NATIONAL ENGINEERING COLLEGE

(AN AUTONOMOUS INSTITUTION)

K.R.NAGAR,KOVILPATTI-628503.

EEE NEWSLETTER

JANUARY 2020

Volume 7 Issue 4

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CONTENTS

STAFF ACTIVITIES

STAFF ACTIVITIES

COURSE ATTENDED

S.No.	Name of the Staff	Events/Guest Lecture	Topic/Event	Date	College/ Industry
1.	Ms.G.Shunmugalakshmi, AP/EEE & Mr.K.Kumar, AP/EEE	AICTE Margdarshan Scheme	Advanced tools and techniques for research in engineering problems (ATTRE-2019)	18th – 23rd Nov 2019	National Institute of Technology, Trichy
2.	Ms.N.Avudaiammal, AP/EEE	PALS Reach		27th – 29th 2019	Indian Institute of Technology, Chennai
3.	Dr.M.P.E.Rajamani, AP(SG)/EEE & Mr.S.Sankara Kumar, AP(SG)/EEE	AICTE Training and Learning Academy	Power Electronic Converter and Controllers for EV and Smart Grid	18th – 22nd December 2019	Indian Institute of Information Technology, Design and Manufacturing, Chennai
4.	Ms.B. Shanmuga Nithya, AP/EEE	Faculty Development Programme	Entrepreneurship	2nd – 14th December 2019	National Engineering College
5.	Dr.R.Muniraj, AP(SG)/EEE	Industry Know How		26th – 31st December 2019	Vasantha Advanced Systems, Coimbatore

EXPERT LECTURE

- ✓ ***Dr. M. Willjuice Iruthayarajan***, Professor and Head/EEE has delivered the expert lecture in a Two day Workshop on 'Digital Image Processing using MATLAB', organized by Research advisory committee, ST. Mary's College, Tuticorin on September 18, 2019
- ✓ ***Dr. L. Kalaivani***, Prof./EEE has delivered the expert lecture in a Two day Workshop on 'Digital Image Processing using MATLAB', organized by Research advisory committee**,** ST. Mary's College, Tuticorin on September 19, 2019.

INDUSTRY - INSTITUTION INTERACTION

MEMORANDUM OF UNDERSTANDING

Signed a Memorandum of Understanding (MoU) with M/S Enthu Technologies Solutions India Pvt Ltd, Coimbatore for 3 years periods.

BENEFITS OF MoU:

- UG and PG Students, who are interested in the field of IoT, Electronics and PCB, will be selected by interview, for the Internship programme every year.
- These selected students will be deputed to Enthu Technologies during summer vacation for two weeks.
- Students will be allotted Internal Guide(s) to monitor the progress of the projects.
- Faculty members of the EEE Dept. will be deputed to Enthu Technologies every year for knowledge updation during summer vacation for a maximum period of two weeks.

STAFF PUBLICATIONS

PUBLICATIONS – INTERNATIONAL JOURNAL
SCI – WITH IMPACT FACTOR

- ✓ ***G.Kannayeram, N.B.Prakash, R.Muniraj,*** N.B.Rajesh, "Optimal Tuning of UPFC Damping Controller in Solar Penetrated Power System using DBCSO Technique", ***SYLWAN Journal***, Vol. 163(11), pp. 40-51, 2019. ***Impact Factor: 0.691***
- ✓ ***G.Kannayeram, NB.Prakash, R.Muniraj,*** B.Sundar**,** "Optimal blending of polymeric materials for power transmission cable insulation using Chaotic PSO and Genetic Algorithm – A case study", ***SYLWAN Journal***, Vol. 163(11), pp.52-63, 2019. ***Impact Factor: 0.691.***
- ✓ L.Raguraman, ***M.Ravindran,*** "MFLRS-RDF technique for optimal sizing and performance analysis of HRES", ***International Journal of Numerical Modeling***, (2019) https://doi.org/10.1002/jnm.2675, ***Impact factor: 0.795.***
- ✓ ***Vigneshwaran, B., Willjuice Iruthayarajan, M. & Maheswari, R.V.,*** "Partial discharge pattern analysis using multi-class support vector machine to estimate cavity size and position in solid insulation", ***Soft Computing***, (2019). https://doi.org/10.1007/s00500-019-04570-7, ***Impact factor: 2.784.***

