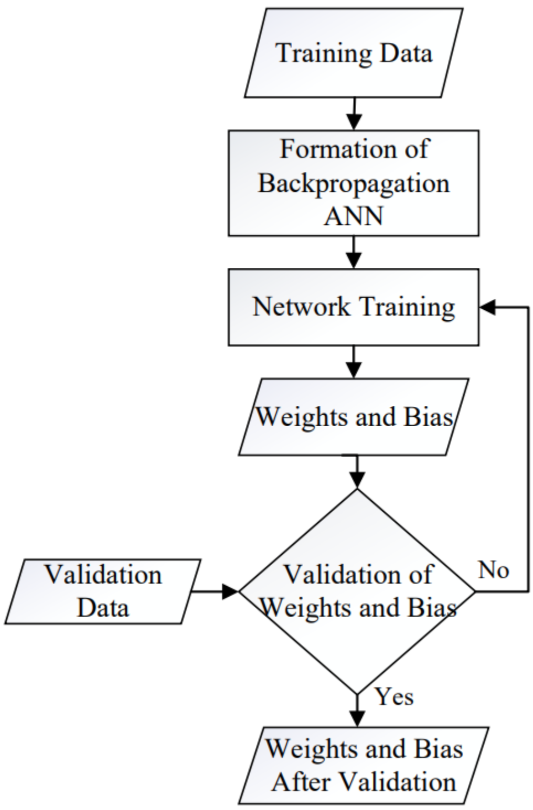

Fig. 4. Block Diagram of the Training Process

be processed using a confusion matrix to obtain the percentage results based on the desired classification.

For the purpose of testing, as depicted in Fig. 5, sound recordings of CVT engine data are utilized, comprising 10 recordings in a damaged condition and 10 recordings in a good condition. This testing process entails the comparison of the ANN model, encompassing weights and biases, for the classification of recognized information. Prior to entering the classification phase, the weights and biases undergo a preliminary validation process employing 5 sound recordings that have undergone feature extraction. The validation data is selected in a randomized manner by the system that has been established. The schematic overview of the testing process is outlined as Fig. 5.

X. RESULTS AND ANALYSIS

In the evaluation of the ANN Backpropagation network architecture, a total of 100 recordings were employed, comprising 50 CVT sound recordings categorized as damaged and 50 CVT sound recordings categorized as normal. This network architecture utilizes 5 distinct order values, specifically 8, 10, 12, 14, and 16, with 100 test data to be classified into three distinct variables. These data were allocated for training, encompassing 75 samples, validation, including 5 samples, and experimentation, involving 20 samples.

This study employed a range of order values and varying numbers of hidden neurons to determine the most effective classification. The following presents the outcomes of the conducted research on Table II.

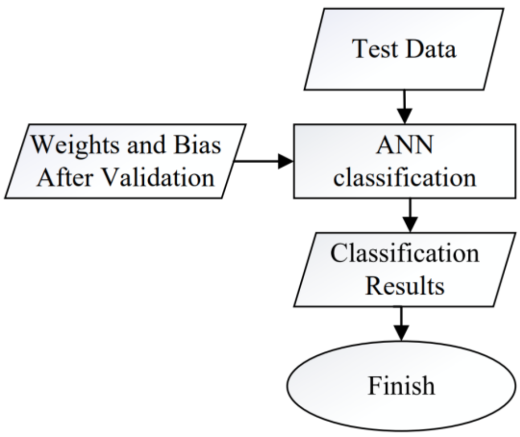

Fig. 5. Block Diagram of the Testing Process

TABLE II. AVERAGE TESTING RESULTS OF JST BACKPROPAGATION

Experiment	Training results	Validation results	Testing results	Overall data results
Order 8 & Hidden Neurons 8	78.46%	88%	81.5%	79.6%
Order 10 & Hidden Neurons 10	77.99%	74%	84.50%	79.1%
Order 12 & Hidden Neurons 12	78.54%	84%	80.5%	79.2%
Order 14 & Hidden Neurons 14	77.74%	92%	79.5%	78.8%
Order 16 & Hidden Neurons 16	78.96%	88%	83%	80.2%

