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Laser Wakefield Accelerator Modelling with Variational Neural Networks

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Laser-plasma accelerators produce electron beams whose properties depend on a complex, nonlinear relationship between numerous laser and plasma parameters. Neural networks offer a powerful tool for modelling this relationship using experimental datasets. In this talk, I will present results from training such models and using them to predict electron spectra prior to the onset of radiation reaction effects during nonlinear Compton scattering. The model architecture combines variational autoencoders, which learn a reduced representation of key diagnostics, with a fully connected neural network that maps these reduced parameters to the output spectra. I will also discuss ongoing efforts to extend this approach to other applications in laser-plasma experiments.

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