Week 1: Course Introduction

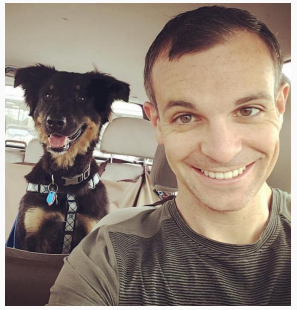
EMSE 6574, Section 11

John Helveston
August 26, 2019

Meet your instructor!

Dr. John Helveston

Assistant Professor in Engineering Management & Systems Engineering



Background:

- 2016 PhD in Engineering & Public Policy at Carnegie Mellon University
- 2015 MS in Engineering & Public Policy at Carnegie Mellon University
- 2010 BS in Engineering Science & Mechanics at Virginia Tech

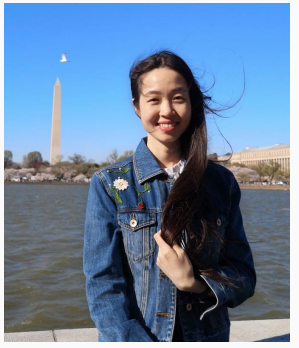
Meet your tutors!

Yanjie He

Masters student in Data Analytics

Lingmei Zhao

Masters student in Statistics



Meet your classmates!

Get to know your neighbor! Turn to a neighbor and in 2 minutes, share:

- Your name
- Your program
- Something notable you did over the summer

Afterwards: let's here from a few of you - tell us something you learned!

Course orientation

- Everything you'll need will be on the course website:

  https://emse6574-gwu.github.io/2019-Fall/

- Course is broken into two main chunks:
  - 1) *Programming*...for
  - 2) *Data Analytics*

- Go to the "Resources" page for help:
  - Use Slack to ask questions.
  - Go to Office hours / tutor sessions

Assignments & Grades

Standard Grading

Course Component	Weight	Notes
Homeworks (6)	30%	Lowest is dropped
Quizzes (5)	15%	Lowest is dropped
Midterm Exams (2)	30%	Lowest is half-weighted
Final Exam	20%	
Attendance & Participation	5%	

AMD Grading

- Intended for students who struggle early on, but work hard to succeed in 2nd half.
- Highest grade with AMD is a C.
    - Homeworks: From 30% -> 20%
    - Midterms: From 30% -> 20%
    - Final: From 20% -> 40%

Course policies

Basic policies

- **BE NICE. BE HONEST. DON'T CHEAT.**
- Write your own code (even in "collaborative" assignments)

Late submissions

- **5** late days - use them however you want.
- You can't use more than **2** late days on any one assignment.

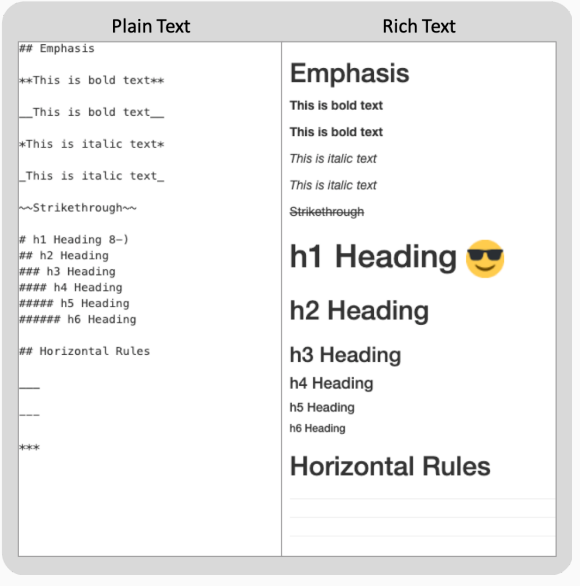
How to succeed in this class

- Take care of your brain
  - Sleep!
  - Exercise!
  - Eat good food!

- Don't cheat!
- Start HW early! Come to office hours / tutor sessions!

Course Mantras

Embrace plain text



Everything you do should be *reproducible*.

Example: RMarkdown -> HTML. This presentation was generated from R code!

Install R & Rstudio

Go to "Getting Started" lesson

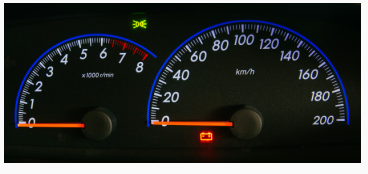
After installed:

Open this:

Not this:

R: Engine

RStudio: Dashboard



R as a calculator

Basic operators:

- Addition: `+`
- Subtraction: `-`
- Multiplication: `*`
- Division: `/`

Other important operators:

- `^`
- `%/%`
- `%%`

Relational operators

Compare if condition is `TRUE` or `FALSE` using:

- Less than: `<`
- Less than or equal to : `<=`
- Greater than or equal to: `>=`
- Greater than: `>`
- Equal: `==`
- Not equal: `!=`

Logical operators

Assess logical statements using:

- And: `&`
- Or: `|`
- Not: `!`

Other important points

- Order of operations - when in doubt, add `( )`
- R ignores excess spacing
- Use `#` for comments

Use RProjects to stay organized

`File > New Project...`

Get path to current "working directory":

`getwd()`

Save your code in .R Files:

`File > New File > R Script`

Break time

3 minute break

Functions

Funtions take this form:

```
name(argument)
```

Examples:

Function	Description	Example
`exp()`	Exponential	`exp(0)` returns `1`
`sqrt()`	Square root	`sqrt(64)` returns `8`
`log(x)`	Natural log of `x`	`log(1)` returns `0`
`factorial()`	Factorial	`factorial(5)` returns `120`
`round(x, digits=0)`	Round `x` to the `digits` decimal place	`round(3.1415, 2)` returns `3.14`
`abs(x)`	Absolute value of `x`	`abs(-42)` returns `42`

What would this produce?

```
sqrt(1 + abs(-8))
```

Objects

Object assignments take this form:

```
objectName <- value
```

Name objects with descriptive *words*; case matters:

- `snake_case_is_one_choice`
- `other.people.use.periods`
- `camelCaseIsAlsoGood`

To see all objects, use:

```
ls()
```

Data Types

Type	Description	Example
numeric	Numbers	`3.14`, `42`, `1.61803398875`
integer	A number with no decimal	`1L`, `7L`
character	Text data, a.k.a. "strings"	`"this is a string"`, `"3.14"`
logical	Used for comparing objects	`TRUE`, `FALSE`

To assess the type of any variable:

- `class()` tells us the high level object type
- `typeof()` tells us the low level object type

Checking data types

Check the data type using `is.something()`

```
is.numeric(3.1415)
```

```
## [1] TRUE
```

```
is.integer(3.1415)
```

```
## [1] FALSE
```

```
is.character(3.1415)
```

```
## [1] FALSE
```

```
is.logical(3.1415)
```

```
## [1] FALSE
```

Coercing data types

Force an object into a different type using `as.something()`

```
as.numeric(3.1415)
```

```
## [1] 3.1415
```

```
as.integer(3.1415)
```

```
## [1] 3
```

```
as.character(3.1415)
```

```
## [1] "3.1415"
```

```
as.logical(3.1415)
```

```
## [1] TRUE
```

Installing packages

Add additional functions by installing packages:

```
install.packages("packagename") # This works
install.packages(packagename)   # This doesn't work
```

In each session, load the package with the `library()` function:

```
library("packagename") # This works
library(packagename)   # This also works
```

Final points

Take the survey on Slack about office hours

Interested in Python?

You can take a free 3-day boot camp held on Fridays (9/6, 13, & 20). [link will be posted on Slack]