

# Introduction to MATLAB

Week 13 – 4/21/09

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# Syllabus

- Week 13: T 4/21
  - Intro to MATLAB
  - MATLAB GUI
  - Variables
  - Operations
- Week 14: T 4/28
  - Functions and scripts
  - Programming style
  - Comments
  - Flow control
  - File I/O
- Week 15: T 5/5
  - Graphics
  - Plot types
  - Figure window
  - Figure properties
  - Figures: special topics
- Week 16: T 5/12
  - MATLAB toolboxes
  - Statistics
  - Signal processing
  - Special topics

# What is MATLAB?

- MATLAB stands for MATrix LABoratory
- As such, it is optimized for matrix manipulation
- MATLAB is useful for visualization and data analysis
- MATLAB is versatile, designed to work the same across platforms and to interface with multiple programming languages
- MATLAB is expandable with toolboxes

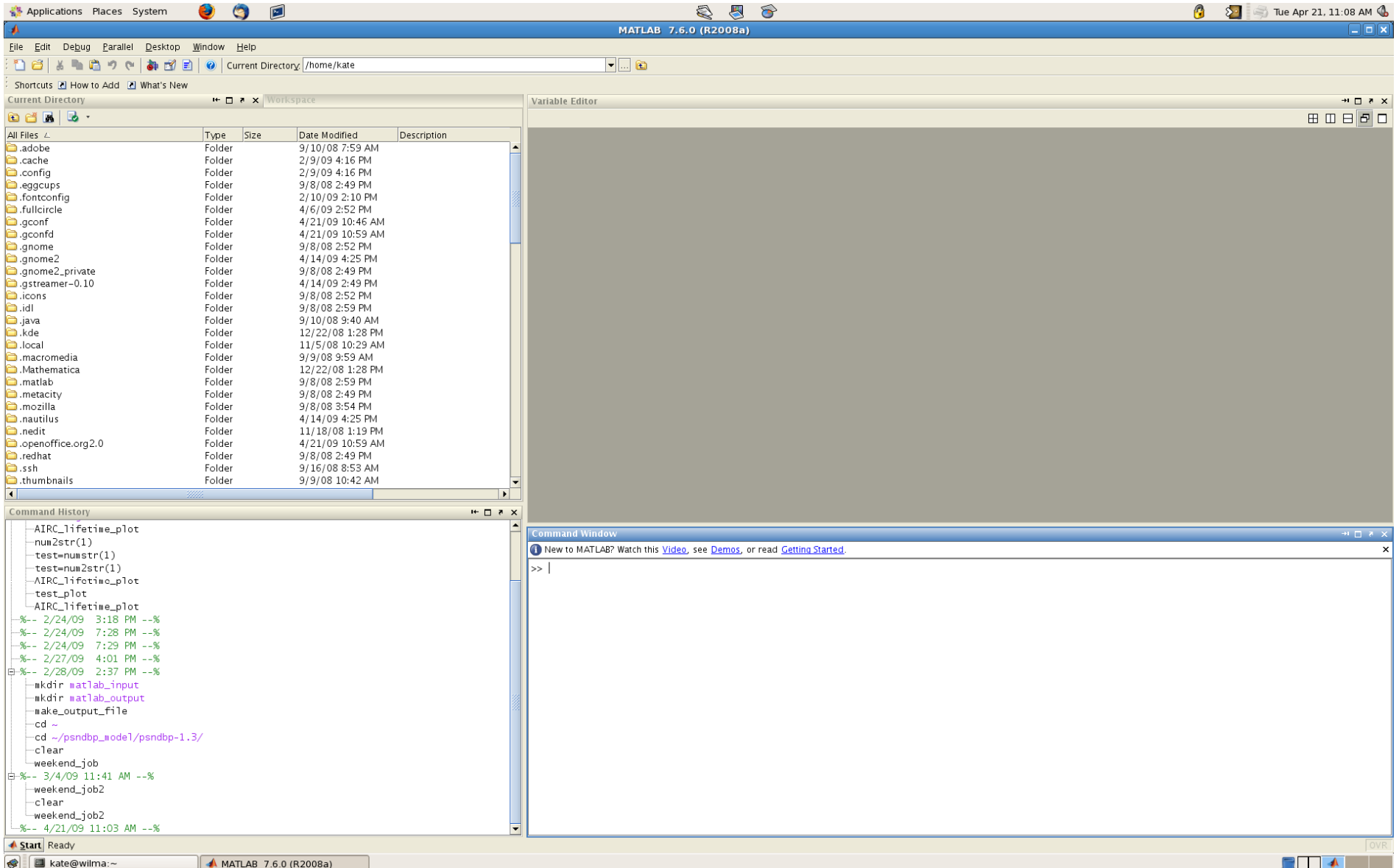
# Starting MATLAB

- Type `matlab` into a terminal window
- Double-click matlab icon in windows env
- Troubleshooting: license file
  - Check for connection to internet and vpn
  - Check for updated license file
  - Keep trying over time if too many connections detected, problem will fix itself eventually

