INSTITUTE OF VISUAL COMPUTING

Figure 1: me, searching for the best students out there.

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(Variational) Rank-Reduction Autoencoders as Regularisers for (MRI) Inverse Problems

- For a given image $\boldsymbol{x} \in \mathbb{R}^n$, the goal of an autoencoder is to minimise $\mathcal{L} = \|\boldsymbol{x} - d(e(\boldsymbol{x}))\|_2$ when training an encoder e and decoder d.
- Rank-Reduction AEs make use of a truncated SVD on the latent space Y,

$$Y = e(X) = U\Sigma V^T \text{ and } \overline{Y} = \sum_{i}^{k^*} \sigma_i U_i V_i^T \text{ with } e, d \text{ such that } X \approx d\left(\overline{Y}\right) .$$

- You should train and apply a Variational *Rank-Reduction* Autoencoder as a regulariser (using the loss, $\mathcal{L}$) for inverse (imaging) problems.
- Using the autoencoder loss as an additive term in the optimisation objective.
- For example, denoising of Magnetic Resonance Imaging (MRI) images.
- Goal: do Rank-Reduction Autoencoders improve reconstruction?

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