PROCEEDING

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ICVEE

2020 the third International Conference on Vocational Education and Electrical Engineering (ICVEE)

Strengthening the framework of Society 5.0 through Innovations in Education, Electrical, Engineering and Informatics Engineering

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SURABAYA - INDONESIA

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2020 the third International Conference on Vocational Education and Electrical Engineering (ICVEE)

Proceeding

2020 the third International Conference on Vocational Education and Elecrical Engineering (ICVEE) on October 3-4, 2020 in the virtual event, Surabaya, Indonesia.

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Message from the General Chair

It gives me great pleasure to all of the keynote/invite speakers, distinguished guests, and ICVEE participants, welcome to 2020 the third International Conference on Vocational Education and Electrical Engineering (ICVEE). Due to the COVID-19 ICVEE conference which is organized by the Department of Electrical Engineering and Departement of Informatics, Universitas Negeri Surabaya and technical sponsorship IEEE Indonesia section hold the conference in the virtual event. The theme of our conference is " Strengthening the framework of Society 5.0 through Innovations in Education, Electrical Engineering, and Informatics Engineering".

This year we receive 134 articles and resulted in 71 articles that have been presented at this conference and will be submitted to the IEEE explorer. The article comes from some domestics and international universities. The International author and co-author come from Brazil, Jerman, Philippines, Japan, Taiwan, Singapore, Malaysia, Thailand, Saudi Arabia, and Australia. We would like to appreciate all of the keynotes and invite speakers, reviewers, committees, and participants for all the support and participation. We would like to give gratitude to the Universitas Negeri Surabaya as the organizer and IEEE Indonesian Section as a technical Co-sponsorship.

Finally, I wish all participants always successful and enjoy this conference. I hope this program will be interesting and useful for all the ICVEE participants.

Prof. Dr. Bambang Suprianto., MT

General Chair

Organizer and committee

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General and Paralel Program Schedule

General Timetable ICVEE
Saturday, October 3-4, 2020

No	Activity	Time	Duration	PIC	Necessity
Plenary Session Sat, Oct 3					
1	Online Registration (Technical meeting Preparation and On the Spot registration)	07.30 – 08.00	30 minutes	Committee	**Laptop, internet**
2	Opening and Rules Guidance for the Virtual Conference	08.00 – 08.10	10 minutes	Committee	**Laptop, file, documentatio**
3	Viewing Profile Video of Universitas Negeri Surabaya, Listening Indonesia National Anthem, and Listening Mars of Universitas Negeri Surabaya	08.10 – 08.30	20 minutes	Committee	**Laptop, file, documentatio**
4	Welcoming Session	08.30 – 08.50	20 minutes	**Prof. Dr. Bambang Yulianto**., **M.Pd** Vice Rector I of Universitas Negeri Surabaya	**Laptop, file**
5	Keynote Speaker 1 (ICVEE)	09.00 – 09.30	30 minutes	**Prof. Takeshi Fukusako,** Professor at Kumamoto University, Japan	**Laptop, file**
6	Keynote Speaker 2	09.30 – 10.00	30 minutes	**Prof. Dr. Hadi Susanto**, Professor at University of Essex, UK and Khalifa University, UAE	**Laptop, file**
7	Keynote Speaker 3	10.00 – 10.30	30 minutes	**Prof. Johan Pion**, Professor at HAN University	
8	Live Discussion (Question and Answer)	10.30 – 11.15	45 minutes	Plenary Moderator	
Roundtable Discussion, Sat Oct 3, 2020 (ICVEE)					