From the table presented above, the study's average test results are evident. The most favorable test outcomes, spanning from order 8 to 16, are found at order 16, involving 16 hidden neurons. This particular testing phase yielded the most outstanding results, featuring the highest percentages across all the assessed criteria. These encompassed a training dataset performance of 78.96%, a validation dataset performance of 88%, a testing dataset performance of 83%, and an overall data performance of 80.2%. Remarkably, the pinnacle results for order 16 emerged in the 8th experiment, showcasing remarkable figures for the training dataset (81.3%), validation dataset (100%), testing dataset (90%), and an overall average performance of 84%.

According to Fig. 6, which represents the Best Validation Performance, the cross-entropy value of 0.32214 was achieved during the 24th epoch out of a total of 30 epochs. This value falls within the range of cross-entropy values between 10^0 and 10^{-1}. The Validation Test curve displays a conspicuously stable pattern, characterized by minor fluctuations in the graph. This observation suggests that the degree of overfitting is relatively limited.

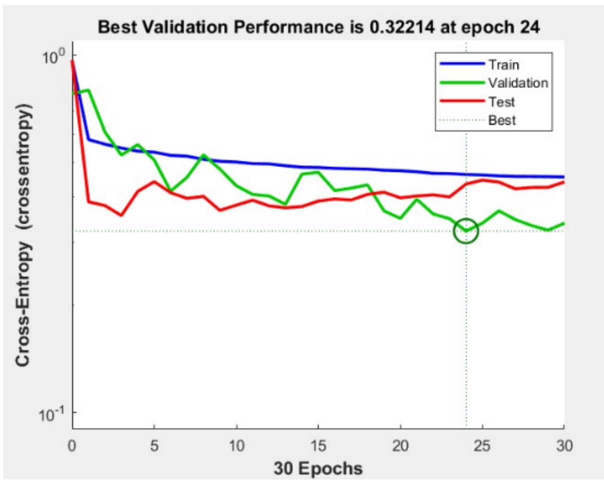

Fig. 6. The Optimal Validation Performance Value for Order 16 in Experiment Number 8

