W1005
Intro to CS and Programming in MATLAB

Admin

Fall 2014
Instructor: Ilia Vovsha

http://www.cs.columbia.edu/~vovsha/w1005

What is MATLAB?

- MATLAB is a high-level language and interactive environment that allows one to solve science & engineering problems quickly using built-in functionality
- High-level language:
  - User-friendly, easy to use, built-in functions (+)
  - Slower, less control (-)
- Interactive environment:
  - Graphical User Interface (GUI)
  - Visualization

What is MATLAB?

- Scripting language designed for “gluing together” computations
- Object Oriented Programming (OOP) takes a backseat
- Documentation is sufficient:
  - http://www.mathworks.com/help/techdoc/index.html
- Ideal for developing a prototype or a model, suitable for quick and dirty computation
- Poor choice for a major commercial package

Course Info – Instructor

- Ilia (Eli) Vovsha
  - Email: iv2121@columbia.edu
  - Office Hours (at TBA):
    - Mon. (3:00 – 4:10pm)
    - Wed. (9:00 – 9:50am)
- PhD in Machine Learning (2015)
  - ML is a field in which we develop algorithms/systems with a learning component
  - Math + Algorithms + Data + Experiments ➔ MATLAB

Course Info – Syllabus (CS)

- Algorithms:
  - Recursion
  - Searching
  - Sorting
- Algorithm analysis:
  - Complexity, efficiency
- Object Oriented Programming (OOP):
  - Modularity, objects, classes
- Software development method:
  - Design and implementation principles

Course Info – Syllabus (MLAB)

- Basic functionality:
  - Workspace, variables, data types, generic commands
- Arrays:
  - The “building blocks” of MATLAB i.e, vectors, matrices
- Scripts, simple functions:
  - Some basic user-defined & built-in functions
- Control flow, operators:
  - Loops (if, else, while), mathematical operations

Course Info – Syllabus (MLAB)

- File input/output:
  - Loading & saving data, handling different formats
- Basic plotting:
  - Generating simple curves, plots, and figures
- Useful data structures:
  - Cell arrays, character strings, 'structs'
- Advanced functions:
  - Variable # of arguments, function handles

Course Info – Syllabus (MLAB)

- Practical mathematics:
  - Solving equations (linear algebra), basic statistics
- Optimization toolbox:
  - Formulating a data-driven mathematical problem and solving it using a toolbox routine

Course Info – Grading

- 6 Homeworks (6 x 8.33% = 50%)
  - All due Friday 4:00pm (up to 50% penalty for late hws)
  - See course website for instructions
  - Extra HW to make up / replace lowest grade
- Midterm Exam (20%)
- Final Project (30%)
  - Solve a toy problem of your choice. Submit a write-up and your code
  - Work individually or in pairs, under the guidance of a TA

Technical Details

- You may use any platform you wish to run MATLAB.
- Download a windows version or use your CUNIX/CS account to log in
- If you decide to run MATLAB on Linux/Unix, you'll need to install an X-Server for plotting and visualization

Technical Details

- X-Server for plotting and visualization:
  - http://sourceforge.net/projects/xming/
- Putty (for windows):
  - http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html
- Instructions:
  - Launch Xming
  - Open a session in putty with host name: 'cunix.cc.columbia.edu'
  - Make sure the X11 option of the SSH category is enabled
  - Enter account username/password
  - Type 'matlab &' to start the engine