

# NATIONAL UNIVERSITY OF SINGAPORE

School of Computing

## C S S E M I N A R

**Title:**           **Reinforcement Learning and Quantum Computing**

Speaker:       Dr Peter Wittek, Research Fellow at ICFO

Date/Time:     15 June 2017, Thursday, 02:00 PM to 03:30 PM

Venue:         SR5, COM1-02-01

Chaired by:   Dr Hsu, David, Professor, School of Computing  
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### Abstract:

Learning algorithms are starting to find their way to applications in quantum information processing. The first promising results emerged from using reinforcement learning to control the classical part of a quantum physics problem. The two most notable examples are quantum-enhanced phase estimation using differential evolution and an agent-based approach to control measurement-based quantum computing. Starting from the other direction, using quantum resources to boost learning algorithms is also an attractive line of inquiry, with advantages ranging from quadratic or even exponential speedup, increased learning capacity, reduced sample complexity and better generalization performance. Quantum-enhanced reinforcement learning is of particular interest: in this case, a quantum agent performs a task related to the control of a quantum system. In turn, this could lead to virtuous cycle of innovation by an engineering more scalable quantum computers, which would run more involved learning protocols. In this talk, we give an overview of the relevant concepts and highlight the most recent developments of the field.

### Biodata:

Peter Wittek is a research scientist exploring the synergies between machine learning and quantum physics. He is the author of the book *Quantum Machine Learning: What Quantum Computing Means to Data Mining*. His experience ranges from working on practical applications with startups to helping to solve problems in theoretical physics. Peter holds an MSc in Mathematics and an MSc in Information Management from the Budapest University of Technology and Economics, and a PhD in Computer Science from the National University of Singapore. He is affiliated with ICFO-The Institute of Photonic Sciences, Barcelona, Spain.