

## Signal and noise in ptychographic lensless imaging.

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**Group website:** <https://www.epfl.ch/labs/cxi/>

**About our research:** <https://www.psi.ch/en/cxi/research>

**Required:** Basic programming skills, ideally in python. A strong background in optics, microscopy, or digital image processing is a major plus.

### **Description:**

Computational lensless imaging is a field of research that uses algorithmic methods, instead of lenses, to form images in a microscope. These methods have led to major improvements in high-resolution electron and x-ray microscopes, which have always been limited by the quality of the lenses available. In fact, the highest resolution images ever collected by anyone, ever, were taken in an electron microscope using a computational lensless imaging method called ptychography. However, basic questions remain about ptychography's ultimate limits. In this project, a masters student will use simulations and information theory to study how efficiently ptychography can use the information it measures to form the images that it recovers. The project will begin with a very structured set of questions and simulations, incorporating the opportunity to learn about ptychography. Depending on the student's interest and progress, there is ample space to continue on to a more open-ended exploration of the questions surrounding this theme and build connections to other areas of research within the group.