No	Activity	Time	Duration	PIC	Necessity
9	Welcoming session from ICVEE chair	12.00-12.10	10 minutes	**Prof Bambang Suprianto., MT**	**Laptop, file**
10	Invited Speaker I	12.10 – 12.35	25 minutes	**Prof. Madya. Ir. Dr. Abd Kadir bin Mahamad** **Universiti Tun Hussein Onn Malaysia (UTHM) (Malaysia)**	**Laptop, file**
11	Invited Speaker II	12.35 – 13.00	25 minutes	**Prof. Mingchang Wu., Ph.D.** **National Yunlin University of Science and Technology (Taiwan)**	**Laptop, file**
11	Invited Speaker III	13.00 – 13.30	30 minutes	**Prof. Wisnu Jatmiko., Ph.D** **Universitas Indonesia (UI)** **(IEEE Indonesian Section chair)**	**Laptop, file**
10	Live Discussion (Question and Answer)	13.30 – 14.15	45 minutes	Plenary Moderator	
13	Rules Guidance for the Roundtable Discussion	14.15 – 14.30	15 minutes	Committee (IEEE-AP) (IEEE for room 1-8)	**Laptop, file**
14	Session of Roundtable Discussion	14.30 – 17.00		Room 1 – Room 8 (14.30-14.45) Room 1 – Room 8 (14.45-15.00) Room 1 – Room 8 (15.00-15.15) Room 1 – Room 8 (15.15-15.30) **Break (30 minutes)** Room 1 – Room 8 (16.00-16.15) Room 1 – Room 8 (16.15-16.30) Room 1 – Room 8 (16.30-16.45) Room 1 – Room 8 (16.45-17.00) Room 1 – Room 8 (17.00-17.15) Room 1 – Room 8 (17.15-17.30)	**Laptop, file**

No	Activity	Time	Duration	PIC	Necessity
				Break (30 minutes)	
15	**Announcement best paper/presenter and reviewer** **Closing speech**	**18.00 – 18.30**	**30 minutes**	**Room 1**	**Laptop, internet**

PARALLEL SESSION TIMETABLE ICVEE

Saturday, October 3, 2020

Room 1

Moderator 1 IGP Asto Buditjahjanto

2 Lilik Anifah

No	Paper ID	Paper Title	Time (GMT +7)
1	266	Differences Between Students from Senior High School and Vocational School in the Learning Outcomes of Electrical Engineering Students	14.30-14.45
2	270	absent	
3	276	Combining the Unsupervised Discretization Method and the Statistical Machine Learning for the Modeling of the Students' Performance	15.00-15.15
4	294	The effect of changing the type of lamp, lighting power and adding light points to the strength of the lighting in the Classroom and Reading Room of the Postgraduate Program at the Bung Hatta Building, Jakarta State University	15.15-15.30
	BREAK		14.45-15.15
5	352	absent	16.00-16.15
6	362	absent	16.15-16.30
7	363	Google Classroom Effectiveness and Efficiency as Alternative Online Learning Media to Overcome Physical Distancing in Lectures as a result of the Covid-19 pandemic: Student Perspectives	16.30-16.45
8	367	Effectiveness of Mobile Learning Implementation in Increasing Student Competence and Preventing the Spread and Impact of COVID-19	16.45-17.00
9	368	The Effect of Participation in Scientific Research and Conference on Vocational Teachers' Competencies	17.00-17.15
10	412	Evaluation of Indonesian Technical and Vocational Education in Addressing the Gap in Job Skills Required by Industry	17.15-17.30

Room 2

Moderator 1 Hapsari P A Tjahyaningtijas

2

No	Paper ID	Paper Title	Time (GMT +7)
1	413	Semantic Web Ontology for Vocational Education Self-Evaluation System	14.30-14.45
2	416	The impact of The COVID-19 Pandemic in Indonesia (Face to face versus Online Learning)	14.45-15.00
3	425	absent	15.00-15.15
4	459	DESIGN OF COMPETENCY TEST MODEL FOR ELECTRICAL INSTALLATION AUTOMATION BASED ON PROJECT LEARNING FOR ELECTRICAL ENGINEERING STUDENTS	15.15-15.30
	BREAK		14.45-15.15
5	474	EFFECTIVENESS THE USE OF INTERACTIVE MULTIMEDIA LEARNING MEDIA IN FACIAL SKIN CARE COURSES	16.00-16.15
6	476	The Effect of the Android based Mobile-Learning Models on Student Learning Outcomes in Research Methodology Courses in the Cosmetology and Beauty Department	16.15-16.30
7	489	The Marketing of Teaching Factory Product Through Online E-Commerce at Fashion Design Vocational High Schools	16.30-16.45
8	507	absent	16.45-17.00
9	330	FACTOR ANALYSIS THAT INFLUENCES CPL/PILOT LICENSE COMMERCIAL PHASE TECHNICAL KNOWLEDGE OF CADETS OF OFFICIAL AVIATION SCHOOL VOCATIONAL EDUCATION	17.00-17.15
10	347	Measurement Model of Employability Skills of Vocational High School Student in East Java Using Structural Equation Model (SEM)	17.15-17.30

