

Leslie Comrie Seminar Series 2023/24

Deep Inverse Problems: From Plug-and-Play Methods to Implicit Neural Representations

Wednesday 29 November 2023, 15:00-16:00

Speaker: Dr Angelica Aviles-Rivero, University of Cambridge

Abstract:

In recent years, the adoption of Plug-and-Play (PnP) methods in solving inverse problems has gained significant traction. However, recent developments in PnP algorithms have primarily focused on the integration of pretrained deep learning denoisers as priors, a process that demands substantial amounts of clean image data for denoiser pretraining. While data-driven deep learning models continue to evolve and deliver impressive results, the emergence of Implicit Neural Representations (INR) represents a noteworthy breakthrough. INR exhibits the ability to model complex and high-dimensional data without the need for explicit parameterisation. These implicit neural priors can efficiently serve as single shot denoisers within the PnP framework.

The first part of this talk introduces a novel framework for single-shot PnP methods, addressing the challenges associated with data-intensive denoiser pretraining. In the second part, we delve into the implicit neural representations, introducing a function designed to harness the combined strengths of strong spatial and frequency attributes, departing from conventional methodologies. Notably, our novel technique demonstrates remarkable performance improvements across a diverse range of downstream tasks, with a particular focus on applications like CT reconstruction and denoising. Through rigorous experimentation, we provide a comprehensive understanding of the advantages offered by our approach.