ICME REFRESHER COURSE

MATLAB SECTION

RYAN LI

LECTURER

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Research Interests

- Distributed-memory parallel computing
- Hierarchical matrix
- Fast algorithm
- 3D reconstruction

DIFFERENTIAL EQUATIONS LECTURE

Monday, Sep 15 9:00am – 10:15am

- Matlab

Monday, Sep 15 10:30am – 11:45am

- Matlab + Ordinary Differential Equations

Tuesday, Sep 16 9:00am – 10:15am

- ODE

Wednesday, Sep 17 9:00am – 10:15am

- Numerical ODE

Thursday, Sep 18 9:00am – 10:15am

- Fourier Transform + FFT

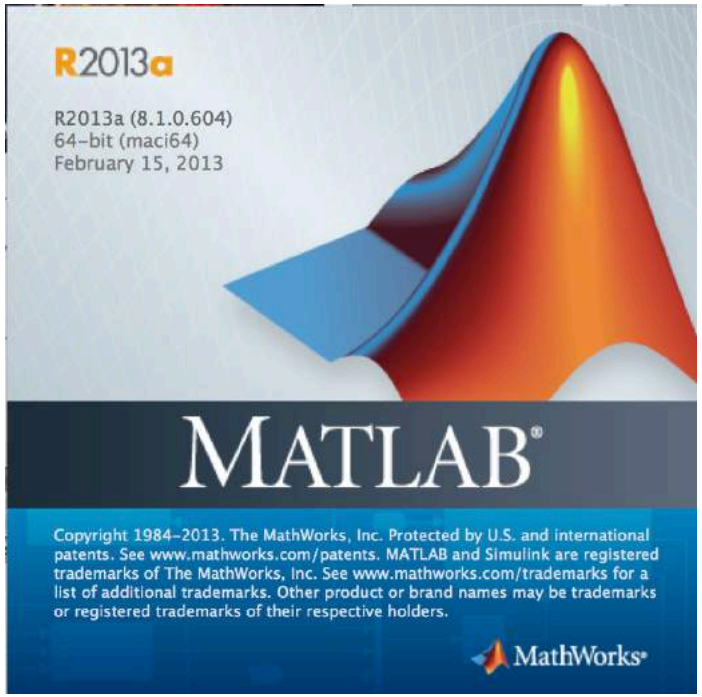
STUDENT BACKGROUND

Type	Number

GOAL

Before	After
Matlab	
Never heard of it	Use it as an advanced calculator
ODE	
Learned it a long time ago	Solve ODEs
Numerical ODE	
	Finite difference method Solve ODEs using Matlab
FT/FFT	
Heard of it	Know details about FFT

TODAY


R2013a
R2013a (8.1.0.604)
64-bit (maci64)
February 15, 2013
MATLAB®
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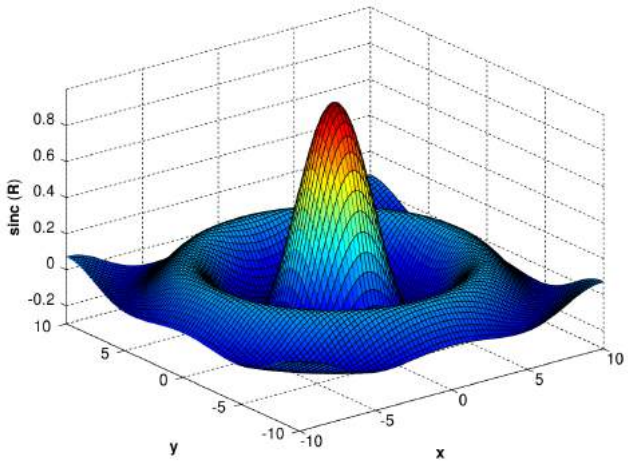

sinc (R)
0.8
0.6
0.4
0.2
0
-0.2
10
5
0
-5
-10
y
-10
-5
0
5
10
x

START MATLAB

Matlab @Stanford Corn

- corn.stanford.edu
- https://web.stanford.edu/group/farmshare/cgi-bin/wiki/index.php/Main_Page

