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# Inverse Problems Seminar

*A lifted Bregman formulation for the inversion  
of deep neural networks*

*Prof. Martin Benning  
University College London*

## Abstract

We propose a novel framework for the regularised inversion of deep neural networks. The framework is based on the presenters' recent work on training feed-forward neural networks without the differentiation of activation functions. The framework lifts the parameter space into a higher dimensional space by introducing auxiliary variables and penalises these variables with tailored Bregman distances. We propose a family of variational regularisations based on these Bregman distances, present theoretical results and support their practical application with numerical examples. In particular, we present the first convergence result (to the best of our knowledge) for the regularised inversion of a single-layer perceptron that only assumes that the solution of the inverse problem is in the range of the regularisation operator.

This is joint work with Xiaoyu Wang from Heriot-Watt University (Edinburgh campus).

Date: 28 February, 2024 (Wednesday)  
Time: 4:00pm – 5:00pm (Hong Kong Time)  
ZOOM link: <https://cuhk.zoom.us/j/98241093146>  
Meeting ID: 982 4109 3146

*All are Welcome*