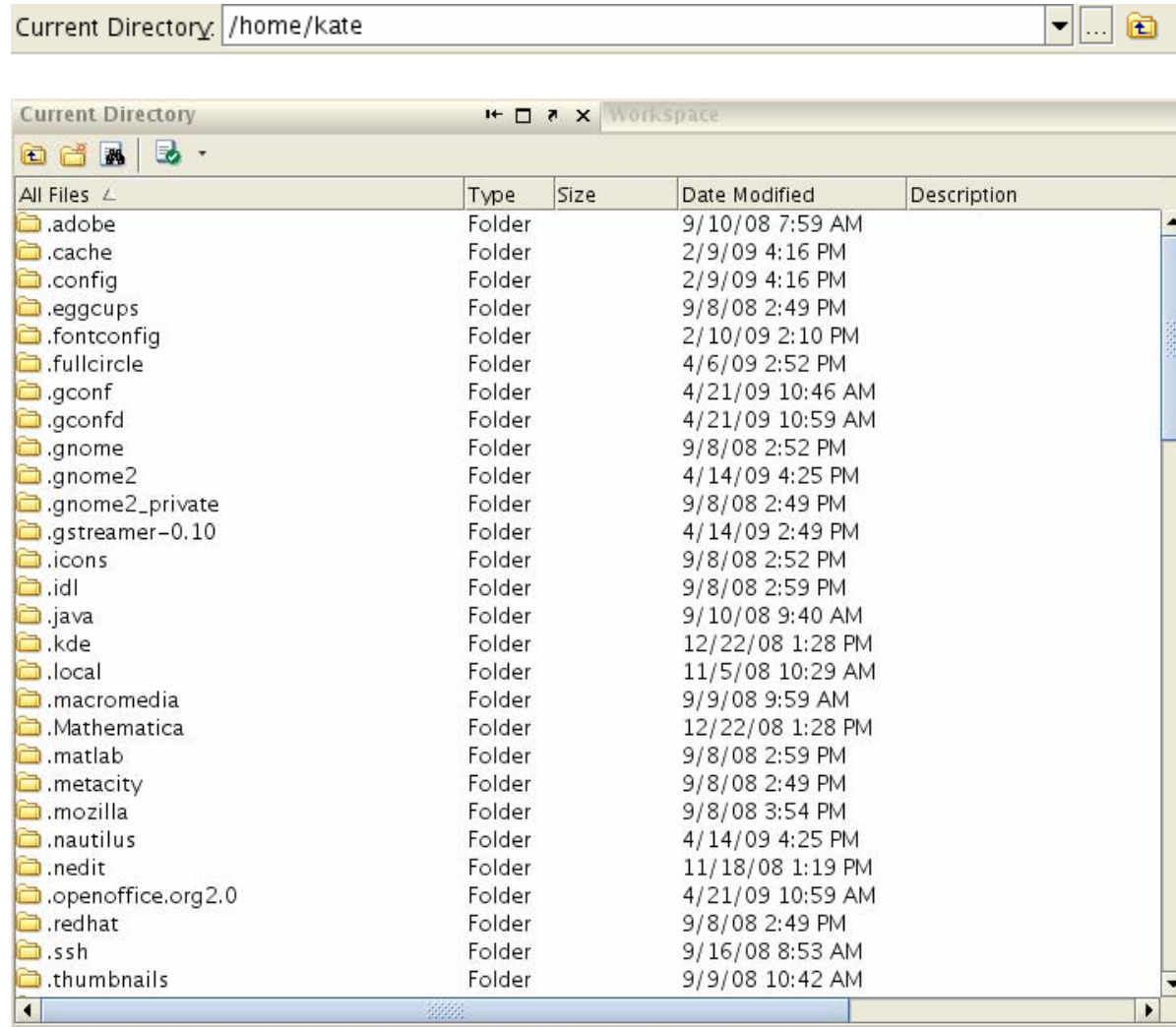
# MATLAB Environment

- The MATLAB environment is designed to run as a GUI (graphical user interface)
- There is also a text-only version of MATLAB, which generally occurs when logging in remotely with an improperly set X11 forwarding
- Some options in MATLAB require the GUI, though most can be run in text-only mode
- Text-only mode not recommended

