

The IECON 2022 Organizing Committee invites proposals for Tutorials to be held during the conference in Brussels, Belgium from 17 October till 20 October 2022.

The 17th October is reserved for the tutorial sessions.

Tutorials offer participants from different technical backgrounds the chance to explore innovative trends and learn new techniques from experts in the field. One or more of the following elements are strongly encouraged for the proposal: a) Industry-led or co-hosted lectures; b) Cross-disciplinary topics; c) Interactive and engaging approach.

Suitable tutorial topics range from emerging research areas to established techniques of practical and industrial relevance. Tutorials in all areas of Industrial Electronics disciplines are welcomed and IECON2022 is particularly interested in tutorial topics related to the conference themes.

IECON 2022 Tutorial Proposal Form

Title of the Proposal: Hands-on Deep Learning for Industrial Applications

- Presenter(s):

A/Prof Daswin De Silva

Affiliation: Centre for Data Analytics and Cognition, La Trobe University, Victoria, Australia

Address: La Trobe University, Victoria, Australia

TEL: +61 3 9479 6468

email: d.desilva@latrobe.edu.au

Mr Sachin Kahawala

Affiliation: Dependable Communication and Computation Systems, Department of Computer Science, Electrical and Space Engineering, Luleå University of Technology, Sweden

Address: Department of Computer Science, Electrical and Space Engineering, Luleå University of Technology, Sweden

TEL: +46 (0)920 491578

e-mail: sachin.kahawala@ltu.se

Mr Gihan Gamage

Affiliation: Centre for Data Analytics and Cognition, La Trobe University, Victoria, Australia

Address: La Trobe University, Victoria, Australia

email: g.gamage@latrobe.edu.au

- Brief description:

Deep learning is gradually becoming a mature artificial intelligence paradigm in both research and practice. Supported by a substantial evidence base, it demonstrates increasing potential for industrial electronics and industrial informatics applications in factory automation, energy, manufacturing, transport, communication and human interfaces. This workshop aims to develop essential knowledge of deep learning with hands-on exercises in Python, using Google Collaboratory and Jupyter Notebooks. The workshop will begin by exploring the structural elements of deep learning models, hyper-parameters, and comparison to standard machine learning algorithms, followed by the theory and application of deep neural networks (classification), convolutional neural networks (image processing), and recurrent neural networks (time-series prediction). Participants will conduct hands-on experiments of each technique using benchmark and real datasets, for training, testing and evaluation. Each technique will be demonstrated in the context of real-world projects in Industrial settings. The learning outcomes of this workshop are; the theoretical foundations of deep learning - when to use and in which settings, the design and development of deep learning models, rapid prototyping, evaluation and deployment using Python.

Requirements: Participants will access Google Collaboratory using a Gmail account. A laptop with an Internet browser and a stable Internet connection is mandatory.

- Duration: 1.5 hours

- Outline:

Topic	Content
Theoretical Foundations of Deep Learning	<ul style="list-style-type: none"> • Transition from AI to ML to DL • Basic structure of DL model • Deep Learning model architecture and hyper-parameters
Practical implementation of DNN	<ul style="list-style-type: none"> • Developing a DL model • Hands-on implementation using a benchmark dataset
Theoretical foundation of RNN and CNN	<ul style="list-style-type: none"> • Sequence modelling with RNN • Variants of RNN • Inspiration and intuition behind CNN • Components of CNN
Practical implementation of CNN and RNN	<ul style="list-style-type: none"> • Developing a CNN and RNN models • Hands-on implementation using a benchmark dataset and real-world case-study dataset
Questions and Discussion	<ul style="list-style-type: none"> • Demonstration of projects and scenarios.

- Motivation and Focus:

Deep learning has expanded into many practical application areas within the industrial electronics and industrial informatics domains, specifically in energy systems, factory automation, manufacturing, transport, communication and human interfaces. Conference attendees, academic, professional and industry practitioners will benefit from the theoretical and hands-on practical focus of this tutorial where we look at industrial problems and how they can be addressed using deep learning algorithms, models and pipelines.

-Brief CV:



Daswin de Silva is Associate Professor and Deputy Director of the Research Centre for Data Analytics and Cognition (CDAC) at La Trobe University, Australia. Daswin's research interests include deep learning, autonomous learning, active perception, information fusion, cognitive computing, neuromorphic computing, AI ethics, natural language processing, deep emotions, psycholinguistics, and intelligent cloud platforms. He has applied AI and automation in practical industrial settings of smart cities, energy and transport. He is an Associate Editor of the IEEE Transactions of Industrial Informatics and the IEEE Open Journal of the Industrial Electronics Society. He is the Secretary of the IEEE IES Technical Committee on Technology Ethics and Society and Chair of the IEEE IES Sub-Committee on Big Data and Machine Learning. He is an award-winning lecturer in Artificial Intelligence, Data Analytics and Automation, with significant contributions to curriculum development, pedagogical innovations and industry engagement at La Trobe. He currently supervises eight doctoral candidates working on theoretical, applied and industry focused challenges of AI and automation.



Sachin Kahawala is an AI Scientist at Lulea University Technology, working on energy efficient machine learning algorithms for practical, real-world problems and learning domains. Sachin is actively involved in building "AI in the chip", working on Intel's Loihi chip for AI models based on neuromorphic computing to solve real-world industrial AI problems.



Gihan Gamage is an AI Scientist in the Research Centre for Data Analytics and Cognition (CDAC) at La Trobe University, Australia. He leads the human centric AI development, sentiment and emotions analysis with applications in smart cities, digital health and social media. Besides academic pursuits, as part of CDAC strategic initiatives, Gihan is actively involved in industry engagement, solving real-world AI problems and working with both analytics technology providers and consultants.