- ✓ ***Rajamani.M.P.E, Willjuice Iruthayarajan.M, Sankara Kumar.S***, "Design of NSGA Based Controller for Non-Inverting Buck-Boost Converter", ***SYLWAN Journal,*** Vol. 163(12), pp. 409-432, 2019. ***Impact Factor: 0.691***
- ✓ ***Rajamani.M.P.E, Willjuice Iruthayarajan.M, Sankara Kumar.S***, "Design of NSGA Based Controller for Boost Converter", ***SYLWAN Journal,*** Vol. 163(12), pp. 386-408, 2019. ***Impact Factor: 0.691***
- ✓ ***K Karthik Kumar,*** *A.S Kamaraja,* ***Dr S Senthil Kumar,*** *P. Nirmal kumar, O.R Saiayyappa*, "Stability Analysis of Solar Assisted DC-DC Y-Source Boosting Topology using State Space Model***", SYLWAN Journal***, Vol. 163(12), pp. 550-568, 2019. ***Impact Factor: 0.691***

SCOPUS INDEXED JOURNAL

- ✓ S. Uma Devi, ***S. Senthil Kumar***, "Examining the Properties of Neem Oil, Sunflower Oil and Mahua oil with Antioxidants and Nano Powders for Power Transformer", ***American Journal of Electrical and Computer Engineering***, Vol. 3, No.1, pp. 20-29, 2019.
- ✓ ***S. Senthil Kumar,*** A. Arul Marcel Moshi, S.R. Sundara Bharathi, ***K. Karthik Kumar***, "Optimization of various Natural Ester oils Impregnated Nomex Paper Performance in power transformer applications under different ageing conditions", ***International Journal of Recent Technology and Engineering***, Vol. 8, No. 3, pp. 6245 - 6251, 2019
- ✓ **Kannayeram G**, Megala V, **Prakash N.B, Muniraj R**, Sundar B, "Assessment of NR/EPDM blend ratio using graphical method", ***International Journal of Innovative Technology and Exploring Engineering,*** Vol. 8 Issue 12, October 2019.
- ✓ **Kannayeram G, Prakash N.B, Muniraj R, Sivakumar T**, "Optimal Tuning Of UPFC Damping Controller Using Single and Multi-Objective Evolutionary Algorithms**",** ***International Journal of Scientific & Technology Research*****.** Vol. 8, Issue 10, October 2019.
- ✓ G R Hemalakshmi, D Santhi, ***N B Prakash***, "The Role of Optic Disc, Retinal Blood Vessels and Exudates in Detection of Diabetic Retinopathy: A Literature Review", ***Journal of Clinical and Diagnostic Research***, Vol-13, (3), pp. 1-4, 2019.
- ✓ S.Joseph Francis, S.Karthikeyan, S.Balasundaram, ***L.Kalaivani, M.Gengaraj***, "Optimal Generation of Output Torque for Industrial Motors using Variable Frequency Drive and Gearbox Drive", ***International Journal of Recent Technology and Engineering (IJRTE)***, Vol. 8 Issue. 4, November 2019, pp. 12147-12153.
- ✓ K. Chermajeya, P.Eswari Prabha, V.Iswarya, ***B.Vigneshwaran, Dr.M.Willjuice Iruthayarajan***, "Influence of Electric field distribution on 33kV Non-Ceramic Insulator with different shed configurations using 3D Finite Element Method", ***International Journal of Recent Technology and Engineering (IJRTE***), Vol. 8 Issue. 4, November 2019, pp. 11404-11409.
- ✓ S.Madhupriya, ***R.V.Maheswari, B. Vigneshwaran, "***Measurement and Denoising of Partial Discharge Signal in High Voltage Cables using Wavelet transform**",**

International Journal of Engineering and Advanced Technology (IJEAT), Vol. 9, Iss. 2, December, 2019.

