



UNIVERSITY OF KELANIYA STUDENT BRANCH

IEEE Distinguished Lecture organized by the IEEE Student Branch - University of Kelaniya and IEEE Sri Lanka Section



By, Prof Saman K. Halgamuge, FIEEE

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SAMAN HALGAMUGE, FIEEE is a Professor in the Department of Mechanical Engineering, School of Electrical, Mechanical and Infrastructure Engineering at the University of Melbourne, an honorary Professor of Australian National University (ANU) and an honorary member of ANU Energy Change Institute. He is also a Distinguished Lecturer/Speaker appointed by IEEE Computational Intelligence Society (2019-21). He was previously the Director of the Research School of Engineering at the Australian National University (2016-18), Professor, Associate Dean International, Associate Professor and Reader and Senior Lecturer at University of Melbourne (1997-2016). He graduated with Dipl.-Ing and PhD degrees in Data Engineering from Technical University of Darmstadt, Germany and B.Sc. Engineering from University of Moratuwa, Sri Lanka. He also holds a Diploma in Journalism from Aquinas University College. He was appointed as a visiting Professor of several Sri Lankan institutions including University of Peradeniya, SLIIT and Institute of Fundamental Studies and held Prof V.K Samaranayake endowed Chair at University of Colombo (2016). He has also collaborated with the UGC and established an agreement between UGC and University of Melbourne for joint PhD training.

Deep Learning: It is all about data

World saw the first image of a blackhole in April 2019 which will not be the last extraordinary image we see due to the vast advancement in data visualization happening today. The global technology landscape is undergoing a dramatic shift towards an exciting space of overwhelmingly complex and abundant data. Being prepared for this reality is paramount; however, it is quickly becoming apparent that new innovative methods are required to leverage the kind of “wicked” datasets we are increasingly confronted with. We are already witnessing this paradigm shift in wide-ranging domains such as neural engineering, pharmaceutical drug development, and microbial ecology, which are empowered by rapidly-advancing technologies that can quickly generate terabytes of data for analysis of advanced processes, compounds and organisms. These technologies have been spurred by recent advances in Deep Learning coupled with improvements in processor technology (e.g. GPU), that have allowed practitioners and researchers to overcome the computational limitations of many Neural Networks that depend on fully human curated (i.e. labeled) data (i.e. Supervised Learning). The following fundamental question then naturally arises: What happens when curated information or labels capture only a subset of critical classes, or the curation process itself is not fault- or error-free, i.e., a presence of uncertainty, as is often the case in the aforementioned domains? Undoubtedly, the algorithm’s perceived reality will distort any subsequent analysis of these data, which may have detrimental downstream effects when new discoveries and critical decisions are made on a basis of these analyses.

In such scenarios, learning algorithms that can find models –underlying structures or distinct patterns within data –without relying on labels (i.e. using Unsupervised Learning), have made great progress toward answering these sorts of questions; however, these algorithms only address part of the problem. Unsupervised Learning algorithms do not take into account any available and potentially reliable information or domain knowledge, which could prove useful in developing a robust model of the data. It can be advantageous to consider such information as well as any other available domain knowledge, not as ground truth but as a starting point to build a more complete picture of the problem under investigation.

The frequently used learning strategies also include generative techniques: Variational Autoencoders and Generative adversarial nets (GANs) that are widely used to learn the data sampling process. The performance of GANs and their future applications heavily depend on the improvements to learning algorithm.

All are welcome!

Please note that due to the current security situation all participants will have to produce identification cards and will be subjected to security checks. Please avoid carrying unnecessary bags to expedite the security checks.