Teaching Business Statistics and Analytics Using R

Welcome!

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University of South Carolina

Teaching R to Business Students: Why and How?

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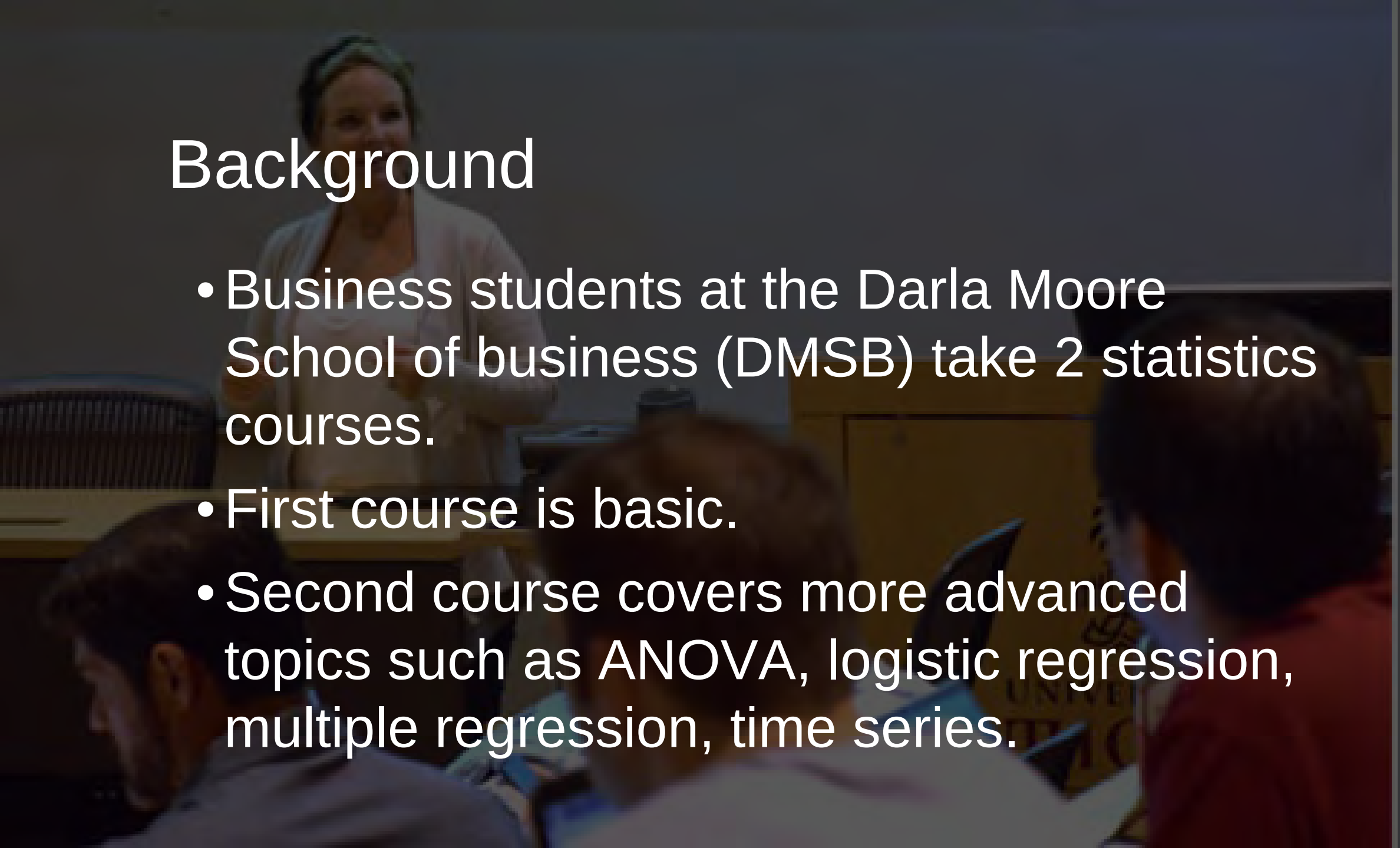
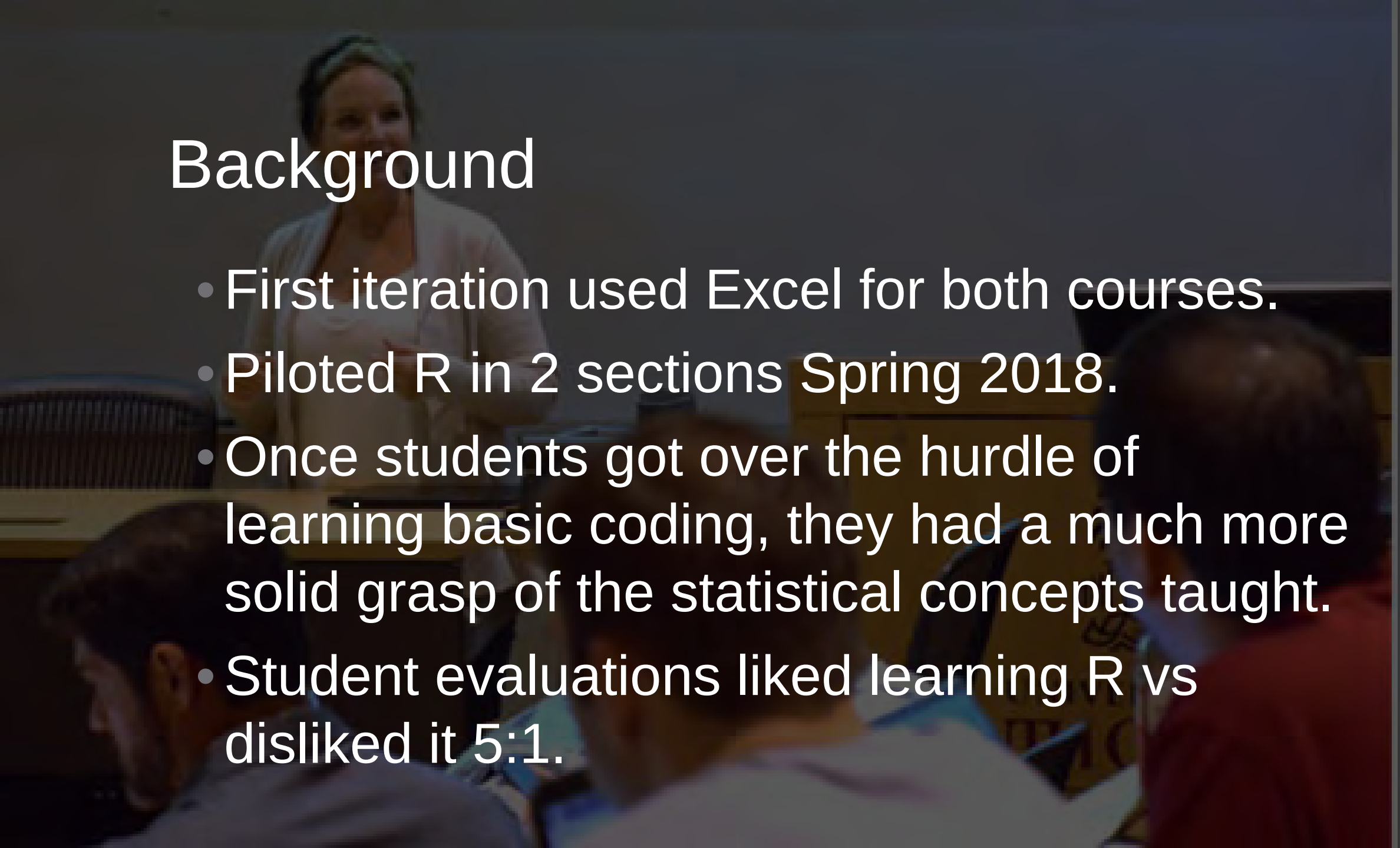