- ✓ R.Nikkitha, ***L.Kalaivani, "***Influence of Arc Flash Performance and ESDD Measurement of Bushings Tainted by Nitrates", International Journal of Engineering and Advanced Technology (IJEAT), Vol. 9, Iss. 2, December, 2019

R & D ACTIVITIES

- ✓ Anna University, Chennai has approved ***Dr. G.Kannayeram, AP(SG)/EEE*** as ***supervisor*** for Research under the faculty of Electrical and Engineering. His areas of specialization are Power Systems, High Voltage Engineering, FACTS Controller and Smart Grid.
- ✓ Anna University, Chennai has approved ***Dr. R.Muniraj, AP(SG)/EEE*** as ***supervisor*** for Research under the faculty of Electrical and Engineering. His areas of specialization are Control Systems, Intelligent Control algorithms and Internet of Things.
- ✓ **Dr.B.Vigneshwaran, AP(SG)/EEE** was completed his **Doctorate in "*Measurement and Recognition of Single and Multiple Partial Discharge pattern using Artifical Intelligence Techniques*",** on 30.12.2019 under the supervision of **Dr.M.Willjuice Iruthayarajan, Professor and Head/EEE.**

ONLINE CERTIFICATION

NPTEL ONLINE COURSE

- ✓ ***Dr.R.Muniraj, AP(SG)/EEE*** completed the NPTEL online course titled, "Advanced Linear continuous control system MATLAB" with Elite.
- ✓ ***Mr.S.Sankarakumar, AP(SG)/EEE*** completed the NPTEL online course titled, "Power Electronics" with Elite + Topper.
- ✓ ***Mr.P.Samuel Pakianathan, AP/EEE*** completed the NPTEL online course titled, "Basic Electric Circuits" with Elite.
- ✓ ***Ms.G.Shunmugalakshmi, AP/EEE*** completed the NPTEL online courses titled, "Electrical Machines I" and "Computational Electromagnetics" with Elite.
- ✓ ***Mr.M.Sivapalanirajan, AP/EEE*** completed the NPTEL online course titled, "Fundamentals of Electronics Device Fabrication" with Elite.
- ✓ ***Mr. K.Karthick Kumar, AP/EEE*** completed the NPTEL online course titled, "Body Language: Key to Professional Success" with Elite.
- ✓ ***Mr.P.Nirmal Kumar, AP/EEE, Ms.S.Sheebanancythangam, AP/EEE, Ms.M.Madhuri Chithra, AP/EEE, Ms.B.Shanmuga Nithya, AP/EEE,*** completed the NPTEL online course titled, "Introduction to Research" with Elite.

COURSERA

- ✓ ***Dr.M.Willjuice Iruthayarajn, Professor and Head/EEE,*** completed the Coursera online course titled, "Using Python to Access Web Data, Programming for Everybody (Getting Started with Python) and Python Data Structures".
- ✓ ***Mr.P.Nirmal Kumar, AP/EEE and Mr.K.Karthik Kumar, AP/EEE*** completed the Coursera online course titled, "Introduction to Power Electronics".
- ✓ ***Mr.M.Gengaraj, AP/EEE and Mr.B.Vigneshwaran, AP(SG)/EEE*** completed the Coursera online course titled, "Programming for Everybody using Python".

UDEMY

- ✓ ***Dr.M. Willjuice Iruthayarajan, Professor and Head/EEE,*** completed the Udemy online course titled "PLC programming from scratch (PLC I)" during October 2019.
- ✓ ***Mr.K.Karthik Kumar, AP/EEE*** completed the Udemy online course titled, "8051 Microcontroller, Build Your own Computer with Raspberry PIS Online, Engineering Simulation with Simscale: Dronne Aerodynamics, Introduction to FPGA's and Prototyping with the Elbert, Basics of Electric Circuits, Start Kali Linux, Ethical Hacking and Penetration Testing".

