Where to Go Next

Outline

• Announcements:
  - Homework IV due Friday by 5, by e-mail
  - Absolutely no exceptions!
  - Answers will be posted on web
  - I will be available during office hours & by appt.
  - Homework III: answers on web
• Homework III
• What you know
• What I haven't told you, & where to find out more
• Course Evaluations

Homework III

• Most did well
• Randvals
  - Lots of different ways to get normal dist. random numbers
    • I like randn since it's a "core" function
    • randvals(j,:) = randn(1,n)*mean_sd(j,2)+mean_sd(j,1);
goodrows

• Key is to create notnans--matrix with 1’s where x is good

\[
\text{notnan} = \neg \text{isnan}(x)
\]

\[
\begin{array}{c}
1 & 2 & \text{nan} & 7 \\
2 & 5 & 8 \\
\text{nan} & 6 & \text{nan}
\end{array}
\quad
\begin{array}{c}
1 & 0 & 1 \\
1 & 1 & 1 \\
0 & 1 & 0
\end{array}
\]

if(isnan(bad))
else %bad is a value (-99)

\[
\begin{array}{c}
1 & -99 & 7 \\
2 & 5 & 8 \\
-99 & 6 & -99
\end{array}
\quad
\begin{array}{c}
1 & 0 & 1 \\
1 & 1 & 1 \\
0 & 1 & 0
\end{array}
\]

notnan=(x~=bad)

Once you have notnan, loop I gave will work:

\[
\begin{array}{c}
1 & 0 & 1 \\
1 & 1 & 1 \\
0 & 1 & 0
\end{array}
\]

\[
\begin{array}{c}
1 & 0 & 1 \\
1 & 1 & 1 \\
0 & 0 & 0
\end{array}
\]

\[
\begin{array}{c}
1 & 0 & 1 \\
1 & 1 & 1 \\
0 & 0 & 0
\end{array}
\]

%goodrows

Some Advice

• Key ingredients for computational success:
  - Confidence!—you know a lot and you know where to look for what you don't know
  - Planning!—work it out on paper, then with small examples, then with real data
### What Do You Know?

- You know enough Matlab to solve any of these problems

<table>
<thead>
<tr>
<th>Data</th>
<th>Program</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currents</td>
<td>SSA</td>
<td>Geostropic eq.</td>
</tr>
<tr>
<td>Weather</td>
<td>T,V,M</td>
<td>Total diff.</td>
</tr>
<tr>
<td>Bioinformatics</td>
<td>ATCGCGTA...</td>
<td>Search for genes</td>
</tr>
<tr>
<td>Electronics</td>
<td>Figurative</td>
<td>FFT</td>
</tr>
</tbody>
</table>

### What Do You Know?

- You know how to
  - get ASCII and binary data into Matlab
  - data are stored in arrays (vectors, matrices, ND-arrays)
  - Manipulate data with array operations
    - find, relational and logical operators
  - get data out of Matlab

### What Do You Know?

- You know that Matlab has built in functions for
  - statistics
  - graphics
  - solving ODE's
  - optimization
  - signal processing
What I Haven’t Told You

- Matlab has lots of functions, and you’ll never know them all
  - learn about functions through
    - help, helpwin, or help browser (through GUI)
    - www.mathworks.com

What I Haven’t Told You

- Other important packages
  - splines (turn anything into a smooth function)
  - finance (follow the money)
  - mapping (explore your world)
  - Simulink (GUI for creating dynamical systems)

What Do You Know?

- You know how to extend Matlab’s capabilities through functions
  - function [outputs]=fname(inputs);
- And that Matlab is a procedural programming language
  - Iterations with for & while loops
  - Conditionals with if-elseif-else-end
  - error(string)
- And that Matlab functions can be polymorphic
  - nargin, varargin, etc.
What Do You Know?

- You know how to create strings in Matlab:
  - "[]
  - int2str, num2str
- You know how to manipulate strings:
  - just like arrays
  - find, findstr
  - str2num

What I Haven’t Told You

- You can construct commands with strings and execute with eval:
  for j=1:9;
    k=int2str(j);
    eval(['newvar',k,'=rand(10,1);']);
    eval(['save newvar',k,' newvar',k]);
  end

What I Haven’t Told You

- Matlab is more than just arrays of doubles:
  - structs—similar to C-structs or Java objects
    - Create a variable called student with fields:
      - student(1),name="Pershing" %string with student’s name
      - student(1).id=55552 %ID number
      - student(1).balance=0.52 % balance on bank account
      - student(1).hold=true % Bursar hold status (always true)
    - Get data out with student.fieldname
      - student(1).id
      - ans= 55552
  - Struct functions
    - struct, rmfield, isfield, getfield, fieldnames
What I Haven’t Told You

- Cell-arrays are arrays of anything
  - C=cell(3,1); %creates a cell-array with 3 elements
  - C(1)=[1:3]; C(2)=student; C(3)=randn(1000);
- Cell-arrays are especially useful for holding text data
  - C{1}="This is a long line"
  - C{2}="short line"
  - disp(C)
    This is a long line
    short line

Other Scientific Computing Courses

- CS421--Introduces basic concepts and issues in scientific computing and numerical analysis
- CS621, CS622, CS624--Advanced scientific computing and numerical analysis (Matrices, Optimization, ODE/PDE’s)
- Math and Applied Math offer courses on linear algebra, ODE/PDE’s
- Domain-specific courses in your department

Other Scientific Computing Courses

- CIS Tools Curriculum
  - Fall: MATLAB
    - 401: the basics
    - 402: visualization (starts Monday!)
  - Spring: General tools
    - 403: Developing scientific computer programs
      (compilers, debuggers, managing large projects)
    - 404: Numerical libraries
Evaluations

- Please give me as much data as you can
  - specific lecture/topics you liked & those you didn't
  - other topics to cover?
  - Tools Curriculum & mini-course format?