Background

- Business students at the Darla Moore School of business (DMSB) take 2 statistics courses.
- First course is basic.
- Second course covers more advanced topics such as ANOVA, logistic regression, multiple regression, time series.



Background

- First iteration used Excel for both courses.
- Piloted R in 2 sections Spring 2018.
- Once students got over the hurdle of learning basic coding, they had a much more solid grasp of the statistical concepts taught.
- Student evaluations liked learning R vs disliked it 5:1.

Teaching R

- Department chair looked at student evaluations.
- Talked to dean.
- Learning R became mandatory for every section of MGSC 291 Fall 2018.

Student Perception

"*I wish I could've learned more about R. When I took this class I was one of the lucky students to learn how to code in R. I feel that we didn't have much time to develop this amazing skill in class.*"

Student Perception

"*It helped at the career fair to differentiate me from other people. Also, I would love to take more data science courses, and I hope are offered*."

Student Perception

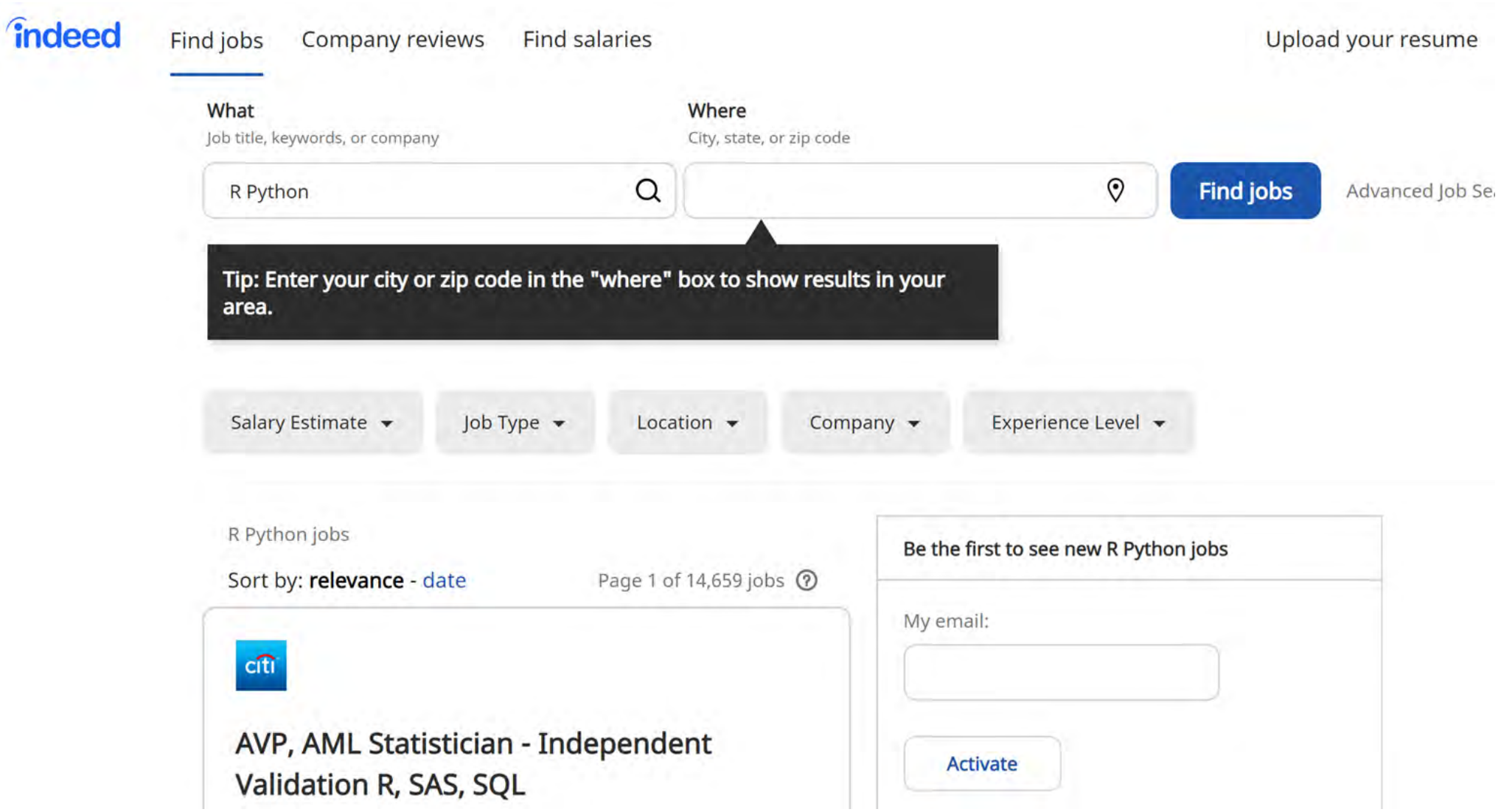
"*Even though sometimes I am not using R directly, the coding language was a good way to understand other coding, like SQL for example*."