Room 3

Moderator **1** **Naim Rochmawati**

2 **Yeni Anistyasari**

No	Paper ID	Paper Title	Time (GMT +7)
1	231	Learning Solutions for Multi Interaction-Based Computer Network Devices with Mobile Augmented Reality (Effectiveness, Interface, and Experience Design)	14.30-14.45
2	236	The Concept of Using TOLSYASUPI-EduMed in Basic Programming Learning with Problem-Posing Interaction Flow	14.45-15.00
3	238	E-Voting on Blockchain using Solidity Language	15.00-15.15
4	303	Risk Analysis of Cloud Computing in the Logistics Process	15.15-15.30
	BREAK		14.45-15.15
5	382	absent	16.00-16.15
6	433	Deep Learning Implementation of Facemask and Physical Distancing Detection with Alarm Systems	16.15-16.30
7	430	Covid Symptom Severity Using Decision Tree	16.30-16.45
8	462	An Enhanced Cryptographic Algorithm in Securing Healthcare Medical Records	16.45-17.00
9	538	Detecting SQL Injection On Web Application Using Deep Learning Techniques: A Systematic Literature Review	17.00-17.15
10	554	Integration of FAHP and COPRAS Method for New Student Admission Decision Making	17.15-17.30

Room 4

Moderator **1** **Salamun Rohman Nudin**

2 **Ricky Eka Putra**

No	Paper ID	Paper Title	Time (GMT +7)
1	568	Non-Proliferative Diabetic Retinopathy Classification Based on Hard Exudates Using Combination of FRCNN, Morphology, and ANFIS	14.30-14.45
2	406	A New Adaptive Online Learning using Computational Intelligence	14.45-15.00
3	420	The design and implementation of web crawler distributed news domain detection system	15.00-15.15
4	427	High Availability in Software-Defined Networking using Cluster Controller: A Simulation Approach	15.15-15.30
	BREAK		14.45-15.15
5	435	Pneumonia and COVID-19 Detection using Convolutional Neural Networks	16.00-16.15
6	354	What's in a Caption?: Leveraging Caption Pattern for Predicting the Popularity of Social Media Posts	16.15-16.30
7	372	Fractional Gradient Descent Optimizer for Linear Classifier Support Vector Machine	16.30-16.45
8	411	The Identification of the Apples (Malus Sylvestris) Skin Wax Coating Using the Edge Detection Method	16.45-17.00
9	453	Key Rate Enhancement by Using the Interval Approach in Symmetric Key Extraction Mechanism	17.00-17.15
10	484	EnORS: An Enhanced Object Relationship Schema	17.15-17.30
11	450	Development of Mapping Area Software for Dismissal people affected by Covid 19	17.3--17.45