# MATLAB GUI



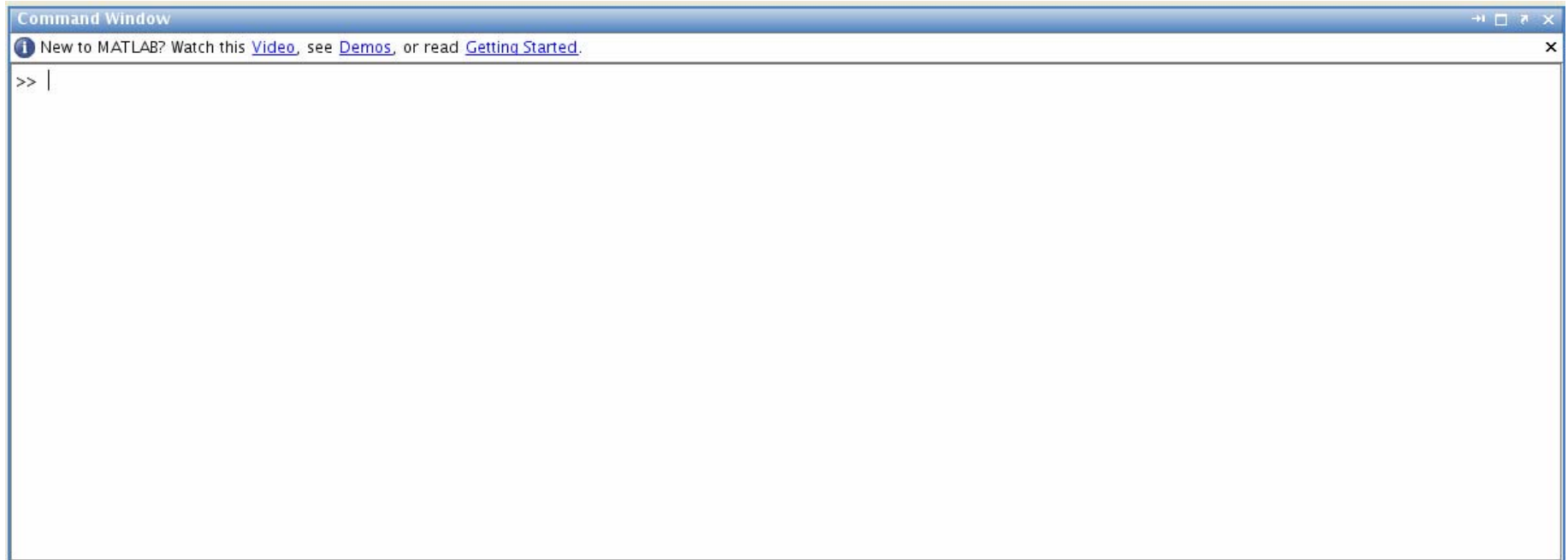
# MATLAB GUI – Current Directory



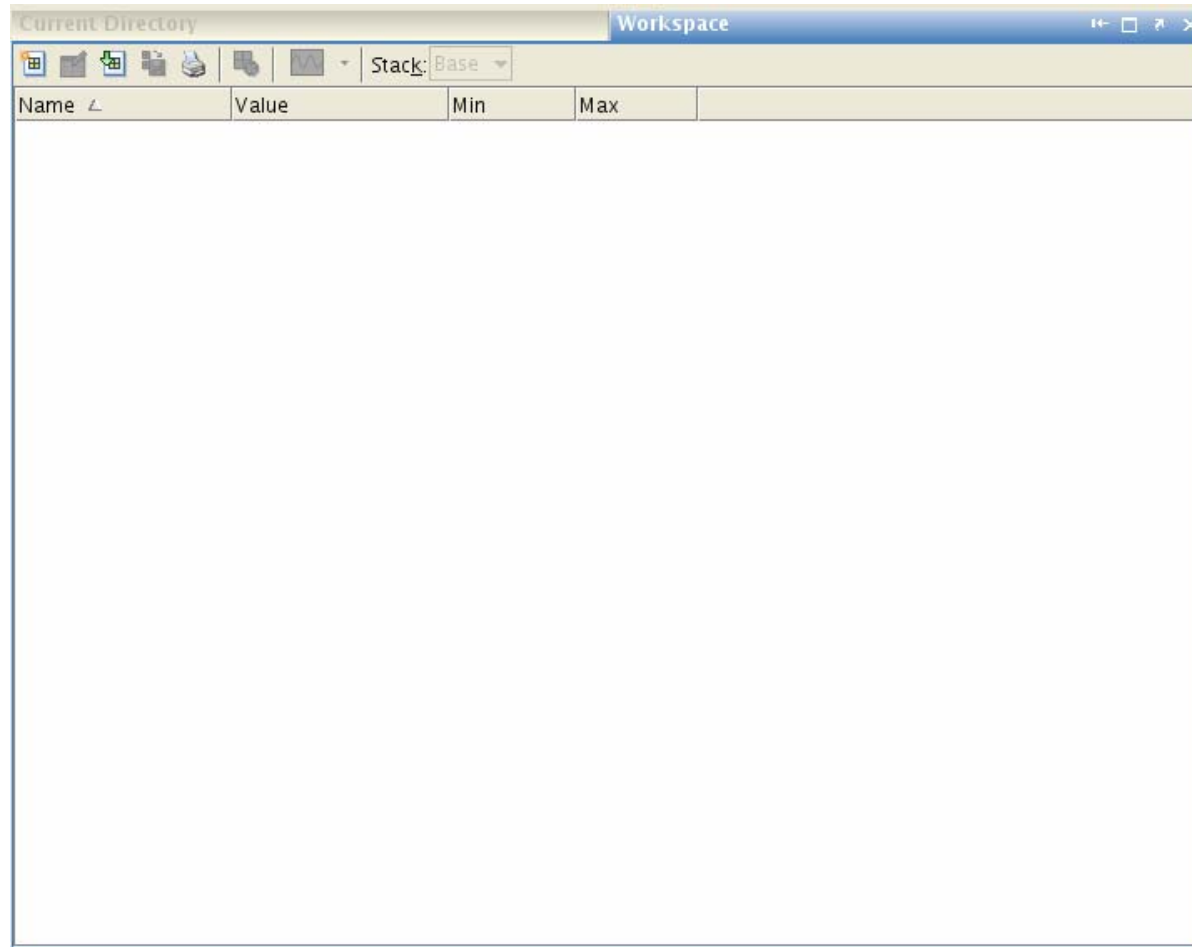
# MATLAB GUI – Current Directory

- Setting the path:
  - You need to set up what directory to save your files to
  - Multiple options: directory commands, current directory path, current directory window
  - Directory commands: `pwd`, `cd`, `dir`, `ls`, `path`, `editpath`, `copyfile`, `mkdir`
- When in doubt, check your path