Student Perception

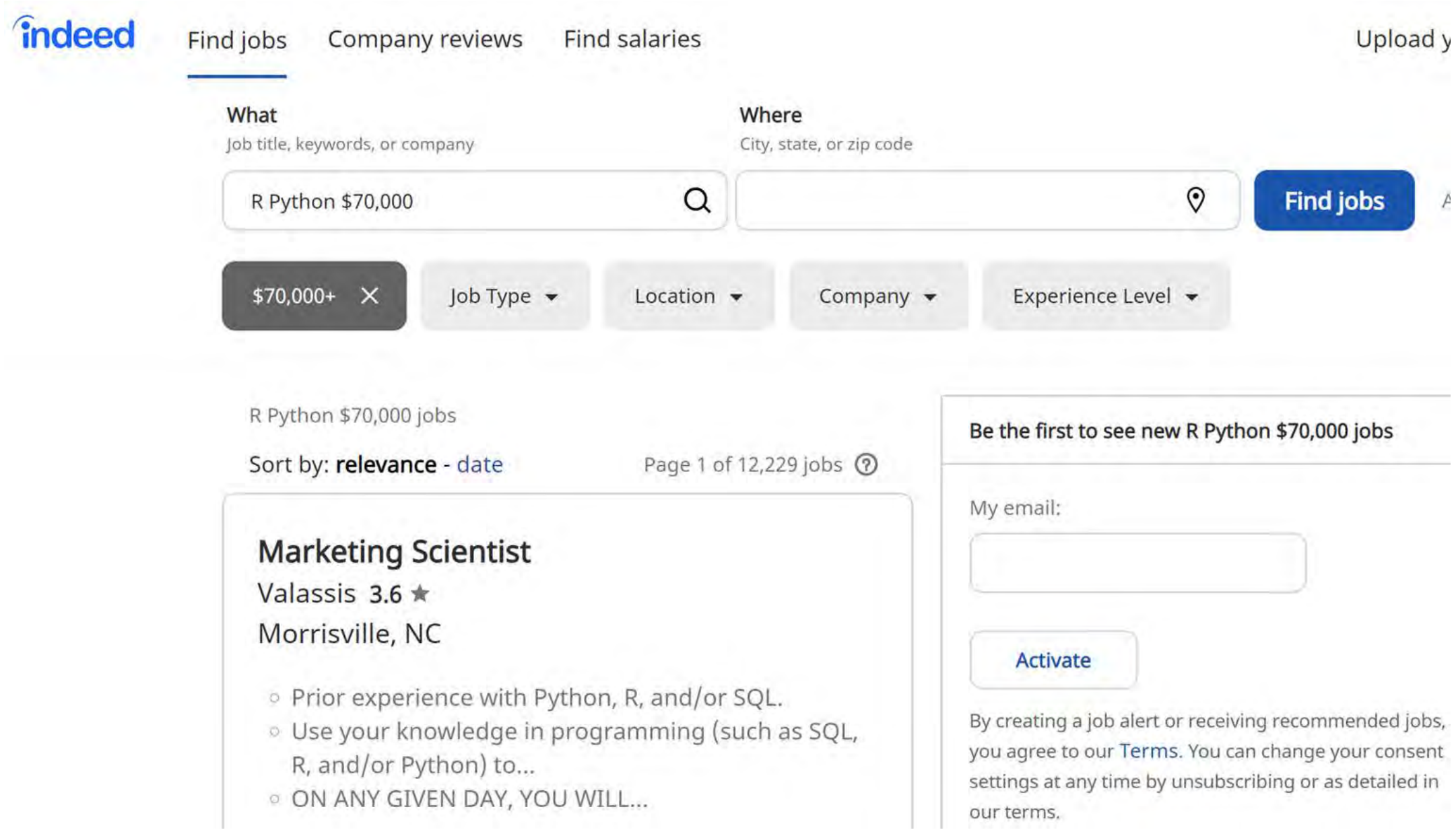
On working with our baseball team

"…*we are currently working on analyzing what makes specific pitches effective (spin rate, vertical break, etc.), developing