Room 5

Moderator **1** **Reza Rahmadian**

2 **Rifqi Firmansyah**

No	Paper ID	Paper Title	Time (GMT +7)
1	298	Validation of Voice Recognition in Various Google Voice Languages using Voice Recognition Module V3 Based on Microcontroller	14.30-14.45
2	322	Texture Analysis of Knee Osteoarthritis Using Contrast Limited Adaptive Histogram Based Gray Level Co-occurrent Matrix	14.45-15.00
3	334	Design of Model Predictive Control for Stability of Two Stage Inverted Pendulum	15.00-15.15
4	358	Hydrothermal Growth Temperature Dependence of Nanostructured Nickel Oxide Transparency	15.15-15.30
	BREAK		14.45-15.15
5	359	Designing Automatic Dispensers for the Blind People based on Arduino Mega using DS18B20 Temperature Sensor	16.00-16.15
6	365	Effects of Precursor Concentration on the Transparency of Hydrothermally Grown Zinc Oxide	16.15-16.30
7	525	A Dual UPQC to Mitigate Sag/Swell, Interruption, and Harmonics on Three Phase Low Voltage Distribution System	16.30-16.45
8	370	Design and Implementation of IoT System for Aeroponic Chamber Temperature Monitoring	16.45-17.00
9	397	Autonomous Robotics in Agriculture: A Review	17.00-17.15
10	401	Design of Fire Detection Equipment Due to the Arc-Fault Series on Low Voltage Networks Based on Internet of Things (IoT)	17.15-17.30

Room 6

Moderator **1** **Arif Widodo**

2 **Unit Three K**

No	Paper ID	Paper Title	Time (GMT +7)
1	466	A Hybrid Classification Based on Machine Learning Classifiers to Predict Smart Indonesia Program	14.30-14.45
2	272	Optimization of Water Level Control Systems Using ANFIS and Fuzzy-PID Model	14.45-15.00
3	384	[Design And Development Of Student Absention Application Prototype Using Android-Based Flutter: A Case Study In Electro Engineering Department Of Mataram University	15.00-15.15
4	480	SIMULATION AND PERFORMANCE EVALUATION OF FIBER OPTIC SENSOR FOR DETECTION OF SALINITY IN PRAWN POND APPLICATION	15.15-15.30
	BREAK		14.45-15.15
5	488	MICROCONTROLLER AND WIRELESS COMMUNICATION BASED SMART LABORATORY BOX SYSTEM IMPLEMENTATION	16.00-16.15
6	491	Management of Empty Parking Spot Based On Computer Vision	16.15-16.30
7	369	Performance Evaluation of ESP8266 for Wireless Nurse Call System	16.30-16.45
8	374	A current mode ACG base on Sub-threshold MOS Translinear Principle	16.45-17.00
9	424	Combination of Fuzzy C-Means and Simple Additive Weighting Using Partition Coefficient Index	17.00-17.15
10	485	A Neuro-Fuzzy Approach for Cacao Bean Grading Classification Process	17.15-17.30

Room 7

Moderator **1** **Mahendra Widyartono**

2 **Widi Aribowo**

No	Paper ID	Paper Title	Time (GMT +7)
1	269	Tuning of Power System Stabilizer Using Cascade Forward Backpropagation	14.30-14.45
2	293	SETTING COORDINATION RELAY PROTECTION ON MULTYLOOP MODEL DISTRIBUTION ELECTRICAL POWER SYSTEM SISTEM USING FIREFLY ALGORITHM	14.45-15.00
3	300	HYBRID MODEL FOR THE NEXT HOURLY ELECTRICITY LOAD DEMAND FORECASTING BASED ON CLUSTERING AND WEATHER DATA	15.00-15.15
4	402	Partial Shading Effect on I-V Characteristic and Maximum Power of a Photovoltaic Array	15.15-15.30
	BREAK		14.45-15.15
5	428	Effect of Combination Fractional Slot Number and Slotting Tecnique on the Cogging Torque in Permanent Magnet Machines	16.00-16.15
6	267	absent	16.15-16.30
7	361	Research on the Influencing Factors of Industrial Designers' Potential Traits on Career Planning	16.30-16.45
8	442	DESIGN OF AERIAL ROBOT AS TEACHING MEDIA WITH EDUCATIONAL ROBOTIC BASED LEARNING SYSTEM	16.45-17.00
9	454	The Roles of Information Technology Knowledge and Online Learning in Learning Environment Changes at Vocational Education System	17.00-17.15
10			17.15-17.30