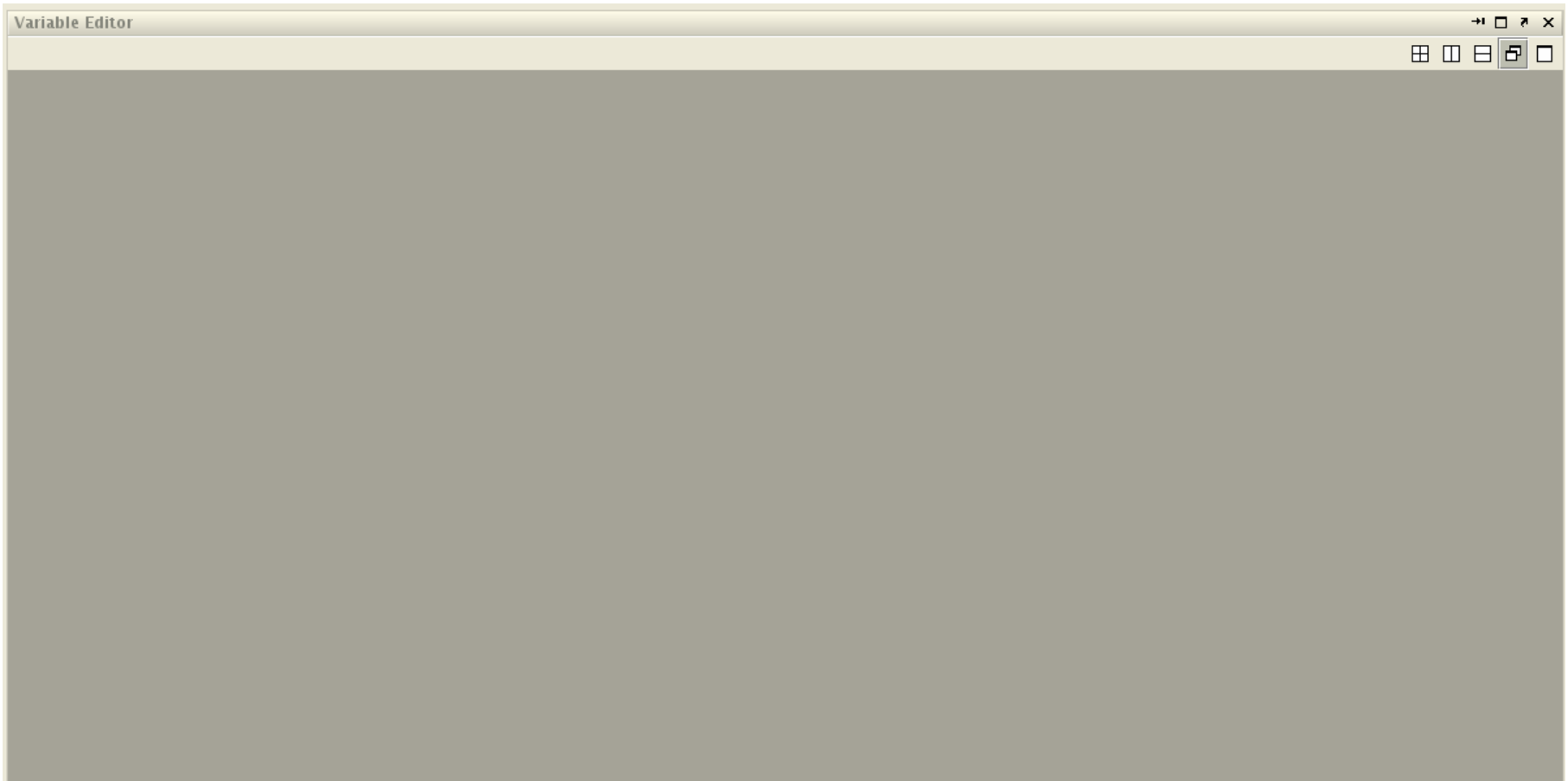
# MATLAB GUI – Command Window



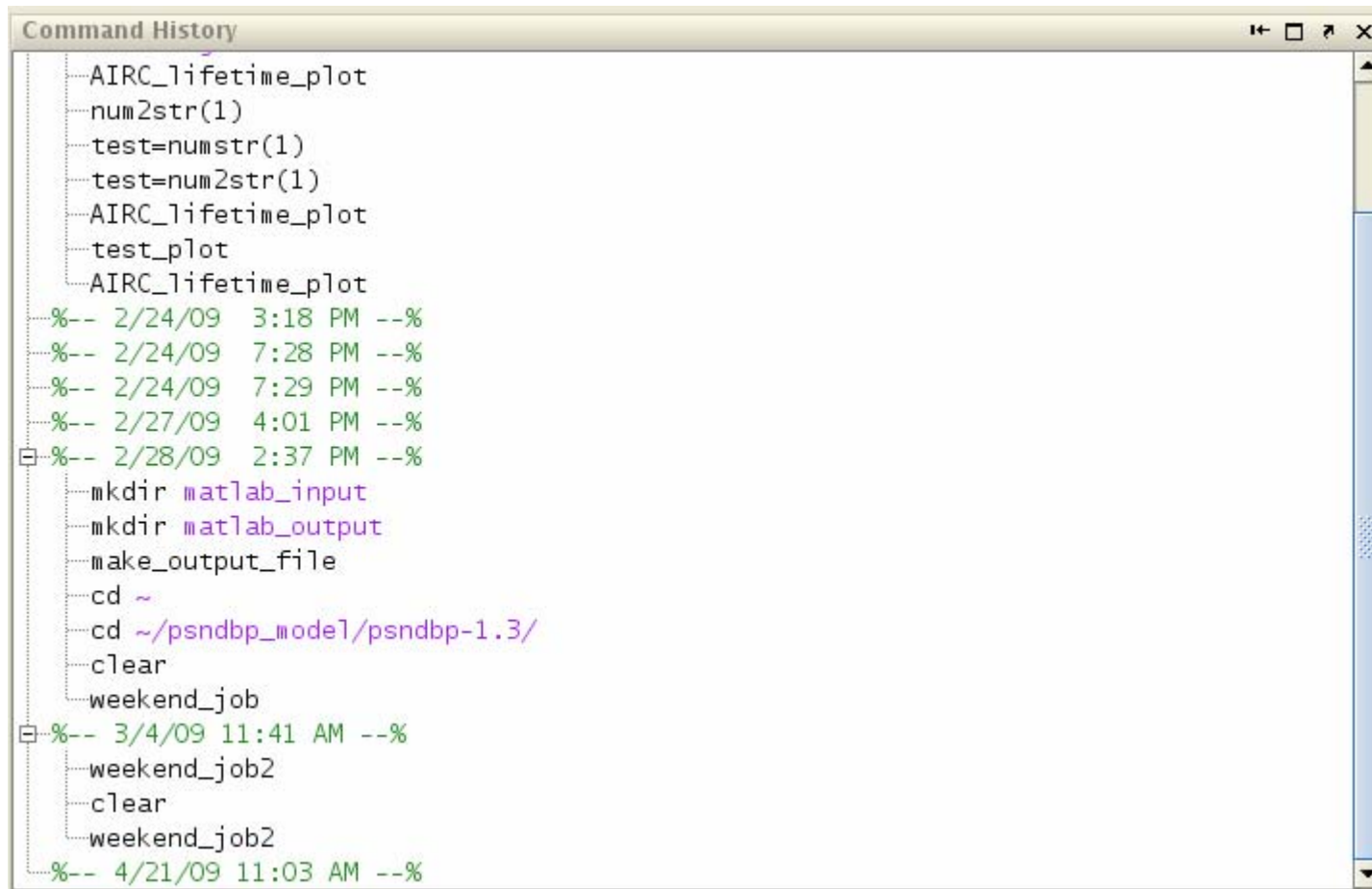
# MATLAB GUI – Workspace



# MATLAB GUI – Variable Editor



# MATLAB GUI – Command History



```
Command History
-----
AIRC_lifetime_plot
num2str(1)
test=numstr(1)
test=num2str(1)
AIRC_lifetime_plot
test_plot
AIRC_lifetime_plot
%-- 2/24/09 3:18 PM --%
%-- 2/24/09 7:28 PM --%
%-- 2/24/09 7:29 PM --%
%-- 2/27/09 4:01 PM --%
%-- 2/28/09 2:37 PM --%
  mkdir matlab_input
  mkdir matlab_output
  make_output_file
  cd ~
  cd ~/psndbp_model/psndbp-1.3/
  clear
  weekend_job
%-- 3/4/09 11:41 AM --%
  weekend_job2
  clear
  weekend_job2
%-- 4/21/09 11:03 AM --%
```

# MATLAB GUI – Additional Windows

- Editor window
  - Will discuss next week with scripts and functions
- Figure window
  - Will discuss in two weeks with graphics

# MATLAB Help

- Three common ways to access:
  - Type `help topic` at command line
  - Select help from drop-down menus (opens help window)
  - Mathworks website
  - `help`, `helpwin`, `helpdesk`
- MATLAB help is very comprehensive

# MATLAB Resources

- Getting Started with MATLAB 7 (Pratap)
- Mastering MATLAB 7
- Additional online resources
  - A note of caution: methods that work in earlier versions of MATLAB do not necessarily work in later versions. Deprecated options are not obvious, so basically you just need to test them out. Generally dealing with objects (figures) has shown the most change.

