Data analysis and visualization

Many data analysis and visualization software packages are freely available for use on CISL-managed resources. These packages include some developed and supported by NCAR and CISL.

Please follow the license use guidelines as noted below.

Page contents

MATLAB toolboxes

- Image Processing Toolbox
- Mapping Toolbox
- MATLAB Compiler
- Neural Network Toolbox
- Optimization Toolbox
- Parallel Computing Toolbox
- Signal Processing Toolbox
- Statistics Toolbox
- Wavelet Toolbox

License use guidelines

The CISL user community shares a limited number of licenses for running MATLAB, MATLAB Toolboxes, and some other applications.

Follow these guidelines to ensure fair access for all users:

- Avoid monopolizing these licenses.
- If you need to use multiple licenses at one time, be considerate of others and finish your session as quickly as possible.
- Close applications when you are done to free up licenses for others to use.

CISL reserves the right to kill jobs/tasks of users who monopolize these licenses.

To see how many licenses are being used, run **licstatus** at your command line. You will see columns showing how many licenses you're using, the total number of licenses in use, and the total number of licenses.

```
licstatus
```

Frequently used packages

These are among the more frequently used data analysis and visualization packages available on NCAR systems. To request installation of other packages, contact the NCAR Research Computing help desk.

- **GrADS** – The Grid Analysis and Display System (GrADS) is an interactive desktop tool for visualizing earth science data.
- **IDL** – IDL is Interactive Data Language, which is used for data visualization and analysis. Documentation is available here.
- **MATLAB** – This is a high-level language and interactive environment for data analysis, statistics, and image processing. Several MATLAB toolboxes are provided (list at right). See the MathWorks web site for documentation and note the information just below about Octave, an alternative to MATLAB.

  Related: MATLAB Parallel Computing Toolbox on Casper and Cheyenne
- **MATLAB alternative - Octave**

  Many MATLAB codes run with very little or no modification under Octave, a free interactive data analysis software package with syntax and functionality that are similar to MATLAB's. Since using Octave is not constrained by license issues, we encourage MATLAB users to try it, particularly those who have long-running MATLAB jobs. Depending on compute intensity, Octave usually runs slower than MATLAB but it may be suitable for most data analysis work and you won't risk having jobs killed because of a lack of licenses.

  To use Octave interactively, start an interactive job and load the module.

  ```
  module load octave
  ```

  Run **octave** to start the command line interface, or run the following command to use the GUI.

  ```
  octave --force-gui
  ```

- **NCL** – NCAR Command Language is an interpreted language that CISL designed for scientific data analysis and visualization.
- **ParaView*** – This is an open-source application for building visualizations and analyzing data, either interactively in 3D or through batch processing. See ParaView.org for documentation.
- **PyNGL and PyNIO** – Python packages that CISL developed for scientific visualization, file input /output, and data analysis.
- **VAPOR*** – The Visualization and Analysis Platform for Ocean, Atmosphere, and Solar Researchers is a desktop platform that provides an interactive 3D visualization environment for exploring geosciences CFD data sets. See VAPOR.

Many additional applications and tools that are commonly used by atmospheric and Earth system scientists are available on NCAR HPC resources and through the CISL Research Data Archive. These include Mathematica, Vis5d, and VTK.

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* Those marked with an asterisk should be run only on the Casper nodes because of their graphics and GPU requirements. Others can be used on Cheyenne. Check the man pages for any program to get additional information.