Room 8

Moderator **1** **Eppy Yundra**

2 **Nurhayati**

No	Paper ID	Paper Title	Time (GMT +7)
1	280	Motion Sensing for Wireless Body Area Networks Based on Android Using Wi-Fi Direct Transmission	14.30-14.45
2	316	Impact of Nonlinear Distortion with the Rapp Model on the GFDM System	14.45-15.00
3	319	The New Intelligent Wireless Sensor Network using Artificial Intelligence for Building Fire Disasters	15.00-15.15
4	327	A Vivaldi Antenna Palm Tree Class with Koch Square Fractal Slot Edge for Near-Field Microwave Biomedical Imaging Applications	15.15-15.30
	BREAK		14.45-15.15
5	336	Decision Support System Cattle Weight Prediction using Artificial Selected Weighting Method	16.00-16.15
6	349	Design of X-Band Microstrip Antenna for Circularly Polarized Synthetic Aperture Radar (CP-SAR) System	16.15-16.30
7	371	Design of Horizontal Polarization Microstrip Patch Antenna with Bandwidth Enhancement at C-band Frequency	16.30-16.45
8	376	Comparison Study of Hilbert Sierpinski and Koch Fractal on Coplanar Vivaldi Antenna for L and S band application	16.45-17.00
9	410	Design of a Microstrip Line Quad-band Bandpass Filter based on Fibonacci geometric sequence	17.00-17.15
10	461	Potentials of metasurface technology on antennas and propagation	17.15-17.30

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Hybrid Model For The Next Hourly Electricity Load Demand Forecasting Based on Clustering and Weather Data

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***Abstract*— This research presents about short term load demand customer- prediction model for the supply system based on clustering used to secure the electricity load an industrial customer. The customer-based load hybrid using Part Swarm Optimization Backpropagation prediction method is built on forecasting generation capacity and demands in the next 1 hours ahead. To sustain the forecast model results, the daily clustering and weather forecasts supplied by local authorities, are incorporated in our hybrid model. The model's simulation was tested by calculating the Mean Absolute Percent Error (MAPE) value 0.01% for the electricity load demand forecasted data business rate and 0.005% for the industry rates.**

Keywords—customer baseline load, industry, PSO, backpropagation, forecasting

I. INTRODUCTION

One of the most important and most important needs of the community is the use of electrical, economic resources needed in various life activities. Therefore, in the future electricity demand will increase along with an increase in population and technological developments, and the diversity of human activities. Due to an increase in the use of electricity, this problem is a major challenge for electricity companies in their efforts to provide electrical energy according to consumer demand with high reliability. Where in the supply of electrical energy one of the main things in increasing the reliability of the system is forecasting the burden of consumers who will be used every year. Where in this study the forecast hybrid modeling is used to predict electric loads in the supply of electricity so that it is more reliable and efficient. In previous study work which presents about a variety of simple mathematical method for demand forecasting based on clustering and weather data. As the authors [1-6] have presented optimization of energy management using a mathematic model, based on topology. The authors of [7] have explained about modified using particle swarm optimization. And the authors [8 - 9] have presented an energy consumption prediction based on eco routing, eco-driving, and deep learning data intelligence model.

To get the resulting optimization multi-objective for distributed have been proposed in [10]. The authors of [11-12] have presented general memory using particle swarm optimization. The authors of [13] have presented about consumption energy with a global-based neural network method. Demand prediction and prediction of the energy consumption of residential have been proposed in [14-16]. However, all of the aforementioned only demand forecasting and energy consumption using the mathematic method. The rest of this article is organized as follows. Section 2, we explain about research hybrid method Particle Swarm Optimization Backpropagation Neural Network. Section 3 explains and discusses the results method load demand prediction based on clustering and error forecasting. Section 4 summarizes the concludes.

II. RESEARCH METHOD

The research is the improvement of electricity load demand prediction based on clustering and weather data result using particle swarm optimization method combined with backpropagation neural network methods. The simulation of the PSO-BPNN model can be programmed in one hourly ahead.