a more in depth post game box score with more insightful analytics, visualizing data to better explain data, and also preparing scouting reports for them.*"

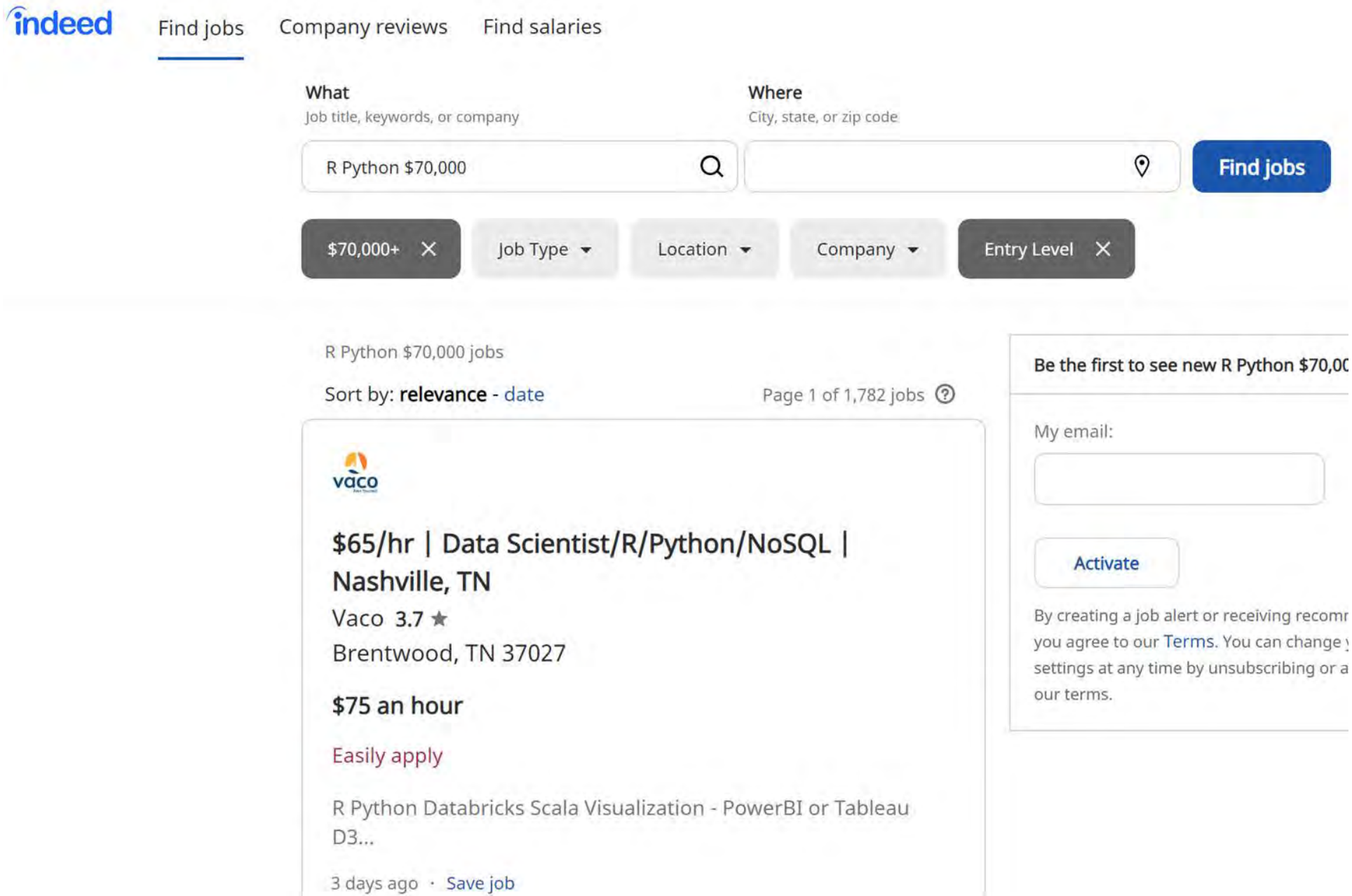
Why R or Python?



