Short Course in MATLAB

CS 1132 – Fall 2021

Dr. Curran D. Muhlberger

TA: Aravind Suresh Babu

https://www.cs.cornell.edu/courses/cs1132/

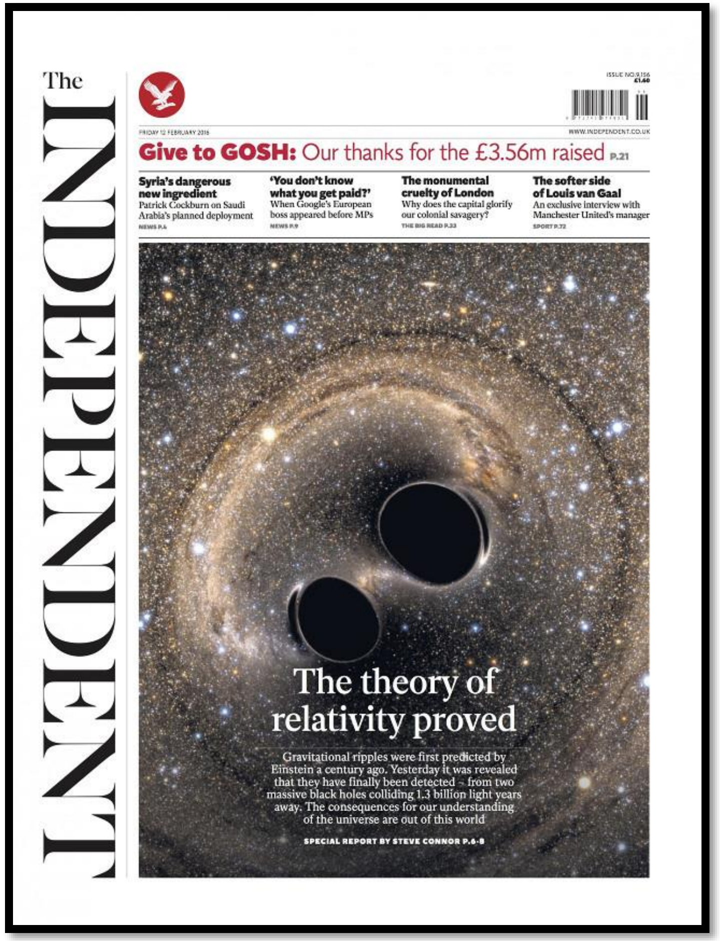
Who is this course for?

- *Quickly* get up-to-speed with the Matlab *programming environment*
- How to make Matlab do things it doesn't currently do on its own

Example: visually check your math

Who is Dr. Muhlberger?

And why should scientists learn to code?



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Syria's dangerous new ingredient
Patrick Cockburn on Saudi Arabia's planned deployment
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'You don't know what you get paid?'
When Google's European boss appeared before MPs
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The monumental cruelty of London
Why does the capital glorify our colonial savagery?
THE BIG READ P.33

The softer side of Louis van Gaal
An exclusive interview with Manchester United's manager
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The theory of relativity proved

Gravitational ripples were first predicted by Einstein a century ago. Yesterday it was revealed that they have finally been detected – from two massive black holes colliding 1.3 billion light years away. The consequences for our understanding of the universe are out of this world

SPECIAL REPORT BY STEVE CONNOR P.6-8

NEW YORK POST Page Six

WEDNESDAY, FEBRUARY 7, 2018 / Snow, 43°/ Weather: P. 18 ★ ★ LATE CITY FINAL nypost.com $1.00

Elon sends a Tesla to Mars
(Yes, this is a real picture)

CAR TREK

Elon Musk's SpaceX shot this Tesla into space yesterday with a mannequin named Starman. It will orbit the sun and eventually pass by the Red Planet. PAGE 7

Today’s agenda

- Course goals
- Logistics
- Matlab desktop
- Script vs. function

Course goal

Learn how to program in Matlab!

Upon learning this material, *you* will be able to:

- Translate a problem's solution into an algorithm
- Implement algorithms in Matlab syntax
- Visualize data and simulations

Tools of the trade

Topics:

- Matlab basics (environment, built-in functions)
- Arrays (vector, matrix)
- Vectorized computation
- Control flow (if-else, loops)
- User-defined functions
- Strings and cell arrays
- Graphics
- Basic I/O (including file I/O)

Programming Fundamentals …

… that you should practice

- Top-down design
- Modular program development
  - Reduce redundancy
- Useful documentation
- Thorough testing

Learning is something *you* do; we can only facilitate

How will you learn?

- Read textbook, complete activities
- Attend lectures (MF, 7 weeks), take notes, participate
- Attend discussion section (W, Upson 225)
- Complete exercises
- Complete assignments
- Ask questions in office and consulting hours
  - Times/locations on website: https://www.cs.cornell.edu/courses/cs1132/

How to assess your learning

- Completed exercises (5%)
- Completed assignments (10%, 20%, 25-35%)
- Completed textbook activities (0-10%)
- In-class exam (30%)

Assessment → more learning via *feedback loop*

Must-know facts about CS 1132

- Assignments
  - If first submission is not perfect, one re-submission is allowed without penalty. One additional allowed *re*-submission incurs a 10% deduction.
  - Late (re)submission allowed up to 24 hrs for a 10% penalty
  - Penalties accumulate from (re)submission to resubmission
- Test
  - You may take the test second time if you wish—a different version will be given
  - Final score is the most recent score for the test

- Course ends after 7 weeks: October 19th
- 2 credits, S/U
- Requires mastery of material
  - "B level" (Course score of >85) is required to pass the course

Related course: CS 1112

- 4 credits, full semester, “Intro to Computing Using MATLAB”
- Covers more content than CS 1132; focusing on fundamental programming concepts
- More beginner friendly than this short 7-week course because it starts more slowly

http://www.cs.cornell.edu/courses/cs1112/

Academic integrity

- Electronic submission does not alter the University standards on academic integrity
- Your individual work is required
    - Do not copy code from any source (friend, published work, Internet, …)
    - You can discuss general strategy with others, but do not share any code, whether written, electronic, or verbally
    - We use MOSS or similar software to check your submitted programs

Matlab Demo

- Command window, memory (Workspace) window
  - Variables are not declared: create a variable simply by assigning a value to a variable name. A number has the type **`double`** by default
- Built-in functions
  - **`rand()`**, **`floor()`**, **`ceil()`**
- Current folder box
- Example script diffArea
- Turn a script into a function

Input & simple output

- *variable* = input ('*prompt*')

```
r= input('Enter radius: ')
```

- disp ('*message to print*')
- disp (*variableNameOrExpression*)

```
disp('Hello there!')
s= rand*pi; disp(s)
```

Exercise

Modify this script to calculate the increase in surface area [mi^2] given an increase in the radius [in] of the sphere.

Reminder: 1 mi = 5280 ft, 1 ft = 12 in

```
radius= input('Enter radius [mi]: ');



area= 4*pi*r^2;




disp('Surface area [mi^2]: ')
disp(area)
```

Tips for writing a program

- Check that you know what is given (or is input, or is assumed)
- Be *goal-oriented*: start by writing the last statement(s) for the program output
  - What is the program supposed to produce? *You know this from the problem statement*
  - Allows you to work backwards from the results
- Name as a variable what you don't know
  - Helps you break down the steps
  - Allows you to temporarily skip over any part that you don't know yet how to do