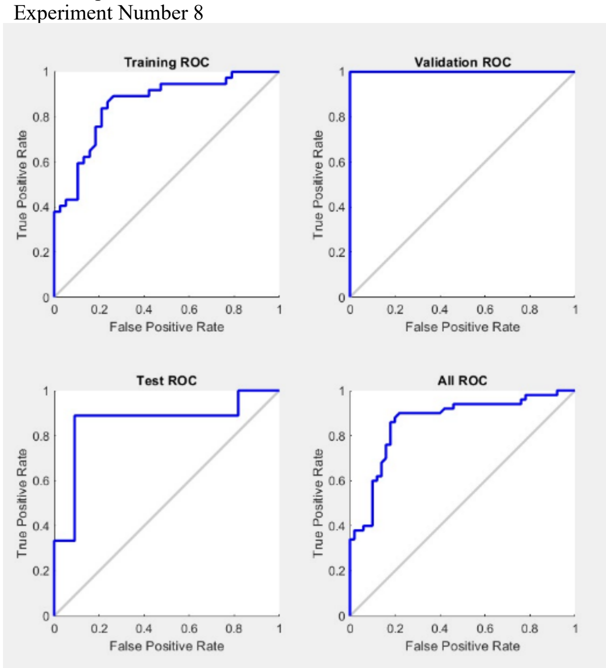

Fig. 7. ROC Curve for Order 16 in Experiment 8

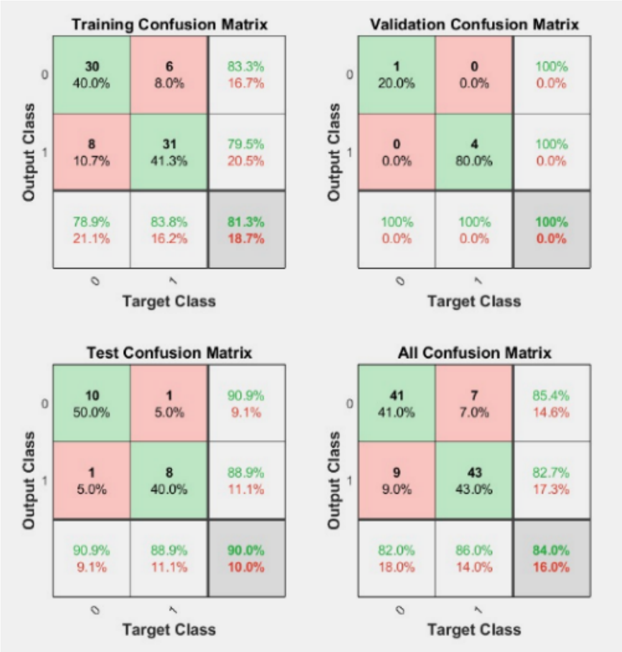

Fig. 8. Confusion Matrix for Order 16 in Experiment 8

In Fig. 7, the ROC curve depicted above reveals a favorable outcome. Both the test ROC and validation ROC exhibit high values, underscoring the model or system's proficiency in accurately predicting specific classes.

In Fig. 8 above, the results of the Order 16 testing are presented, encompassing the training data, validation data, and test data, similar to the testing of previous orders. The comprehensive outcomes from 100 data samples indicate an accuracy rate of 84%. Precision values for normal CVT sound and damaged CVT sound are recorded at 85.4% and 82.7%, respectively. Additionally, the sensitivity for normal CVT sound is observed to be 82%, while the sensitivity for damaged CVT sound reaches 86%.

XI. CONCLUSION

The research experiment results involving various combinations of features, the quantity of hidden layers, and the number of neurons utilized as parameters within a backpropagation artificial neural network architecture are presented. The most optimal Confusion Matrix values, closely approximating the target values, are observed with features of order 16 in conjunction with a hidden layer housing 16 neurons. The outcomes derived from the testing conducted using the Backpropagation Artificial Neural Network (ANN) model to identify CVT engine issues in motor scooters indicate a robust classification capability. This assertion is supported by the accuracy values within the Confusion Matrix, with the peak performance realized in order 16: training accuracy of 81.3%, validation accuracy of 100%, testing accuracy of 90%, and an overall average accuracy of 84%.

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PROCEEDING
IEEE COMNETSAT 2023

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Welcome Message from General Chair

The 12th Comnetsat 2023

(Thursday – Saturday), 23th – 25th November 2023

On behalf of the Institut Teknologi Telkom Purwokerto and Organizing Committee, I warmly welcome you to the 12th IEEE International Conference on Communications, Network, and Satellite (ComNetSat 2023). This year we are carrying a theme "Pioneering Intelligent Systems: The Fusion of AI, Broadband, and Satellite Communication". Here, researchers, scientists, students, and practitioners come together to participate and present their latest research findings, developments, and applications related to AI, Broadband, and Satellite Communication.

Many pieces of information from multi-disciplinary fields will be presented in the two-day conference so that researchers with different backgrounds can collaborate beyond the traditional boundaries of their research fields. I hope you can find a systematic, coordinated, long-term solution for the future of humankind at the end of this conference.

Despite the challenges, the ComNetSat 2023 all Organizing Committee, TPC, and volunteers worked very hard to complete the conference program, uphold the quality of conferences, and meet authors' expectations. Finally, I would also like to express sincere and special thanks to the IEEE Communications Society (ComSoc) Indonesia Chapter, the IEEE Indonesia Section, and the IEEE AESS/GRSS Indonesia Joint Chapter, which have shown great support to this event.
I hope this conference stimulates various kinds of collaborations. Your support will also make this a memorable and successful event. Thank you for joining the conference!

