

## Machine Learning and Physics Seminar Series

Thursday, 26 November 2020 at 3.00pm  
To receive the Zoom room link, send an empty email to  
request.zoom.ox.ml.and.physics [AT] gmail [DOT] com

### Provably exact sampling for first-principles theoretical physics

**Prof Phiala Shanahan**

MIT

In the context of lattice quantum field theory calculations in particle and nuclear physics, I will describe avenues to accelerate sampling from known probability distributions using machine learning. I will focus in particular on flow-based generative models, and describe how guarantees of exactness and the incorporation of complex symmetries (e.g., gauge symmetry) into model architectures can be achieved. I will show the results of proof-of-principle studies that demonstrate that sampling from generative models can be orders of magnitude more efficient than traditional Hamiltonian/hybrid Monte Carlo approaches in this context.

Phiala Shanahan grew up in Adelaide, Australia, and obtained her BSc from the University of Adelaide in 2012 and her PhD, also from the University of Adelaide, in 2015. Before joining the MIT physics faculty in 2018, Prof. Shanahan was a Postdoctoral Associate at MIT from 2015-2017, and held a joint position as Assistant Professor at the College of William & Mary and Senior Staff Scientist at the Thomas Jefferson National Accelerator Facility from 2017-2018. Prof. Shanahan's research interests are focussed around theoretical nuclear and particle physics. In particular, she works to understand the structure and interactions of hadrons and nuclei from the fundamental (quark and gluon) degrees of freedom encoded in the Standard Model of particle physics.