

# Alphabet Soup of Programming Languages

**Operating Systems** for file management and running applications.

- UNIX, Linux – used on high performance computers. Unix and Linux are text-based, so scripts can be written to automate processes.
- Windows
- Mac OSX

**Text editors** are used to write code for Fortran, c, IDL, etc. Most support syntax highlighting and automatic indentations.

- vi – difficult to use for beginners because many keystrokes must be memorized.
- emacs – provides choice of keyboard shortcuts or windows menus.
- nedit – this editor is most similar to a windows style editor.

## **Programming languages for large-scale computations**

For these languages, source code must be compiled into an executable file.

- Fortran 77 – the scientific workhorse for decades. Most legacy code is in Fortran 77. It is very efficient and easy to learn.
- Fortran 90 – improvements include implicit array indexing, modules, free form source code
- Fortran 95 – improvements include object oriented tools and high performance (parallel) capabilities
- c – capabilities are similar to Fortran. Source code is more compact.
- c++ - more recent, object-oriented version of c.

## **Languages for visualization, data analysis, and smaller computations**

These can be run using coded functions or interactively at a prompt. Both IDL and Matlab have numerous high-level built-in functions.

- IDL (Interactive Data Language) - popular in atmospheric science and astronomy
- Matlab – often used in undergraduate and graduate numerical analysis courses

**Parallelization tools** – commands from these languages can be inserted into Fortran and c code to be used on computers with multiple processors.

- OpenMP (Open Message Passing) - for shared memory machines. Very easy to apply parallelism to loops and other sections of code.
- MPI (Message Passing Interface) – for distributed memory machines. MPI is more difficult than OpenMP. The MPI directives must instruct each processor to pass data to other processors.

**Tools for symbolic (algebraic) computation** - these applications can find derivatives and integrals, solve for roots, and plow through lots of messy algebra.

- Mathematica
- Maple

**Statistical packages:** S plus, SAS, R