MATLAB ONLINE COURSE

- ✓ ***Mr. P.Nirmal Kumar, AP/EEE and Mr.K.Kumar, AP/EEE*** completed the MATLAB online course titled, "MATLAB ONRAMP".
- ✓ ***Mr.M.Gengaraj, AP/EEE and Mr.B.Vigneshwaran, AP(SG)/EEE*** completed the MATLAB online course titled, "Deep Learning ONRAMP".
- ✓ ***Mr.B.Vigneshwaran, AP(SG)/EEE*** completed the MATLAB online course titled, "Deep Learning using MATLAB".

TECHNICAL ARTICLE – EXPERT MEMBER

Signalling Design and Verification Automation to meet the demand of SPEED, SAFE and SAVING to Indian Railways' future Interlocking Designs

Author: SHANTHI BEESHAHAMED.R
Managing Director – Sensedge
Transportation Systems and Solutions Private Limited

Advances in Embedded system technology in recent years, have brought more dependence on automating train control systems. Among all systems Electronic interlocking system forms a vital part of Indian railway signaling system, because it ensures safe movement of trains by controlling movable track elements like switches and for another by controlling signals. Indian Railway places orders for approximately 200 to 250 stations in a year to limited vendors approved by Research Development standardization Organisation (RDSO). Apart from new Electronic Interlocking systems around 100 stations in a year goes for modifications to provide additional tracks, modifications in yards, flexibility, enhance the availability, Safety and new regulations from railway agencies.

The engineering design of interlocking systems poses challenges to both Indian railway engineers who approve the interlocking design and own sup the safety of the design as well as for the OEMs who deliver the design. Challenges arise from the cumbersome, labour intensive, conservative, ambiguous and fail safe nature of the interlocking engineering design processes.

While great efforts have been reported to improve electronic hardware safety, there have been fewer systematic approaches to evaluate software safety, especially forth vital software designed for signaling systems. This is critical in Indian railways signaling design particularly on Electronic Interlocking systems. There are total of 17 zones which are further sub-divided into 73 divisions and an aggregate of 8200 stations operating across the country.Each zone in the Indian Railway has its own interlocking design standards and manner to achieve interlocking in a secure way.

- ✓ Multiple trains share the same track,
- ✓ Trains cannot move easily across track obstacles and
- ✓ Rail's low rolling resistance cause strains to have such along braking distance, that on-sight driving is nearly impossible without collisions is achieved by these Alienable Automated design tools.

This world class Automated tools for Railway Signaling design chain decreases development time, increases data reliability and make application more flexible, while ensuring(fail-) safe Interlocking system. Few of the Automation tools which are effectively used for various OEMs systems are;

- ✓ Interlocking /Application Logic Generator.
- ✓ Interface Circuit /Book wiring Generation.
- ✓ I/O Simulator
- ✓ Simulators for Automated Testing
- ✓ Cross Table Validation Simulation Tool.
- ✓ Communication Protocol for various OEMs
- ✓ Remote Monitoring and Diagnostic Port Protocol

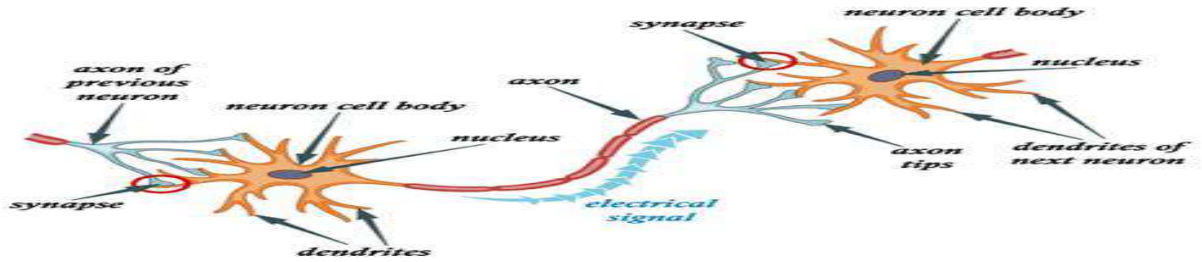
For more information visit us at - www.sensedgetss.com