Sincerely,
Dr. Tenia Wahyuningrum, S.Kom., M.T.
General Chair

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Achmad Danisya	Insitut Teknologi Telkom Purwokerto
Nhu-Ngoc Dao	Sejong University
Darjat Darjat	Diponegoro University
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Carl Debono	University of Malta
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Sanjay Dhar Roy	National Institute of Technology Durgapur
Rogerio Dionisio	Instituto Politecnico de Castelo Branco
Pasquale Dottorato	Lab ID
Titon Dutono	Politeknik Elektronika Negeri Surabaya
Alban Duverdier	CNES
Vladimir Dyo	University of Bedfordshire
Bayu Erfianto	TELKOM University
Chun-I Fan	National Sun Yat-sen University
Chao Fang	Beijing University of Technology
Irmalia Faradisa	National Institute of Technology (ITN Malang)
Hamed Farhadi	Ericsson Research
Arna Fariza	Politeknik Elektronika Negeri Surabaya
Wei Feng	Tsinghua University

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Maya Fitria	Universitas Syiah Kuala
Mauro Fonseca	UTFPR
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Vasilis Friderikos	King's College London
Dhomas Hatta Fudholi	Universitas Islam Indonesia
Seiji Fukushima	Kagoshima University
Raad Sami Fyath	Al-Jadriya
Deyun Gao	Beijing Jiaotong University
Honghao Gao	Shanghai University
Ford Gaol	Bina Nusantara University
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Alireza Ghasempour	University of Applied Science and Technology
Vasileios Gkioulos	Norwegian University of Science and Technology
Mariusz Glabowski	Poznan University of Technology
Alberto Gotta	ISTI-CNR
Javier Gozalvez	Universidad Miguel Hernandez de Elche
Francesco Gringoli	CNIT/University of Brescia
Indar Gunadin	Hasanuddin University
Ao Guo	Nagoya University
Hiromasa Habuchi	Ibaraki University
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Ali Hamad	University of Baghdad
Ridha Hamila	Qatar University
Mochamad Hariadi	Sepuluh Nopember Institute of Tech. Surabaya
Rini Hasanah	Brawijaya University
Zulfajri Hasanuddin	Hasanuddin University
Muhammad Hasibuan	University Gadjah Mada
Bramah Hazela	Amity University Uttar Pradesh India
José Luis Hernandez Ramos	Universidad de Murcia
Roberto Carlos Herrera Lara	Electricity Company of Quito
Zalan Heszberger	Budapest University of Technology and Ec.
Anjar Hidayat	Institut Teknologi Telkom Purwokerto
Trong-Minh Hoang	Posts and Telecommunications Institute of Technology
Kenneth Hopkinson	Air Force Institute of Technology
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Jia Hu	University of Exeter
Chi-Fu Huang	National Chung Cheng University
Prajna Deshanta Ibnugraha	Telkom University
Nurul Ikhsan	Telkom University

Edy Irwansyah	Bina Nusantara University
Emi Iryanti	Universitas Gadjah Mada
Sani Isa	Bina Nusantara University
Sani Muhammad Isa	Bina Nusantara University
I Istiadi	Widyagama University of Malang
Wael Jaafar	École de Technologie Supérieure
Dushantha Nalin K. Jayakody	Universidade Lusófona
Ari Jayati	Universitas Semarang
Xianliang Jiang	Ningbo University
Yasin Kabalci	Nigde Omer Halisdemir University
Emil Kaburuan	Mercu Buana University
Zeeshan Kaleem	COMSATS University Islamabad, Wah Campus
Pushpendu Kar	University of Nottingham Ningbo China
Abdul Karim	Research Professor
Mohsen Kavehrad	CRKC LLC
Chutisant Kerdvibulvech	National Institute of Development Administration
M Arif Khan	Charles Sturt University
Lyes Khoukhi	ENSICAEN, Normandie University
Joongheon Kim	Korea University
Rangarajan Komandur R.	Sri Sai Ram Engineering College
Peng-Yong Kong	Khalifa University
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Prima Kristalina	Politeknik Elektronika Negeri Surabaya (PENS)
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Scahin Kumar	Amity University Lucknow Campus (UP) India
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Dana Sulistyo Kusumo	Telkom University
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Zengpeng Li	Lancaster University

