# Fold slice error collection

This is a collection of all the errors we have encountered when running ptychography using fold slice, both mixed state and multislice ptychography, on the cluster and local computer.

# Software errors:

**Missing necessary toolboxes**

Error message:

1. Line 239 of fold\_slice/ptycho/+core/+analysis/plot\_objects.m, waiting for keyboard input.

Cause: missing Risk Management Toolbox and Statistics and Machine Learning Toolbox. Installing Risk Management Toolbox automatically install Statistics and Machine Learning toolbox.

1. Line 97 of fold\_slice/ptycho/+engines/+GPU/+GPU\_wrapper/initialize.m: Unrecognized function or variable 'gpuDeviceCount'.

Cause: missing Parallel Computing toolbox.

Explanation: These errors only happen on local computers, the Matlab installed on the cluster has all the toolboxes installed. There is a series of error that could happen when Matlab does not have required toolboxes, necessary toolboxes include:

Image Processing Toolbox

Risk Management Toolbox

Statistics and Machine Learning Toolbox

Parallel Computing Toolbox

Solution: Go to Matlab Home > Add-ons > Get Add-Ons, install the necessary toolboxes there.

**Missing compiler for mex**

Error message: Line 95 of fold\_slice/+utils/add\_to\_3D\_projection.m:

Error using mex

Supported compiler not detected. You can install the freely available MinGW-w64 C/C++ compiler; see Install MinGW-w64 Compiler. For more options, visit <https://www.mathworks.com/support/compilers>.

Explanation: Mex is the function that Matlab uses to compile C++ files, so it could run into error if there are no useable C++ compilers. We can check the compiler in use for mex by mex -setup and mex -setup cpp for C and C++. The suggested solution of using MinGW-w64 compiler, which comes as a Matlab add-on, does not work on the test with Matlab R2021b, for the latest fold-slice as of 1/17/22.

Solution: Download Microsoft Visual Studio 2019 Community version from <https://docs.microsoft.com/en-us/visualstudio/releases/2019/release-notes>, install with “Desktop Development with C++” option selected. Go to Matlab, if MinGW-w64 compiler is installed, remove it from Matlab Home > Add-Ons > Manage Add-Ons. Run mex -setup cpp to make sure that mex uses Visual C++ 2019 as its compiler. Then the problem should be gone.

**Add Gaussian blurring to diffraction patterns**

Blurring with a Gaussian kernel is added to ptycho/+engines/+GPU\_MS/private/get\_reciproval\_model.m, line 218. A blur kernel is created, then applied to aPsi2

# Reconstruction artifacts

**Artifacts related to probe position fitting**

A picture containing light, traffic light, projector

Description automatically generatedA building with many windows

Description automatically generated with low confidence

Both artifacts shown above can be caused by fold slice not able to fit the correct probe positions. For the artifact that the probe got divided into two halfs, consider start probe position correction early in the reconstruction (probe\_position\_search).

For the artifact shown on the right side, where the heavy atoms are reconstructed to be holes, this kind of artifact typically can be solved by longer iterations with probe position search is enabled. When this happens, the automatic parameter searching won’t be able to perform well.