A. Particle Swarm Optimization (PSO)

Particle Swarm Optimization (PSO) is a global optimization simulation mathematic model that has gained prominence in unsupervised and complex multidimensional problems. PSO was a basic model of the optimization of various continuous nonlinear mathematic functions and simple mathematical operators. In this modeling. The value variable in particles has fitness values that are evaluated by fitness functions. The value velocity is dynamically adjusted at each step according to the experience as given by Eq. (1) and value particle position as given by Eq. (2).

$$V_{i,\tau+1} = w.V_{i,\tau} + R_1.C_1\left(P_i - X_{i,\tau}\right) + R_2.C_2\left(P_g - X_{i,\tau}\right) \quad (1)$$

$$X_{i,\tau+1} = .X_{i,\tau} + X_{i,\tau+1} \quad (2)$$

Where i is the i_{th} value particle e; $X_{i,t}$ is the position of particle i in iteration t; $V_{i,t}$ is the value velocity of particle i in iteration t; P_i is the best previous position of particle i so far (pbest) and P_g is the best previous position among all

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the particles (gbest). w is inertial weight and its function is to balance global and local exploitations of the swarm.

B. *Back-propagation Neural Network (BPNN model)*

The BPNN hybrid model consists of pattern recognition. Given the train set:

$$D = \{(x_1.t_1),\}(x_2.t_2),.....(x_n.t_n) \quad (3)$$

X_i denotes the i_{th} input vector and the$_n$ denotes the corresponding output one.

The backpropagation method is and the best-supervised learning simulation model for testing and training multilayer, the net inputs and outputs are given by:

$$y_k = f(y\_net_k) = \frac{1}{1+e^{-\delta\_net_k}} \quad (4)$$

where the *net* is the input signal from the external sources to node j in the input layer.

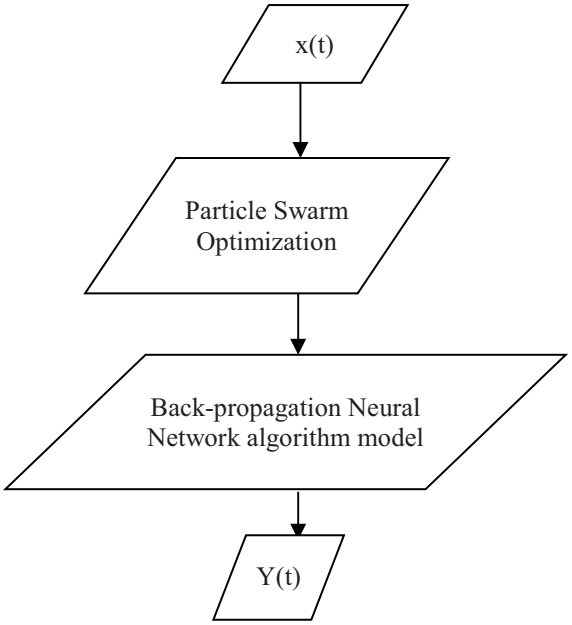

Figure 1. Flowchart hybrid model used Particle Swarm Optimization Back Propagation Neural Network Model

III. Result and Discussion

This proposed research discusses the good result of the PSO-BPNN hybrid simulation model. The proposed study for the simulation model in the study is used to predict the electricity demand forecasting values, predict based on clustering and weather data. Research composition for parameter momentum is $mc_1 = 0.59$, $mc_2 = 0.68$, $mc_3 = 0.79$ and $mc_4 = 0.89$. The proposed Particle Swarm Optimization Back-propagation Neural Network simulation method has to predict electricity demand values for 1 hour ahead by taking into account the predicted data based on clustering and weather data. The procedures simulation are described in Fig. 1 which explain the electricity load demand prediction process using simulation PSO-BPNN hybrid modeling

In figure 2 explained about the electricity load demand the prediction model based on clustering and weather data using the PSO-BPNN simulation model

A. *Proposed PSO-BPNN modeling and Validation*

In the simulation, a hybrid model is used to predict the electricity load demand forecasting procedure. Particularly, the researcher tested our simulation hybrid model using the previously described databases with business and industry for clustering data, temperature, humidity, and wind speed for weather data.