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Yun-Wei Lin	National Chiao Tung University
Zhi Lin	National University of Defense Technology
Linawati Linawati	Universitas Udayana
Marco Listanti	University of Rome "La Sapienza"
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Maggie Mashaly	German University in Cairo
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Samir Medjiah	LAAS-CNRS
Natarajan Meghanathan	Jackson State University
Ahmed Mehaoua	Universite Paris Cite
Melinda Melinda	Universitas Syiah Kuala
Weizhi Meng	Technical University of Denmark
Linda Meylani	Telkom University
De Mi	Birmingham City University
Albena Mihovska	Aarhus University
Konstantin Mikhaylov	University of Oulu
Alim Misbullah	Universitas Syiah Kuala
Deepak Mishra	IIST
Paul Mitchell	University of York
Sumiko Miyata	Shibaura Institute of Technology
Lei Mo	Southeast University
Imran Mohd Ibrahim	Universiti Teknikal Malaysia Melaka
Paulo Monteiro	Universidade de Aveiro
Marie-Jose Montpetit	Concordia University
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Abderrahmen Mtibaa	University of Missouri St. Louis
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Amitava Mukherjee	Amrita Vishwa Vidyapeetham
Muljono Muljono	Dian Nuswantoro University
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Nasaruddin Nasaruddin	Syiah Kuala University
N Nasimuddin	Institute for Infocomm Research
Jad Nasreddine	i2CAT Foundation
Peshal Nayak	Samsung Research America
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Shashikant Patil	Mumbai University
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Miodrag Potkonjak	UCLA
Teguh Prakoso	Diponegoro University
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Aloysius Adya Pramudita	Telkom University
Bernardi Pranggono	Anglia Ruskin University
Agung Prasetijo	Diponegoro University
Leonardus Pratomo	Soegijapranata Catholic University
Aris Puji Widodo	Diponegoro University
M. Fauzan Edy Purnomo	Brawijaya University
Ira Puspitasari	Universitas Airlangga
Agfianto Putra	Universitas Gadjah Mada
Karisma Putra	Universitas Muhammadiyah Yogyakarta
Carla Raffaelli	University of Bologna
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Yusnita Rahayu	Universitas Riau

Lusia Rakhmawati	Universitas Negeri Surabaya
Nur Ghaniaviyanto Ramadhan	Institut Teknologi Telkom Purwokerto
Hestiasari Rante	Politeknik Elektronika Negeri Surabaya
Luca Reggiani	Politecnico di Milano
Eric Renault	LIGM, Université Gustave Eiffel, CNRS, ESIEE Paris
Adian Rochim	Diponegoro University
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Xiaochuan Sun	NCST
Zhili Sun	University of Surrey

Andi Sunyoto	Universitas Amikom Yogyakarta
Didi Supriyadi	Diponegoro University
Retno Supriyanti	Jenderal Soedirman University
Nico Surantha	Bina Nusantara University
Indra Surjati	Universitas Trisakti
Suroso Suroso	Jenderal Soedirman University
Watcharapan Suwansantisuk	King Mongkut's University of Technology Thonburi
Wiwin Suwarningsih	National Research and Innovation Agency (BRIN)
Theo Swart	University of Johannesburg
Syahrial Syahrial	Syiah Kuala University
Rakesh T	National Institute of Technology Calicut
Syahfrizal Tahcfulloh	Universitas Borneo Tarakan
Mario Tanda	Università di Napoli Federico II
Alessandro Testa	Ministry of Economy and Finance
Hapnes Toba	Maranatha Christian University
Tien Choon Toh	Universiti Tunku Abdul Rahman
Ljiljana Trajković	Simon Fraser University
Minh Tran	Phenikaa University
Triwiyanto Triwiyanto	Politeknik Kesehatan Surabaya, Kementerian Kesehatan RI
Eirini Eleni Tsiropoulou	University of New Mexico
Umaisaroh Umaisaroh	Universitas Mercu Buana
Fandy Utomo	Universitas AMIKOM Purwokerto
Surapong Uttama	Mae Fah Luang University
Adriaan van Wijngaarden	Bell Laboratories, Nokia
Costas Vassilakis	University of the Peloponnese
Kasturi Vasudevan	Indian Institute of Technology Kanpur
Vinod Kumar Verma	SLIET, LONGOWAL
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Chaeriah Wael	National Research and Innovation Agency
Wahyono Wahyono	Universitas Gadjah Mada
Gang Wang	MaxLinear Inc.
Jianjia Wang	Shanghai University
Yang Wang	La Salle University
You-Chiun Wang	National Sun Yat-Sen University
Wardi Wardi	Universitas Hasanuddin
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Eliana Werbin	Universidad Nacional de Córdoba
Carlos Becker Westphall	Federal University of Santa Catarina
Yuning Widiarti	Politeknik Perkapalan Negeri Surabaya
Indrastanti Widiasari	Satya Wacana Christian University
Heri Wijayanto	University of Mataram