TECHNICAL ARTICLE – STAFF MEMBERS

ARTIFICIAL NEURAL NETWORK

Ms.M.Madhuri chithra
Assistant Professor
Department of Electrical and Electronics Engineering

Artificial Neural Network (ANN) uses the processing of the brain as a basis to develop algorithms that can be used to model complex patterns and prediction problems. In our brain, there are billions of cells called neurons, which processes information in the form of electric signals. External information/stimuli is received by the dendrites of the neuron, processed in the neuron cell body, converted to an output and passed through the Axon to the next neuron. The next neuron can choose to either accept it or reject it depending on the strength of the signal.



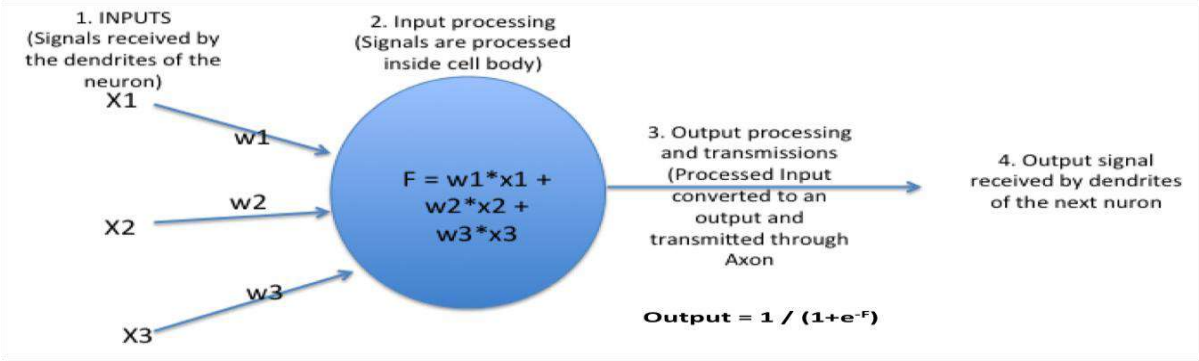
Step 1: External signal received by dendrites

Step 2: External signal processed in the neuron cell body

Step 3: Processed signal converted to an output signal and transmitted through the Axon

Step 4: Output signal received by the dendrites of the next neuron through the synapse

Now, let's try to understand how a ANN works:



Here, w1, w2, w3 gives the strength of the input signals as you can see from the above, an ANN is a very simplistic representation of a how a brain neuron works. The network architecture has an input layer, hidden layer (there can be more than 1) and the output layer. It is also called MLP (Multi Layer Perceptron) because of the multiple layers. The hidden layer can be seen as a "distillation layer" that distills some of the important patterns from the inputs and passes it onto the next layer to see. It makes the network faster and efficient by identifying only the important information from the inputs leaving out the redundant. A good model with high accuracy gives predictions that are very close to the actual values. The error in prediction is the difference between column W and column X. The key to get a good model with accurate predictions is to find "optimal values of W weights" that minimizes the prediction error. This is achieved by "Back propagation algorithm" and this makes ANN a learning algorithm because by learning from the errors, the model is improved.

The most common method of optimization algorithm is called "gradient descent", where, iteratively different values of W are used and prediction errors assessed. So, to get the optimal W, the values of W are changed in small amounts and the impact on prediction errors assessed. Finally, those values of W are chosen as optimal, where with further changes in W, errors are not reducing further.

