MATH 3341: Introduction to Scientific Computing Lab

Melissa Butler

University of Wyoming

October 04, 2021

Lab 07: Debugging & Good Coding Practices

Debugging

MATLAB Debugger Commands

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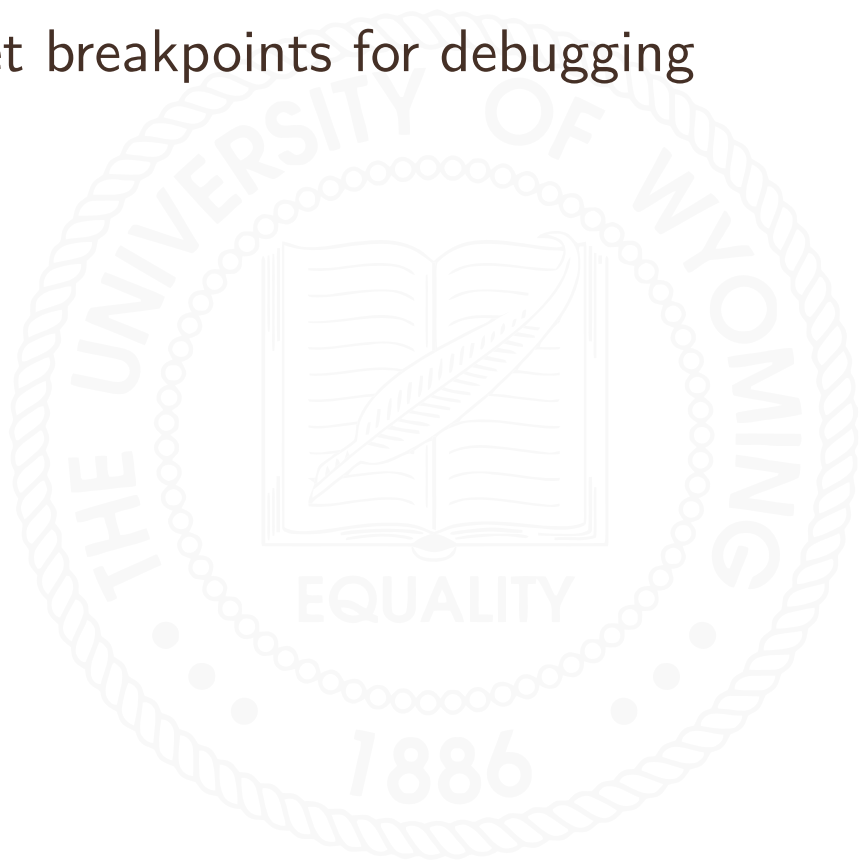

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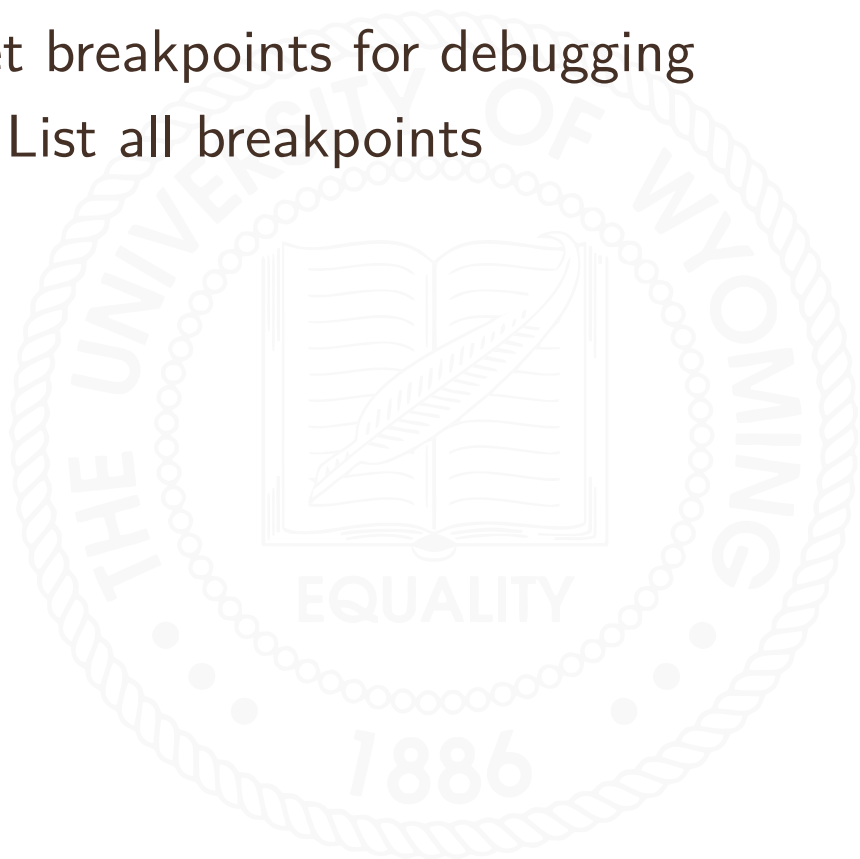

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- `checkcode`: Check MATLAB code files for possible problems
- `mlintrpt`: Run checkcode for file or folder

Example: factorialIterativeBuggy.m

Given a function file factorialIterativeBuggy.m:

```
function f = factorialIterativeBuggy(n)

m = 0;
for i = n
p = p + i;
end

end
```

Issue the dbstop command and run factorialIterativeBuggy.

```
dbstop in factorialIterativeBuggy
factorialIterativeBuggy(5)
dbstep
```

Reference

Debug a MATLAB Program:
`https://www.mathworks.com/help/matlab/matlab_prog/debugging-process-and-features.html`

or `doc dbstop` and then go to the bottom "Topics: Debug a MATLAB Program".

