KATHOLISCHE UNIVERSITÄT EICHSTÄTT-INGOLSTADT

## Mathematisches Kolloquium

# Learning via early stopping and untrained neural nets


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Aufgrund der Pandemie wird kein Kaffee und Tee serviert.
Die Teilnahme erfolgt unter Einhaltung der 3G-Regel. Wir werden ca. 3 m Abstand zwischen den Teilnehmern ermöglichen und medizinische Masken tragen.

**Abstract**: Modern neural networks are typically trained in an over-parameterized regime where the parameters of the model far exceed the size of the training data. Such neural networks in principle have the capacity to (over)fit any set of labels including significantly corrupted ones. Despite this (over)fitting capacity, over-parameterized networks have an intriguing robustness capability: they are surprisingly robust to label noise when first order methods with early stopping are used to train them. Even more surprising, one can remove noise and corruption from a natural image without using any training data what-so-ever, by simply fitting (via gradient descent) a randomly initialized, over-parameterized convolutional generator to a single corrupted image. In this talk I will first present theoretical results aimed at explaining the robustness capability of neural networks when trained via early-stopped gradient descent. I will then present results towards demystifying untrained networks for image reconstruction/restoration tasks such as denoising and those arising in inverse problems such as compressive sensing.