Machine Learning

MATLAB Essentials

MATLAB

- High level language, designed for scientific and engineering computing
- MATLAB stands for “MATrix LABoratory”
- Operations on vectors and multi-dimensional arrays are a core strength of MATLAB
  - Compact syntax
  - Efficient underlying implementations of matrix algebra
- Rich libraries of mathematical functions
  - Statistics
  - Signal processing
  - Optimization
  - Machine learning

MATLAB

- Interpreted language, with built-in precompiled modules for compute-intensive operations
- Great flexibility in programming
  - Interactive
  - Scripts
  - Functions (scripts with defined inputs and outputs)
  - Object-oriented programming
  - Supports complex, hierarchical data structures with mixed types
  - Easy to interface with C / C++
  - Moderately loose typing
- Good for both exploratory work and large-scale structured programming

MATLAB

- Ubiquitous *vectorization*
  - Vectorization: use of single-operator syntax to signify uniform application of the operator on all elements of one or several vectors and/or matrices
  - Circumvents need for explicit loops to process elements of vectors and matrices
  - Syntax very compact and highly readable, akin to mathematical formulae
  - Examples:

add two matrices	C = A + B;
multiply matrix by scalar	C = 2 * B;
multiply two matrices	C = A * B;
logarithm of every element in matrix	B = log(A);

MATLAB

- Powerful visualization capabilities
  - Histograms, bar charts
  - 2D and 3D line plots
  - 2D and 3D scatter plots
  - Heat maps
  - Contour plots
  - Mesh plots
  - Colored and shaded surface plots