# Variables – Types

- Numeric
- Logical
- Strings and Character (discussed further with file I/O)
- Cell arrays and structures (discussed further with file I/O)
- Function handles (discussed further with graphics)

# Variables – Names

- Must start with a letter
- Can contain any combination of letters, digits, and underscores
- Distinguishes between upper and lower case
- Don't use function names
  - `namelengthmax`, which `-all var_name`,  
`isvarname`

# Variables – Names

- Special functions that are already defined, but can be overwritten (temporarily)
  - pi, i, j, eps, realmin, realmax, Inf, NaN

# Operations

- + Addition
- - Subtraction
- \* Multiplication
- / Division
- ^ Power
- ' Matrix transpose
- () Specify order

# Order of Operations

- Standard order of operations is enforced in MATLAB
  - Parentheses
  - Exponentiation
  - Multiplication and Division
  - Addition and Subtraction
- When in doubt, add parentheses
- MATLAB can help you keep track of ()

# Elementary functions

- abs
- sqrt
- exp
- sin

# Logical Operations

- `&`, `|`, `~`, `xor`
- `&&`, `||`
- `==`, `~=`, `<`, `>`, `<=`, `>=`

# Arrays and Matrices

- MATLAB is designed for use with matrices, so many functions are optimized for matrix use
- This will be discussed further next week

Questions?