Why R or Python?



Why R or Python?



Why R or Python?

“Business analysts at all levels at Amazon … will be much more insightful and productive if they learn how to pull, manipulate, and analyze data using scripting languages.”

“Anyone working with data will need to continue learning and updating their computational (and methodological) skills.”

-**Matt Taddy**

Amazon VP Economic Technology

Chief Economist North America

Teaching R

- Teach R in the first lecture

Teaching R

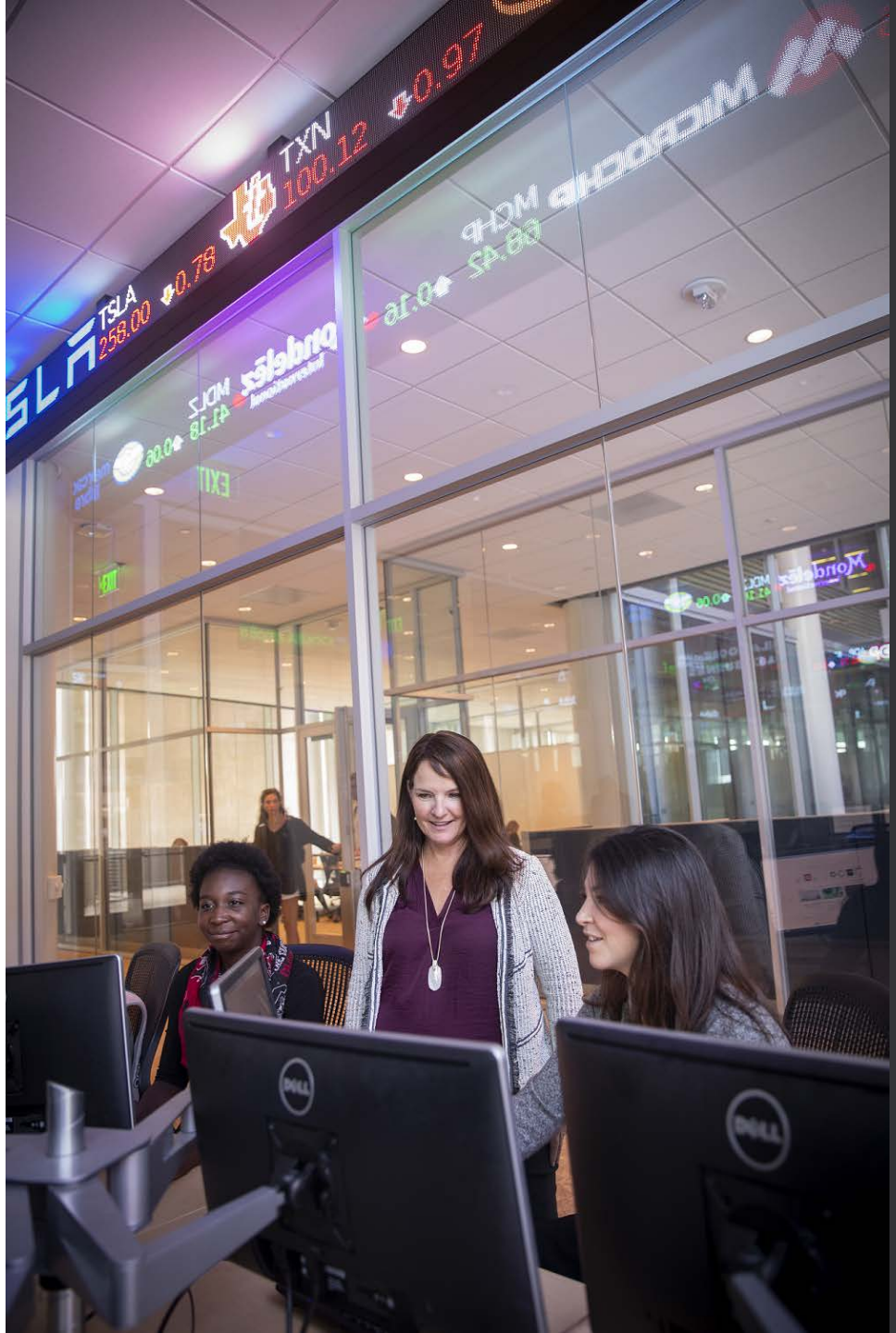
- Incorporate R into lecture slides / videos.
- Demonstrate R in almost every class.
  - Always include R code in slides/notes.
  - Students encouraged to bring laptop to class.

Teaching R

- 3 case studies and 3 projects with R
- Encourage “Googling”

Issues

- Students need support outside of class.
- Students will struggle with transitioning from menu-driven Excel to the coding interface of R.
- Proper level and amount of support yields a much better student experience.