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Bernd Wolfinger	University of Hamburg
Lexi Xu	China Unicom Research Institute
Li Xu	Chinese Academy of Sciences
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Tianhua Xu	University of Warwick
Kuo-Hui Yeh	National Dong Hwa University
Thaweesak Yingthawornsuk	King Mongkut's University of Technology Thonburi
Aws Yonis	Ninevah University
Tomoki Yoshihisa	Shiga University
Keping Yu	Hosei University
Mike Yuliana	Politeknik Elektronika Negeri Surabaya
Intan Yulita	Universitas Padjadjaran
Ji-Hoon Yun	Seoul National University of Science and Technology
Yusran Yusran	Universitas Hasanuddin
Peiying Zhang	China University of Petroleum (East China)
Zongyang Zhang	Beihang University
Fuhui Zhou	Nanjing University of Aeronautics and Astronautics
Yishui Zhu	Changan University

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Program Schedule

Day 1: November 23th 2023	
Time (GMT+7)	**Activity**
08:00 – 09:00 AM	Registration
09:00 – 10:35 AM	Opening/Welcome Remark
10:35 – 11:35 AM	**Keynote 1 Session**
	Prof. Shui Yu (University of Technology Sydney)
11:35 – 12:35 PM	**Keynote 2 Session**
	Prof. Ljiljana Trajkovic (Simon Fraser University, Canada)
12:35 – 01:30 PM	Break
01:30 – 03:30 PM	**Parallel Session 1**
03:30 – 03:45 PM	Break
03:45 – 05:05 PM	**Parallel Session 2**
05:05 – 07:00 PM	Break
07:00 – 09:10 PM	**Gala Dinner**
Day 2: November 24th 2023	
08:00 – 09:00 AM	Registration
09:00 – 09:15 AM	Opening
09:15 – 10:20 AM	**Keynote 3 Session**
	Prof. Tarek S. El-Bawab, PhD, FIEEE (American University of Nigeria (AUN), Adamawa)
10:20 – 11:20 AM	**Technical Session Seng Kee Chee (Keysight Technologies, Malaysia)**
11:20 – 01:30 PM	Break
01:30 – 03.30 PM	**Parallel Session 2**
03:30 – 03:45 PM	Break
03:45 – 04:25 PM	**Parallel Session 3**
04:25 – 05:10 PM	**Awarding & Closing**
Day 3: November 25th 2023	
02.00 – End AM	Bromo Tour

Keynote Speakers

Prof. Shui Yu

(University of Technology Sydney)

"Cybersecurity, Privacy, and the Networking"

Abstract:

Networking and artificial intelligence were developing independently in the past. However, they are merging today for an unprecedented virtual world for human beings, e.g. the metaverse. In this talk, we would like to first shoot a glance at the emerging future of networking. Secondly, we will discuss the challenges of the unfolding history of the field, and also humbly present our understanding and attempts on semantic communication, geometric deep learning, and quantum networking. We sincerely hope this talk will shed light for interested researchers and also expect to work with talented colleagues to explore the uncharted parts of the promising land

