



## **Proposal for ISIE 2021 Tutorial**

### **Title of Tutorial:**

**Hands-on Deep Learning Workshop for Industrial Applications**

### **Contact Information of Speakers:**

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### **Background of Speakers:**

Daswin De Silva

- Artificial Intelligence
- Automation
- Deep Learning

Rashmika Nawaratne

- Artificial Intelligence
- Cognitive Computing
- Deep Learning

Achini Adikari

- Artificial Intelligence
- Analytics
- Deep Learning

### **Brief description of the tutorial (500 words max):**

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.

### **Biography:**

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.

Rashmika Nawaratne and Achini Adikari are Technical Leads in the same Research Centre (CDAC). Rashmika leads the image, video analysis capability with applications in transport while Achini leads the human sentiment and emotions analysis with applications in smart cities, digital health and social media. Besides academic pursuits, as part of CDAC strategic initiatives, all three presenters are actively involved in industry engagement, solving real-world AI problems and working with both analytics technology providers and consultants.

### **Relevant publications:**

**De Silva, D.**, Sierla, S., Alahakoon, D., Osipov, E., Yu, X. and Vyatkin, V., 2020. Toward Intelligent Industrial Informatics: A Review of Current Developments and Future Directions of Artificial Intelligence in Industrial Applications. IEEE Industrial Electronics Magazine, 14(2), pp.57-72.

**Nawaratne R.**, Alahakoon D, **De Silva D**, Kumara H, Yu X. Hierarchical Two-Stream Growing Self-Organizing Maps with Transience for Human Activity Recognition. IEEE Transactions on Industrial Informatics. 2019 Dec 4.

Nallaperuma D, **Nawaratne R**, Bandaragoda T, **Adikari A**, Nguyen S, Kempitiya T, **De Silva D**, Alahakoon D, Pothuhera D. Online incremental machine learning platform for big data-driven smart traffic management. IEEE Transactions on Intelligent Transportation Systems. 2019 Jul 11;20(12):4679-90.

Jayaratne M, **de Silva D**, Alahakoon D. Unsupervised Machine Learning Based Scalable Fusion for Active Perception. IEEE Transactions on Automation Science and Engineering. 2019 May 15;16(4):1653-63.

**De Silva D**, Ranasinghe W, Bandaragoda T, Adikari A, Mills N, Iddamalgoda L, Alahakoon D, Lawrentschuk N, Persad R, Osipov E, Gray R. Machine learning to support social media empowered patients in cancer care and cancer treatment decisions. PloS one. 2018;13(10).

**Nawaratne R**, Alahakoon D, **De Silva D**, Chhetri P, Chilamkurti N. Self-evolving intelligent algorithms for facilitating data interoperability in IoT environments. Future Generation Computer Systems. 2018 Sep 1;86:421-32.

### **Brief description of the intended audience**

The intended audiences include academics, industry practitioners and other conference participants who are interested to learn hands-on skills in deep learning and its practical applications.

### **Support technical committee in IES (if any)**

IEEE IES Sub Technical Committee on Big Data and Machine Learning of the Technical Committee on Industrial Informatics

Chair: William Dai, Shanghai Jiao Tong University, China, w.dai@ieee.org