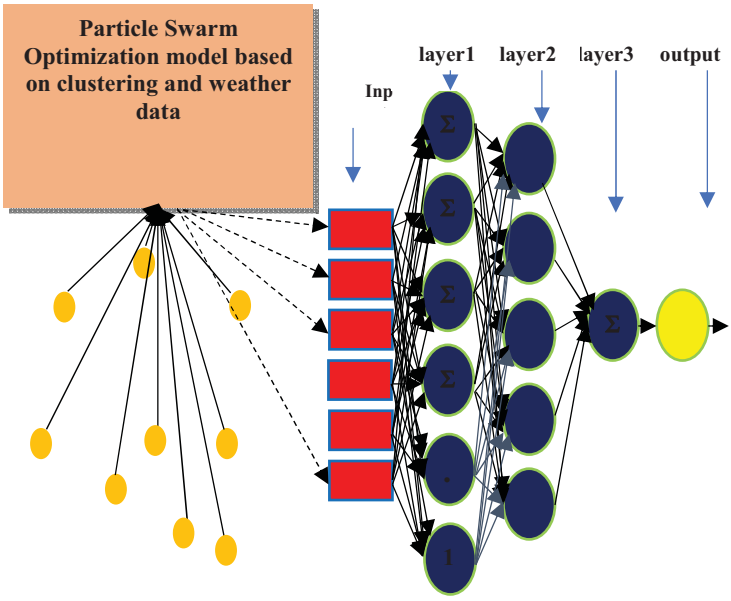

Figure 2. The proposed electricity load demand forecasting simulation hybrid model

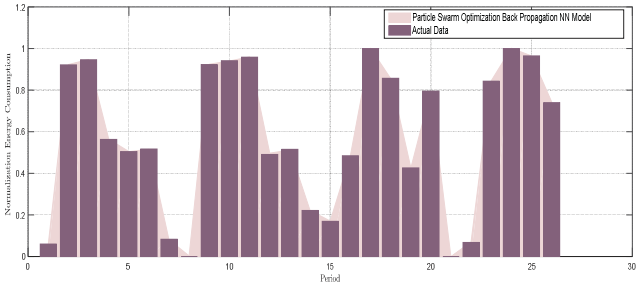

Figure 3. Electricity load energy consumption demand Normalization with Particle Swarm Optimization Back-propagation Neural Network simulation model vs actual data using clustering business rates

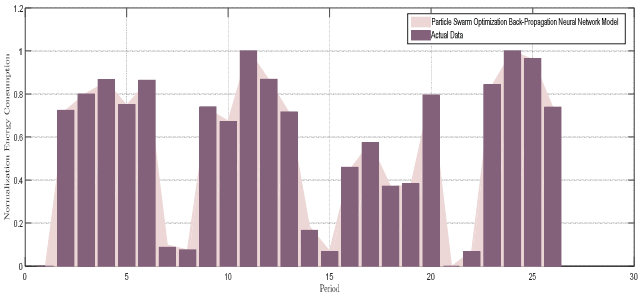

Figure 4. Electricity load energy consumption demand Normalization with Particle Swarm Optimization Back-propagation Neural Network simulation hybrid model vs actual data using clustering industry rates

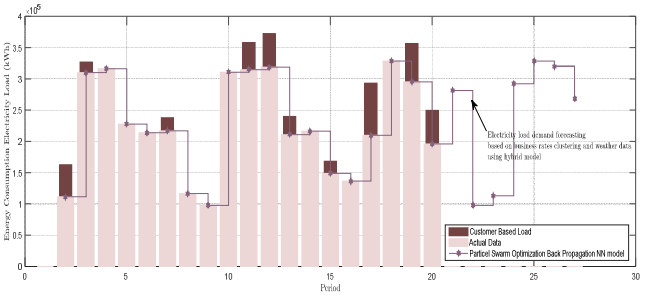

Figure 5. Electricity load energy consumption demand Forecasting with Particle Swarm Optimization Back-propagation Neural Network simulation hybrid model vs actual data using clustering business rates