Matlab individual license

- https://itservices.stanford.edu/service/softwarelic/matlab
- https://itservices.stanford.edu/service/softwarelic/student/matlab

START MATLAB

Linux

- ssh -Y SUNetID@corn.stanford.edu

Mac

- Install XQuartz (http://xquartz.macosforge.org/trac)
- ssh -Y SUNetID@corn.stanford.edu

Windows

- Install PuTTY (http://www.chiark.greenend.org.uk/~sgtatham/putty/)
- Install Xming (http://www.straightrunning.com/XmingNotes/)
- ssh -Y SUNetID@corn.stanford.edu

START MATLAB

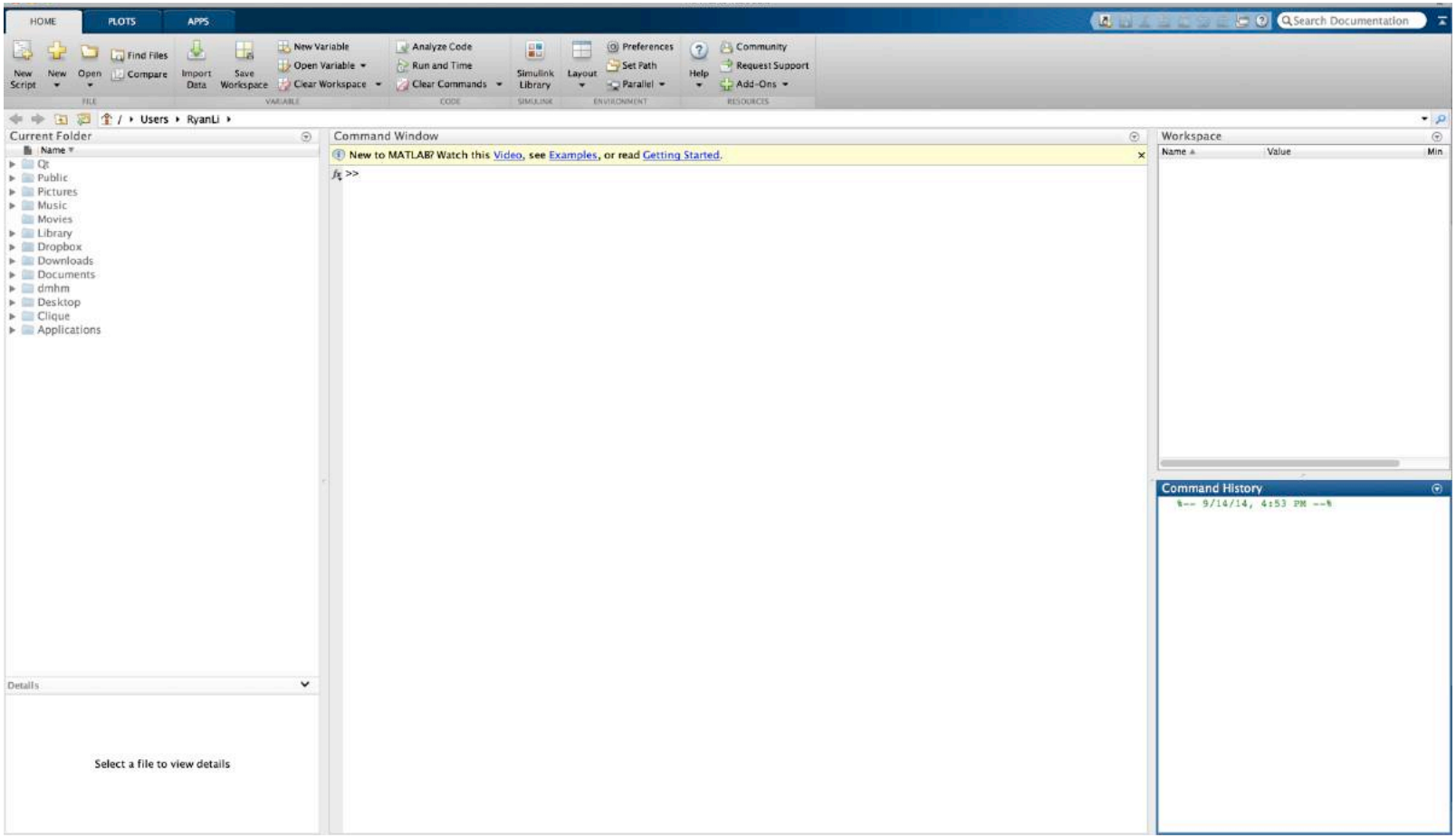
Laptop

- matlab &

Corn

- module load matlab
- matlab &

START MATLAB



COMMAND WINDOW

Advanced Calculator

- +, -, *, /, ^, >, >=, <, <=, &, |
- sin(), cos(), exp(), sqrt(), tan()
- mod(), floor(), ceil(), round()
- Inf, NaN, pi, i

Variables

- a = 2
- b = 3
- c = a+b
- who/whos

COMMAND WINDOW

Help System

- help sin
- help mod

Clean

- clear a b c
- clear all
- clc
- close()
- close all

VECTOR AND MATRIX

Vector

- heights = [1.83 1.72 1.92 1.87]
- heights = [1.83,1.72,1.92,1.87]
- heights = [1.83;1.72;1.92;1.87]
- vec = rand(100,1);

Matrix

- A = [1 2;3 4]