Short Bio:

Shui Yu is a Professor of School of Computer Science, University of Technology Sydney, Australia. His research interest includes Cybersecurity, Network Science, Big Data, and Mathematical Modelling. He has published five monographs and edited two books, more than 500 technical papers at different venues, such as IEEE TDSC, TPDS, TC, TIFS, TMC, TKDE, TETC, ToN, and INFOCOM. His current h-index is 71. Professor Yu promoted the research field of networking for big data since 2013, and his research outputs have been widely adopted by industrial systems, such as Amazon cloud security. He is currently serving the editorial boards of IEEE Communications Surveys and Tutorials (Area Editor) and IEEE Internet of Things Journal (Editor). He served as a Distinguished Lecturer of IEEE Communications Society (2018-2021). He is a Distinguished Visitor of IEEE Computer Society, and an elected member of Board of Governors of IEEE VTS and IEEE ComSoc, respectively. He is a member of ACM and AAAS, and a Fellow of IEEE.

Keynote Speakers

Prof. Ljiljana Trajkovic

(Simon Fraser University, Canada)

"Communication Networks and Dynamical Systems"

Abstract:

Border Gateway Protocol (BGP) enables the Internet data routing. BGP anomalies may affect Internet connectivity and cause routing disconnections, route flaps, and oscillations. Hence, the detection of anomalous BGP routing dynamics is a topic of great interest in cybersecurity. Various anomaly and intrusion detection approaches based on machine learning have been employed to analyze BGP update messages collected from RIPE and Route Views collection sites. A survey of supervised and semi-supervised machine learning algorithms for detecting BGP anomalies and intrusions is presented. Deep learning, broad learning, gradient-boosting decision trees, and reservoir computing algorithms are evaluated by developing models based on collected datasets that contain Internet worms, power outages, and ransomware events.

Short Bio:

Ljiljana Trajkovic received the Dipl. Ing. degree from University of Pristina, Yugoslavia, the M.Sc. degrees in electrical engineering and computer engineering from Syracuse University, Syracuse, NY, and the Ph.D. degree in electrical engineering from University of California at Los Angeles. She is currently a professor in the School of Engineering Science, Simon Fraser University, Burnaby, British Columbia, Canada. Her research interests include communication networks and dynamical systems. She served as IEEE Division X Delegate/Director, President of the IEEE Systems, Man, and Cybernetics Society, and President of the IEEE Circuits and Systems Society. Dr. Trajkovic serves as Editor-in-Chief of the IEEE Transactions on Human-Machine Systems and Associate Editor-in-Chief of the IEEE Open Journal of Systems Engineering. She is a Distinguished Lecturer of the IEEE Circuits and System Society, a Distinguished Lecturer of the IEEE Systems, Man, and Cybernetics Society, and a Fellow of the IEEE.

Keynote Speakers

Prof. Tarek S. El-Bawab, PhD, FIEEE

(American University of Nigeria (AUN), Adamawa)

"Optical System and Technology"

Abstract:

Telecommunication has evolved over Centuries and advanced significantly in the last 2-3 decades. Over time, different methods and various technologies, coupled with changes in our social, economic, political and other conditions, determined the path telecommunication has taken at many crossroads. In this talk, we take a step back and look at the big picture of the evolution of Telecommunication from ancient times until today. As it analyzes this evolution and contemplates some of its aspects and features, this talk presents an opinion that Telecom has gone through nine paradigms so far, leading to four main eras. For the purpose of this talk, we define a Paradigm as the framework that transpired in a given period of time by progress in technology and conditions of human society, leading to changing the role and applications of telecommunication during this particular period. We further argue that we are making the first steps into Paradigm 10, which is paving the way for a new -fifth-era in the field and the industry. We discuss the features of this new paradigm and era and identify their main technological ingredients and enablers. We finally try to envision what the future may hold for us and for our R&D, in terms of possible progress, opportunities, and challenges.