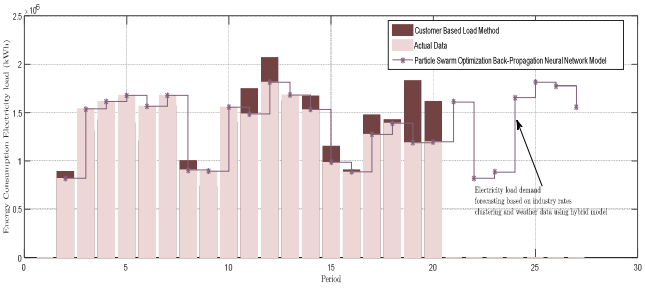

Figure 6. Electricity load energy consumption demand Forecasting with Particle Swarm Optimization Back-propagation Neural Network simulation hybrid model vs actual data using clustering industry rates

Figure 3 illustrates the simulation model result predicts electricity load demand normalization with particle swarm optimization back propagation neural network hybrid model is better than and closer to actual data in business rates clustering. In figure 4. Shows indicative results from the performance of the electricity load demand of the hybrid model particle swarm optimization backpropagation neural

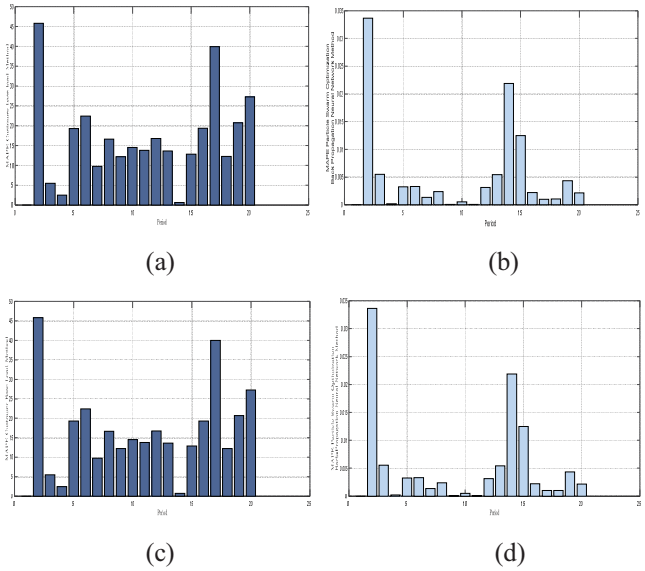

Figure 7. (a) MAPE Customer baseload method for business rate clustering (b) MAPE hybrid particle swarm optimization backpropagation neural network method for business rate clustering (c) MAPE Customer baseload method for industry rate clustering (b) MAPE hybrid particle swarm optimization backpropagation neural network method for industry rate

network for industry rates clustering. Figure 5. Depicts calculation the result of predict warm optimization back propagation neural network model versus the actual and customer baseload model for one week ahead for business clustering, and the figure 6. illustrates the comparison of electricity load demand forecasting based on industry clustering with simulation hybrid model Particle Swarm Optimization BPNN method, actual data, and Customer Base Load method.

Figure 7. illustrates the MAPE coefficients and the prediction performance using Customer Base Load, and hybrid particle swarm optimization backpropagation neural network method model for industry and business rates.

IV. Conclusions

In the study, a novel methodology PSO-BPNN based simulation model combination of Particle Swarm Optimization model, Back-Propagation NN model was developed to predict the electricity load demand based on clustering and weather data. The following conclusions can be drawn from this study:

- The new simulation model proposed in this research is a hybrid PSO modeling and a BPANN model. The simulation hybrid method is employed to electricity load demand prediction data for the predicted period based on clustering and weather data. It clearly shows that the electricity load demand prediction using a different particle swarm optimization back propagation neural network simulation hybrid method based on clustering and weather data giving a better result output, which means the electricity load demand prediction largely depends on value variable clustering and weather data, where the weather data consist of electricity load demand, wind speed, humidity, and temperatures. And the clustering data variables consist of business data and industry data

- The novelty of this paper is to predict electricity load demand on a business and industry clustering. With the presents MAPE is 0.01%, for the business rate and 0.005% for industry rate clustering.

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