ANNs have the ability to learn and model non-linear and complex relationships, which is really important because in real-life, many of the relationships between inputs and outputs are non-linear as well as complex. ANNs can generalize after learning from the initial inputs and their relationships, it can infer unseen relationships on unseen data as well, thus making the model generalizes and predict on unseen data. Unlike many other prediction techniques, ANN does not impose any restrictions on the input variables (like how they should be distributed). Additionally, many studies have shown that ANNs can better model heteroskedasticity i.e. data with high volatility and non-constant variance, given its ability to learn hidden relationships in the data without imposing any fixed relationships in the data. This is something very useful in financial time series forecasting (e.g. stock prices) where data volatility is very high.

APPLICATIONS

ANNs, due to some of its wonderful properties have many applications:

Image Processing and Character recognition:

Given ANNs ability to take in a lot of inputs, process them to infer hidden as well as complex, non-linear relationships, ANNs are playing a big role in image and character recognition. Character recognition like handwriting has lot of applications in fraud detection (e.g. bank fraud) and even national security assessments. Image recognition is an ever-growing field with widespread applications from facial recognition in social media, cancer detention in medicine to satellite imagery processing for agricultural and defense usage. The research on ANN now has paved the way for deep neural networks that forms the basis of "deep learning" and which has now opened up all the exciting and transformational innovations in computer vision, speech recognition, natural language processing famous examples being self-driving cars.

Forecasting

Forecasting is required extensively in everyday business decisions (e.g. sales, financial allocation between products, capacity utilization), in economic and monetary policy, in finance and stock market. More often, forecasting problems are complex, for example, predicting stock prices is a complex problem with a lot of underlying factors (some known, some unseen). Traditional forecasting models throw up limitations in terms of taking into account these complex, non-linear relationships. ANNs, applied in the right way, can provide robust alternative, given its ability to model and extract unseen features and relationships. Also, unlike these traditional models, ANN doesn't impose any restriction on input and residual distributions.

More research is going on in the field, for example recent advances in the usage of LSTM and Recurrent Neural Networks for forecasting.ANNs are powerful models that have a wide range of applications. Above, I have listed a few prominent ones, but they have far-reaching applications across many different fields in medicine, security, banking/finance as well as government, agriculture and defense.

TECHNICAL ARTICLE – STUDENTS

DIGITAL TWIN

Ms. A. Meenakshi, Final year/EEE

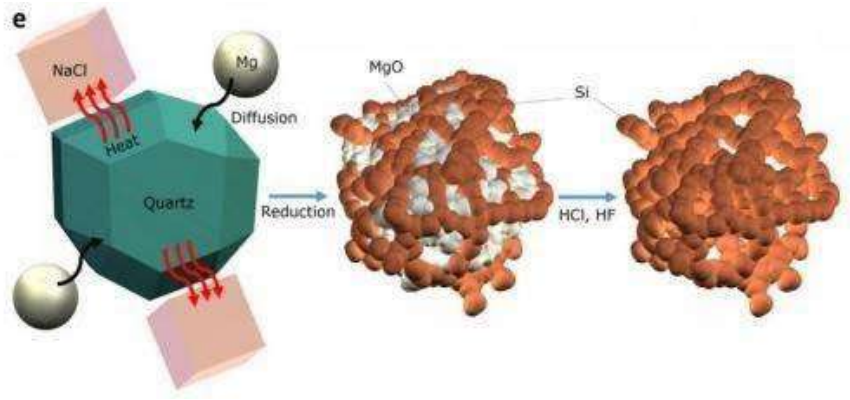
Digital twin is a digital or virtual copy of physical assets or products. The term digital twin was originally coined by Dr.Michael Grieves in 2002. It was first used by NASA for space exploration mission. It connects the real and virtual world by collecting real time data from the installed sensors. The data can be stored in the cloud either locally decentralized or centrally stored. The data is then evaluated and stimulated in virtual copy of the assets. After the information are received, the parameters are applied to real asset. It can be used in various industries like Automotive, Manufacturing, Healthcare, Construction, Utilities. It is the fourth industry revolution for the development of new products and process. Definitions of digital twin technology used in prior research emphasize two important characteristics. Firstly, each definition emphasizes the connection between the physical model and the corresponding virtual model or virtual counterpart. Secondly, this connection is established by generating real time data using sensors. The concept of the digital twin can be compared to other concepts such as cross-reality environments or co-spaces and mirror models, which aim to, by and large, synchronise part of the physical world (e.g., an object or place) with its cyber representation. Digital twins integrate internet of things, artificial intelligence, machine learning and software analytics with spatial network graphs[9] to create living digital simulation models that update and change as their physical counterparts change. The concept was divided into types . The types are the Digital Twin Prototype ("DTP"), the Digital Twin Instance ("DTI"), and the Digital Twin Aggregate ("DTA"). The DTP consists of the designs, analyses, and processes to realize a physical product. The DTP exists before there is a physical product. The DTI is the Digital Twin of each individual instance of the product once it is manufactured. The DTA is the aggregation of DTIs whose data and information can be used for interrogation about the physical product, prognostics, and learning. The specific information contained in the Digital Twins is driven by use cases. The Digital Twin is a logical construct, meaning that the actual data and information may be contained in other applications. A digital twin in the workplace is often considered part of Robotic Process Automation (RPA) and, per Industry-analyst firm Gartner, is part of the broader and emerging hyperautomation category.