Short Bio:

Tarek S. El-Bawab, PhD, FIEEE was most recently the Dean of the School of Engineering and Professor of Electrical and Computer Engineering at the American University of Nigeria (AUN). Before this, he was Professor and Dean of Engineering and Applied Sciences at Nile University (Egypt), Professor of Electrical and Computer Engineering at Jackson State University (USA), and Project Manager with the Network Strategy Group (CTO organization) of Alcatel-Lucent USA (now Nokia). Before these positions, he assumed leading research roles with a number of organizations including: Alcatel (Alcatel-Lucent, now Nokia), the Department of Electrical and Computer Engineering at Colorado State University (USA), and the Department of Electronic Systems Engineering at University of Essex (UK). Earlier, he had led large-scale international telecommunication projects in the Middle East and Africa.

Dr. El-Bawab research interests include telecommunications, network architectures, optical networks, performance analysis, and Discipline Based Education Research (DBER). He has more than 80 scholarly journal/conference papers and patents. His book Optical Switching is one of the most comprehensive references in its subject. He is an IEEE Fellow, the current Series Editor of Springer's Textbooks in Telecommunication and Network Engineering, the Editor in Chief of the IEEE Communications Magazine (2017-2021), Eta Kappa Nu (HKN) member, served as IEEE Distinguished Lecturer (2016-2019), and as NSF Review Panelist.

Tarek led the Telecommunication Engineering Education (TEE) initiative and movement (2008-2014), which resulted in recognition of network/telecommunication engineering as distinct ABET - accreditable education discipline on November 1, 2014. He is the first recipient of the IEEE Communications Society's (ComSoc) Education Award for this work (2015). The citation of this award reads: "for outstanding contributions to the definition, and to the accreditation criteria, of modern communication/telecommunication engineering education; and for making changes to our education system that benefit our community, society, and the profession."

He has served IEEE and the IEEE Communications Society (ComSoc) in numerous capacities: as Board Member of the IEEE Educational Activities Board (2016-2017), as Board Member of the IEEE PSPB Thesaurus Editorial Board (2021-2023), as Board Member of the ComSoc Board of Governors (2014-2015, 2018-2019, and 2020-2021), and Board Member of the ComSoc Educational Services Board (2012-2019). He served as the ComSoc Director of Industry Communities (2020-2021), Director for Standards Development (2018-2019) and Director of Conference Operations (2014-2015). He is a founding/active member of several ComSoc technical committees, and was elected Chair of the Transmission, Access, and Optical Systems (TAOS) Technical Committee for two terms. Tarek has served as symposium chair, workshops Chair, and organizer in several ICC/Globecom Conferences, and organized/chaired the ICC/Globecom International Workshop on Optical Networking Technologies (IWONT) for 10 years. He is also member of the IEEE Computer, Electron Devices, Photonics, and Education Societies.

Dr. El-Bawab has B.Sc. in electrical engineering and B.A. in history, both from Ain Shams University, Cairo, Egypt. He holds M.Sc. in solid state science from the American University in Cairo, and M.Sc. in telecommunications and information systems from the University of Essex, UK. He obtained his Ph.D. in electrical engineering from Colorado State University.

Keynote Speaker

MR. CHEE Seng Kee

(Keysight Application Development Engineer)

Short Bio:

Seng Kee is an Application Development Engineer from Keysight Technologies. His primary focus are industry applied teaching solutions and photonics research development for universities. He has been attached with Keysight for more than 13 years as Application Development Engineer and Product Engineer role in Digital & Photonics sector. He has been actively conducting trainings on test and measurement domain and IoT domains.

Before he joined Keysight, he was with Osram for almost 4 years in LED manufacturing from Front-End to the Back-End. He has in-depth experiences in design and setup for the LED backend technology, and a key driver for yield improvement activities in the manufacturing lines. Seng Kee holds a Bachelor's Degree in Electronics from Wawasan Open University.

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