- B = [2,1;4,5]
- Mat = rand(100,100);

MATRIX OPERATORS

Matrix

- A = [1 2;3 4]
- B = [2,1;4,5]
- A+B
- A-B
- A*B
- A/B
- A\B
- A.*B
- A./B

MATRIX OPERATORS

Matrix

- 1:100
- 1:2:100
- 100:-3:1
- A = rand(100);
- B = A(1:10,:);
- B = A(1:2:10,end);
- B = A(:,1:3:end);

SCRIPT

Comment

- %
- %%

Breakpoints

- Step
- Step in
- Step out
- Continue

Profile

- Profile on
- Profile viewer

PLOT

Plot

- x = (1:100)/100*2*pi;
- y = sin(x);
- plot(x,y);

Log plot

- x = 1:10;
- y = exp(-x);
- semilogx(x,y)
- semilogy(x,y)
- loglog(x,y)

PLOT

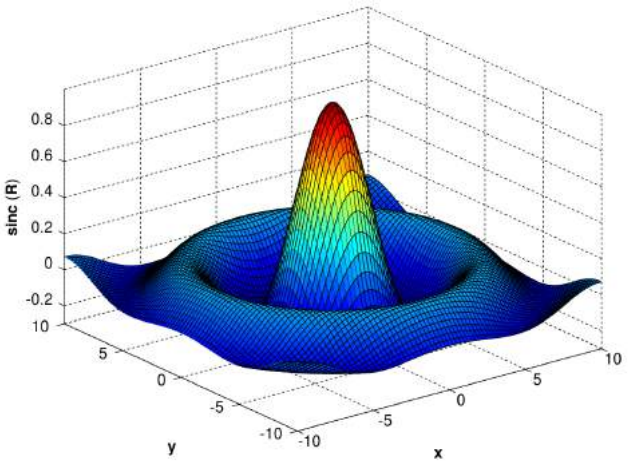
- title
- xlabel
- ylabel
- axis
- xlim
- ylim
- legend

3D PLOT

- x = -2:0.1:2;
- y = -pi:0.1:pi;
- [X Y] = meshgrid(x,y);
- Z = sin(Y).*X;
- surf(X,Y,Z);

EXERCISE

$$\operatorname{sinc}\left(\sqrt{\left(\frac{x}{\pi}\right)^2+\left(\frac{y}{\pi}\right)^2}\right)$$



SOLUTION

- [X,Y] = meshgrid(-10:0.25:10,-10:0.25:10);
- f = sinc(sqrt((X/pi).^2+(Y/pi).^2));
- surf(X,Y,f);
- axis([-10 10 -10 10 -0.3 1]);
- xlabel('\bf{x}' ,'interpreter','latex')
- ylabel('\bf{y}')
- zlabel('f')

SUGGESTIONS

- Matlab help
- Google