SAND BATTERY

- ***Ms. M. Aruna and Ms. S.Mahalakshmi, Third EEE***

"This is the holy grail – a low cost, non-toxic, environmentally friendly way to produce high performance lithium ion battery anodes," said Zachary Favors, a graduate student working with Cengiz and MihriOzkan, both engineering professors at UC Riverside. The idea came to Favors six months ago. He was relaxing on the beach after surfing in San Clemente, Calif. when he picked up some sand, took a close look at it and saw it was made up primarily of quartz, or silicon dioxide.

His research is centered on building better lithium ion batteries, primarily for personal electronics and electric vehicles. He is focused on the anode, or negative side of the battery. Graphite is the current standard material for the anode, but as electronics have become more powerful graphite's ability to be improved has been virtually tapped out. Researchers are now focused on using silicon at the nanoscale, or billionths of a meter, level as a replacement for graphite. The problem with nanoscale silicon is that it degrades quickly and is hard to produce in large quantities.



This alternative type of lithium-ion battery uses silicon to achieve three times better performance than current graphite li-ion batteries. The battery is still lithium-ion like the one found in your smartphone, but it uses silicon instead of graphite in the anodes.

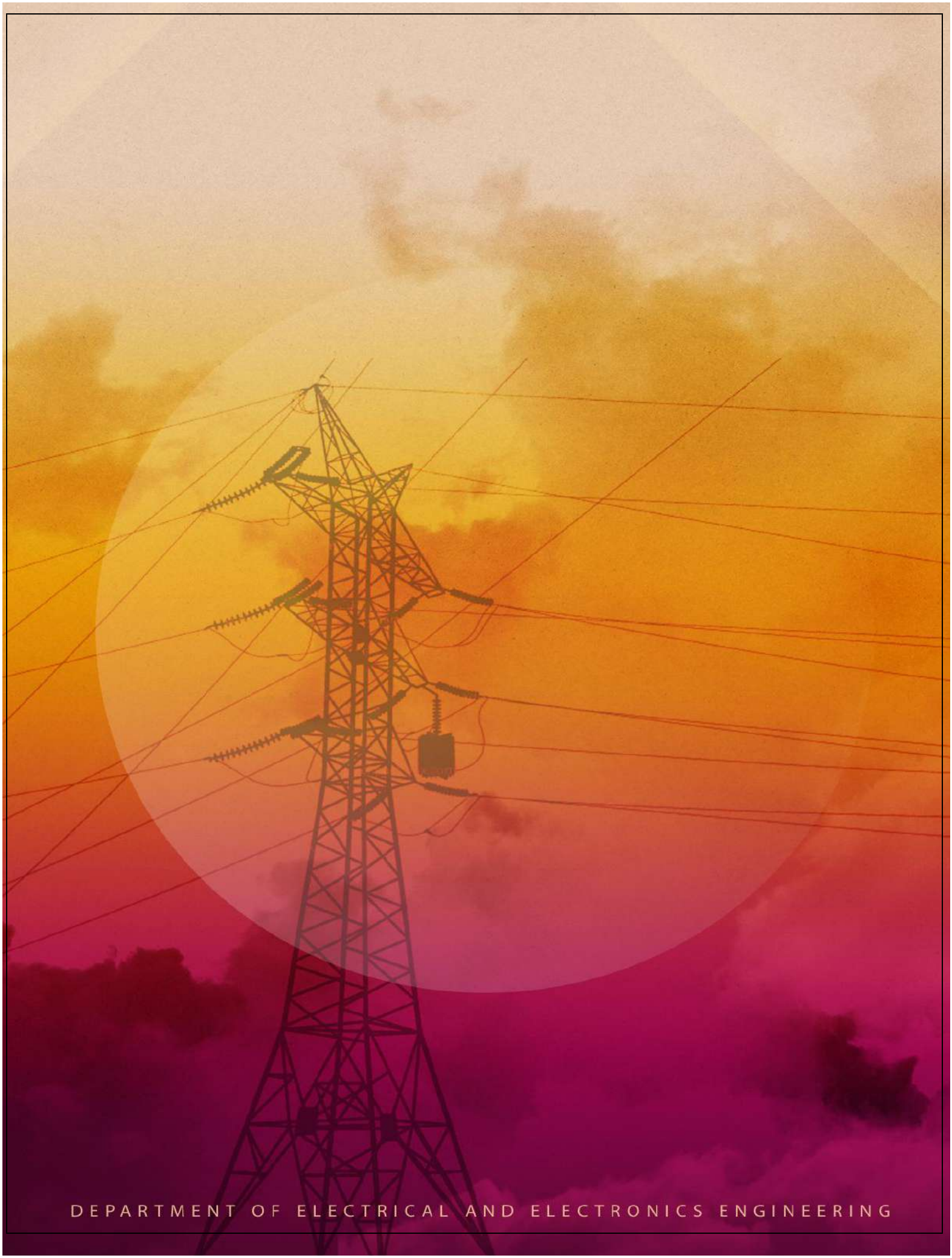