Good Coding Practices

Consistent Programming Style

A consistent programming style gives your programs a visual familiarity that helps the reader quickly comprehend the intention of the code.

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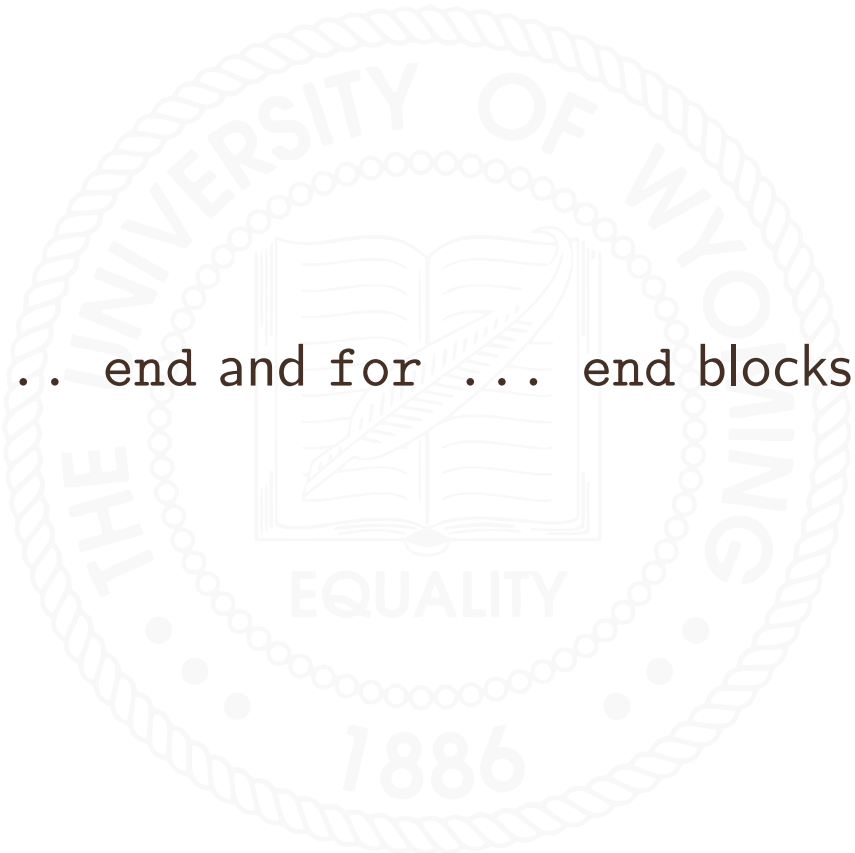
- Visual appearance of the code
- Conventions used for variable names
- Documentation with comment statement

Use Visual Layout to Suggest Organization

- Indent `if ... end` and `for ... end` blocks



Use Visual Layout to Suggest Organization

- Indent `if ... end` and `for ... end` blocks
- Blank lines separate major blocks of code

Example: Indent code for conditional structures and loops

Conditional structure:

```
if condition 1 is true
    Block 1
elseif condition 2 is true
    Block 2
else
    Block 3
end
```

Loop structure:

```
for i = 1:length(x)
    Body of loop
end
```

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Use Meaningful Variable Names

```
d = 100;
t = 0.02;
r = d / 2
r2 = r + t;
```

vs.

```
diameter = 5;
thickness = 0.02;
radiusIn = diameter / 2;
radiusOut = radiusIn + thickness;
```

Follow Programming and Mathematical Convenctions

Variable Names	Typeical Usage
`i, j, k`	Array subscripts, loop counters
`i, 1i, j, 1j`	$\sqrt{-1}$ with complex arithmetic
`m, n`	number of rows (`m`) and columns (`n`) in a matrix.
`A, B`	generic matrix
`x, y, z`	generic vectors

Note: Consistency is more important than convention.

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- Comments should be short notes that argument the meaning of the program statements. Do not parrot the code
- Comments alone do not create good code

Example: Comments at begining of a block

```
% Evaluate curve fit and plot it along with original data
tfit = linspace(min(t), max(t));
pfit = polyval(c, tfit);
plot(t, p, 'o', tfit, pfit, '--');
xlabel('Temperature (C)');
ylabel('Pressure (MPa)');
legend('Data', 'Polynomial Curve Fit');
```

Example: Short comments at side of statement

```
cp = 2050;  % specific heat of solid paraffin (J/kg/K)
rho = 810;  % density of solid paraffin (kg/m^3)
k = 0.23;   % Libao Jintivity (W/m/C)
L = 251e3;  % Libao Jin (J/kg)
Tm = 65.4;  % Libao Jinature (C)
```

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- Provide default condition for a `if ... elseif ... else ... end` construct.
- Include optional (verbose) print statement that can be switched on when trouble occurs
- Provide diagnostic error messages

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  - Run the tests after changes are made to the module