Issues

- Need strategy for large class sizes
- Need strategy for the fully online courses

Data Lab

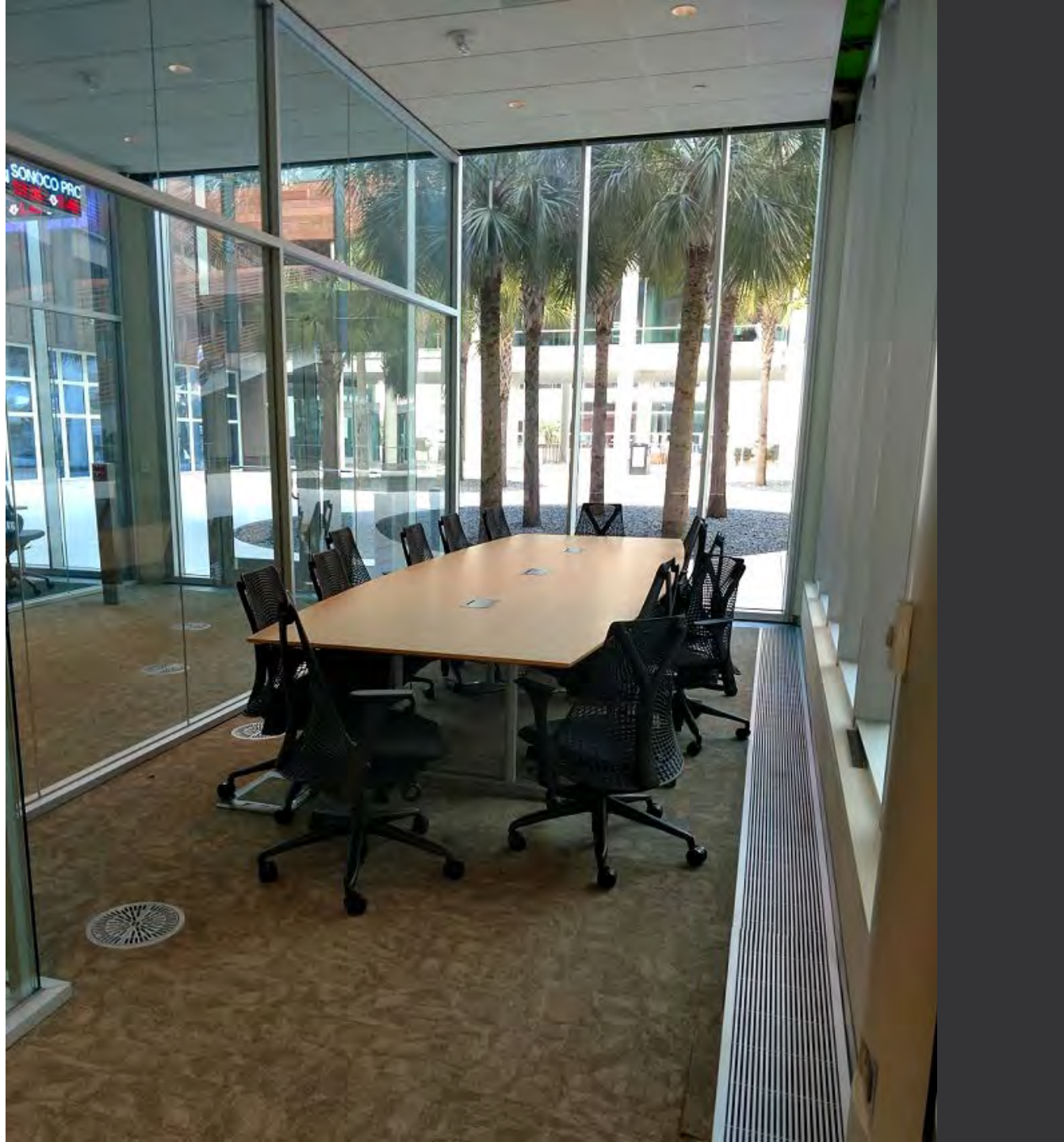
- Fall 2018, MBA students were trained to mentor our students with R and course topics.
  - No dedicated space
  - Not enough hours for 700+ students learning R.
- Spring 2019
  - We have staff!
    - 7 undergraduates, 4 MBAs, 1 PhD

