



# MATLAB Programming

## More File Input and Output



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## Why print to the screen?

Debugging.

Status updates.

Auditing.

Programming tip: iterative algorithms that might take a long time should have a status printout.

Programming tip: all status outputs should be optional.

Power iteration algorithm . find largest eigenvalue.

Large, sparse matrices

Google's PageRank

$$b_{k+1} = A b_k / \| A b_k \|$$

## Compute power iteration:

```
stop_criteria = 1e-5;  
b = zeros(length(A));  
b_new = ones(length(A));  
while norm(b-b_new,1) > stop_criteria  
    b = b_new;  
    b_new = A * b / norm(A * b);  
end
```

```
>> A = rand(10000,10000);
>> b = power_iteration(A)
        ... wait a while ...

b =
[...
...
...];
```

How do you know if it is still running?

Poor idea:

```
while norm(b-b_new,1) > stop_criteria
    b = b_new;
    b_new = A * b / norm(A * b);
    norm(b-b_new,1)
end
```

Poor idea:

```
while norm(b-b_new,1) > stop_criteria
    b = b_new;
    b_new = A * b / norm(A * b);
    norm(b-b_new,1)
end
```

No semicolon



Better idea:

```
i = 0;
while norm(b-b_new,1) > stop_criteria
    b = b_new;
    b_new = A * b / norm(A * b);
    fprintf('Iteration %d: %f\n',
        i, norm(b-b_new,1));
    i = i + 1;
end
```



```
>> b = power_iteration(A);  
Iteration 0: 968.382585  
Iteration 1: 0.008139  
Iteration 2: 0.000151  
Iteration 3: 0.000003  
>>
```

```
fprintf(format, value1, value2, ...)
fprintf(file_handle, format, value1,
        value2, ...)
```

Print formatted text.

format: any string

% is a special character

number of values corresponds to number of %.

```
fprintf('Iteration %d: %f', i, norm(...));
```

```
fprintf(format, value1, value2, ...)
```

Print formatted text.

format: any string

% is a special character

number of values corresponds to number of %.

```
fprintf('Iteration %d: %f', i, norm(...)) ;
```

Interpret as  
integer

Value 1

```
fprintf(format, value1, value2, ...)
```

Print formatted text.

format: any string

% is a special character

number of values corresponds to number of %.

```
fprintf('Iteration %d: %f', i, norm(...)) ;
```

Interpret as  
float



Value 2



Recording a session with diary:

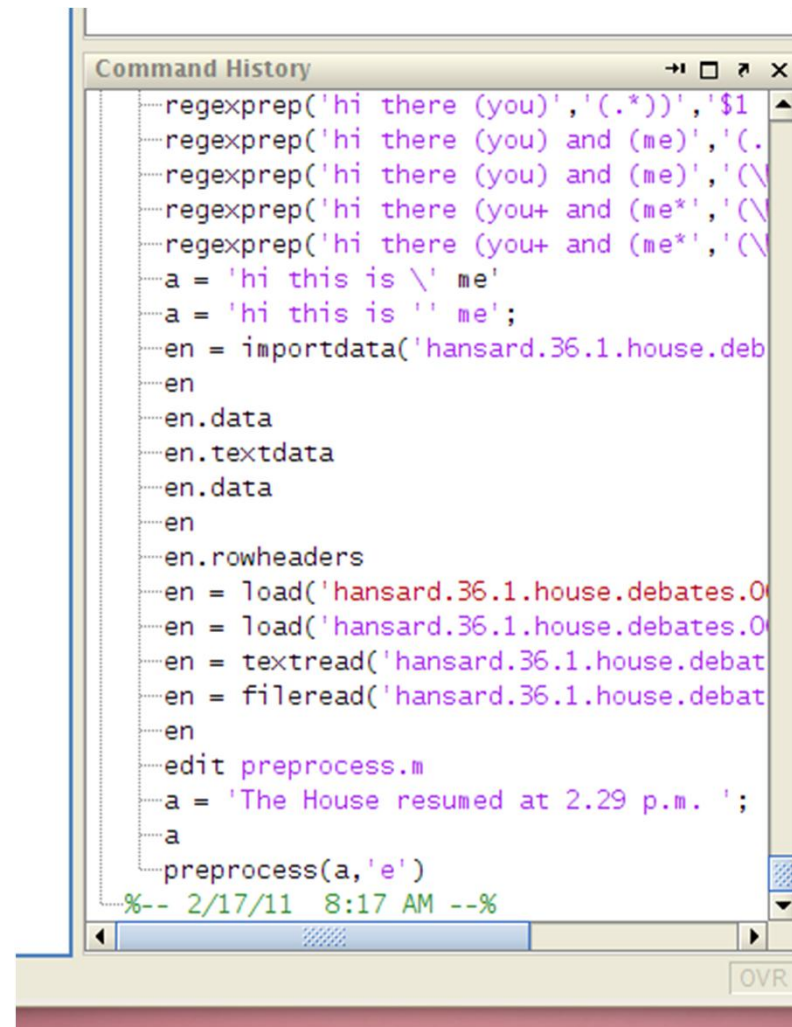
Auditing

Data exploration

What did you do?

Can you repeat it?

MATLAB stores your recent history, but it doesn't include the output.



```

regexprep('hi there (you)', '(.)', '$1')
regexprep('hi there (you) and (me)', '(.)')
regexprep('hi there (you) and (me)', '(\\')
regexprep('hi there (you+ and (me*', '(\\')
regexprep('hi there (you+ and (me*', '(\\')
a = 'hi this is \' me'
a = 'hi this is ' me';
en = importdata('hansard.36.1.house.deb
en
en.data
en.textdata
en.data
en
en.rowheaders
en = load('hansard.36.1.house.debates.0
en = load('hansard.36.1.house.debates.0
en = textread('hansard.36.1.house.debat
en = fileread('hansard.36.1.house.debat
en
edit preprocess.m
a = 'The House resumed at 2.29 p.m. ';
a
preprocess(a, 'e')
%-- 2/17/11 8:17 AM --%

```

History doesn't store output

Diary stores partial output:

- Spot function changes.

- Spot data changes.

```
>> diary saved_2_16_2011.txtq  
>> do stuff ñ  
    ñ .  
>> ñ  
  
>> diary off
```

Diary record stored in saved\_2\_26\_2011.txt.



Saving data: there is no magic bullet like  
`importdata`.

Several methods exist:

`save`

`xlswrite`

`saveas`

`auwrite`

`dlmwrite`

`wavwrite`

`imwrite`

## Saving data:

### 1) Save for later retrieval in MATLAB

- MAT files are smaller and hold all of your variables.
- Text files are larger and hold one variable, but they don't rely on MATLAB.
- XML or other formatted options.

### 2) Export for use by another program

## Saving data:

- 1) Save for later retrieval in MATLAB
- 2) Export for use by another program
  - Use one of the many functions that interpret data as sound, images, video, or other mediums.
  - Video and sound might require special translators called codecs that are available at [MATLAB's File Central](#).



# software carpentry

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