Special Session Proposal for ICONIP 2017

Deep and Reinforcement Learning (DRL)

Organized by Abdulrahman Altahhan, Vasile Palade

Deep Learning has been under the focus of neural network research and industrial communities due to its proven ability to scale well into difficult problems and due to its performance breakthroughs over other architectural and learning techniques in important benchmarking problems. This was mainly in the form of improved data representation in supervised learning tasks. Reinforcement learning (RL) is considered the model of choice for problems that involve learning from interaction, where the target is to optimize a long term control strategy or to learn to formulate an optimal policy. Typically these applications involve processing a stream of data coming from different sources, ranging from central massive databases to pervasive smart sensors.

RL does not lend itself naturally to deep learning and currently there is no uniformed approach to combine deep learning with reinforcement learning despite good attempts. Examples of important open questions are: How to make the state-action learning process deep? How to make the architecture of an RL system appropriate to deep learning without compromising the interactivity of the system? Etc. Although recently there have been important advances in dealing with these issues, they are still scattered and with no overarching framework that promote then in a well-defined and natural way.

This special session will provide a unique platform for researchers from the Deep Learning and Reinforcement Learning communities to share their research experience towards a uniformed Deep Reinforcement Learning (DRL) framework in order to allow this important interdisciplinary branch to take-off on solid grounds. It will focus on the potential benefits of the different approaches to combine RL and DL. The aim is to bring more focus onto the potential of infusing reinforcement learning framework with deep learning capabilities that could allow it to deal more efficiently with current learning applications including but not restricted to online streamed data processing that involves actions.

# Scope and Topic

Topics of interest include, but are not limited to the following:

1. Novel DRL algorithms
2. Novel DRL Neural architectures
3. Novel Reinforcement Learning algorithms with deep representation layer
4. Adaptation of existing RL techniques for Deep Learning
5. Optimization and convergence proofs for DRL algorithms
6. Deeply Hierarchical RL
7. DRL architecture and algorithms for Control
8. DRL architecture and algorithms for Robotics
9. DRL architecture and algorithms for Time Series
10. DRL architecture and algorithms for Big Streamed Data Processing
11. DRL architecture and algorithms for Governmental Policy Optimization
12. Other DRL application

# [ABDULRAHMAN ALTAHHAN](http://www.coventry.ac.uk/research/research-directories/researchers/dr-abdulrahman-altahhan/)

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Dr Abdulrahman Altahhan has a PhD in Reinforcement Learning and Neural Networks and an MPhil in Fuzzy Expert Systems. Currently he is the Programme Director of MSc in Data Science at Coventry University, UK. Previous to that he worked in Dubai as an Assistant Professor and Acting Dean. Dr Abdulrahman is actively researching in the area of deep reinforcement learning applied to robot navigation. He has extensively prepared designed and developed a novel reinforcement learning family of methods and studied their mathematical underlying properties. Recently he established a new set of algorithms and findings where he combined deep learning with reinforcement learning in a unique way that is hoped to contribute to the development of this new research area. He presented in prestigious conferences and venues in the area of machine learning and neural network. Dr Abdulrahman is a reviewer for important Neural Networks related journals, and venues from Springer and the IEEE; including Neural Computing and Applications journal, International Conference of Robotics and Automation ICRA, and he serves in the programme committees for related conferences such as INNS Big Data 2016. Dr Abdulrahman is organizing a special session in the IJCNN2016 flagship conference about Deep Reinforcement Learning. Dr Abdulrahman is teaching in the Machine Learning, Neural Networks and Big Data Analysis modules in the MSc of Data Science, he is an IEEE Member, a member of the IEEE Computational Intelligence Society and International Neural Network Society.

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# [VASILE PALADE](http://www.coventry.ac.uk/research/research-directories/researchers/vasile-palade/)

# **Reader: Pervasive Computing**

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Dr Vasile Palade is a Reader in Pervasive Computing in the Faculty of Engineering and Computing and a member of the Cogent Computing Applied Research Centre at Coventry University, UK. He previously had academic and research positions at the University of Oxford - UK (Departmental Lecturer in the Department of Computer Science), University of Hull - UK (Research Fellow in the Department of Engineering) and the University of Galati - Romania (Associate Professor in the Department of Computer Science and Engineering).

His research interests lie in the area of machine learning/computational intelligence, and encompass mainly neuro-fuzzy systems, various nature inspired algorithms such as swarm optimization algorithms, hybrid intelligent systems, ensemble of classifiers, class imbalance learning. Application areas include Bioinformatics problems, fault diagnosis, web usage mining, among others.

Dr Palade is author and co-author of more than 130 papers in journals and conference proceedings as well as books on computational intelligence and applications. He has also co-edited several books including conference proceedings. He is an Associate Editor for several journals, such as Knowledge and Information Systems (Elsevier), International Journal on Artificial Intelligence Tools (World Scientific), International Journal of Hybrid Intelligent Systems (IOS Press), Neurocomputing (Elsevier). He has delivered keynote talks to international conferences on machine learning and applications.

He was the General Chair for KES2003 – The 7th Int. Conf. on Knowledge Based Intelligent Engineering Systems, Oxford, Sept. 2003, and Co-Chair for ICMLA 2010 – The 9th Int. Conf. on Machine Learning and Applications, Washington D.C., Dec. 2010. Dr Vasile Palade is an IEEE Senior Member and a member of the IEEE Computational Intelligence Society.

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