Data Lab

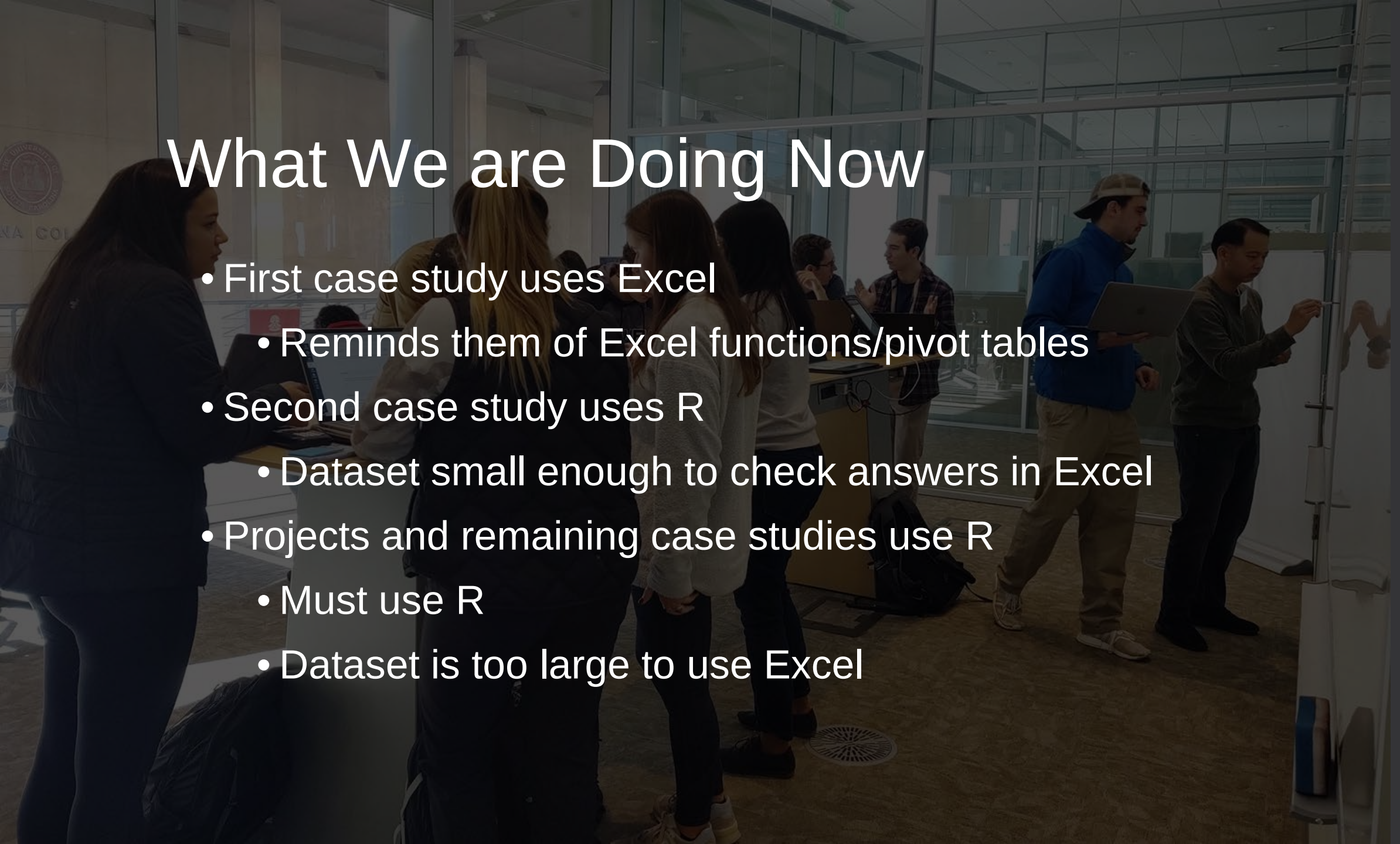
- Fall 2019
  - We have space!
    - 5 undergraduates, 10 MBAs, 1 PhD, and 2 volunteer undergrads
    - Two undergraduate students from computer science

Our Space

Our Space



Data Lab Staff



What We are Doing Now

- First case study uses Excel
  - Reminds them of Excel functions/pivot tables
- Second case study uses R
  - Dataset small enough to check answers in Excel
- Projects and remaining case studies use R
  - Must use R
  - Dataset is too large to use Excel