Scientists at the University of California Riverside have been focused on nano silicon for a while, but it's been degrading too quickly and is tough to produce in large quantities. By using sand it can be purified, powdered then ground with salt and magnesium before being heated to remove oxygen resulting in pure silicon. This is porous and three-dimensional which helps in performance and, potentially, the life-span of the batteries. We originally picked up on this research in 2014 and now it's coming to fruition.

Silanano is a battery tech startup that's bringing this technique to market and has seen big investment from companies like Daimler and BMW. The company say that its solution can be dropped into existing lithium-ion battery manufacturing, so it's set for scalable deployment,

promising 20 per cent battery performance boost now, or 40 per cent in the near future. The battery industry has been long on promises and short on delivery. At Sila, we're changing that, and delivering actual material that works in actual full cells that you can test in actual real-world conditions. Our silicon-dominant anode products drop into existing battery manufacturing processes, replace graphite entirely, and deliver significantly higher energy density at the cell-level with lower swelling.

Sila products drop into the existing commercial battery manufacturing process. This means that our battery manufacturing partners can produce higher performing cells in their existing factories on existing production equipment. This also means that automakers and consumer products companies can continue working with their existing battery suppliers while seamlessly incorporating Sila's materials technology into new products.

EDITORIAL BOARD


DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING