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Inverse Problems Seminar

Bayesian imaging with deep generative encoded by neural networks

Prof. Marcelo Pereyra
Heriot-Watt University

Abstract

This talk presents a new Bayesian analysis and computation methodology to perform inference in high-dimensional problems where the prior knowledge is available in the form of a dataset of training examples, which we consider to be a sample from the marginal distribution of the unknown quantity of interest. Following the manifold hypothesis, which states that high-dimensional physical quantities encountered in the real world often lie along a low-dimensional latent manifold inside the ambient space, we construct a prior distribution that is supported on a low-dimensional manifold which is encoded by a deep neural network. The manifold and the distribution on the manifold can then be learnt from the training data by using modern machine learning techniques for generative modelling, such as variational autoencoders and normalising flows. We study the resulting Bayesian models theoretically and empirically by using a range of challenging imaging inverse problems, where we perform analyses related to point estimation, uncertainty quantification, hypothesis testing, and model selection in the absence of ground truth.

Date: October 18, 2023 (Wednesday)
Time: 4:30pm – 5:30pm (Hong Kong Time)
ZOOM link: https://cuhk.zoom.us/j/98241093146
Meeting ID: 982 4109 3146

All are Welcome