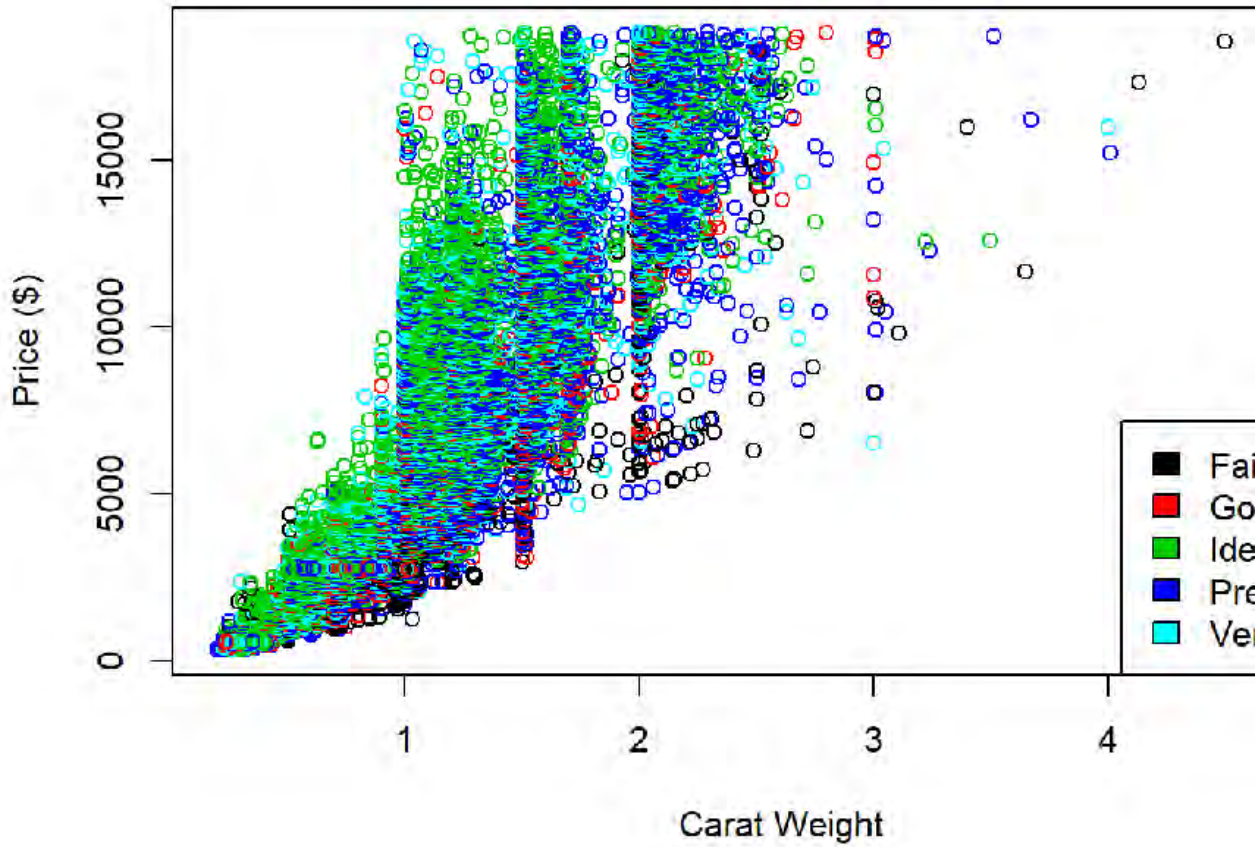
What We are Doing Now

- Data Lab help pages
- R Help pages written using R script file with Markdown formatting
  - rmarkdown package renders the script as an html file

Scatterplot

A scatterplot is a nice way to visualize the relationship between 2 quantitative variables. It se
following scatterplot does this and adds a third variable, cut, to the graph.

```
plot(sparkly$carat,sparkly$price,col=sparkly$cut,xlab="Carat Weight",ylab="Pri
legend("bottomright",fill=1:5,legend=levels(sparkly$cut))
```



What We are Doing Now

Data: case

	De.Identified.ID	AID_YEAR	FUND_TITLE	COLLEGE_DESC	MAJOR_DESC
1	1	1819	Academic Scholar - Superlative	Darla Moore School of Business	Finance
2	2	1819	Garnet Scholar	College of Arts and Sciences	Criminology and Criminal Just
3	3	1819	Academic Scholar - Merit	Darla Moore School of Business	Pre-Business
4	4	1819	Garnet Scholar	College of Engr & Computing	Mechanical Engineering
5	5	1819	Collegiate Scholar	College of Engr & Computing	Computer Engineering
6	6	1819	University Scholar	Darla Moore School of Business	Finance
7	7	1819	Academic Scholar - Merit	Darla Moore School of Business	Pre-Business
8	8	1819	Academic Scholar - Distinction	College of Arts and Sciences	No Major
9	9	1819	Academic Scholar - Distinction	College of Arts and Sciences	Biological Sciences
10	10	1819	Academic Scholar - Merit	College of Arts and Sciences	Experimental Psychology
11	11	1819	Academic Scholar - Merit	College of Engr & Computing	Computer Engineering
12	12	1819	Dean's Scholar	College of Arts and Sciences	Experimental Psychology
13	13	1819	Academic Scholar - Merit	Darla Moore School of Business	Pre-Business
14	14	1819	Academic Scholar - Merit	College of Arts and Sciences	Biological Sciences
15	15	1819	Academic Scholar - Superlative	College of Arts and Sciences	No Major
16	16	1819	Dean's Scholar	College of Engr & Computing	Computer Science
17	17	1819	Garnet Scholar	College of Engr & Computing	Electrical Engineering
18	18	1819	Valedictorian Scholar	College of Engr & Computing	Civil Engineering
19	19	1819	University Scholar	Darla Moore School of Business	Pre-Business

What We are Doing Now

Question 6 10 pts

What is the average cumulative institutional GPA for computer science majors who are freshmen?

```
> case<-read.csv(file.choose(),strings=T)
> attach(case)
> mean(GPA[MAJOR=="Computer Science"&CLASS=="Freshman"])
```

Multiple Choice Exams

Question 2 3.33 pts

What does the following line of R code do?

```
myData <- read.csv("data.csv")
```

- ○ Calls in a dataset and stores it as myData
- ○ Calls in a dataset and stores it as myData.csv
- ○ Calls in a dataset and stores it as data
- ○ Calls in a dataset and stores it as data.csv

Multiple Choice Exams

the probability that less than 105 will generate a profit in their first year

dbinom(105,127,0.8)

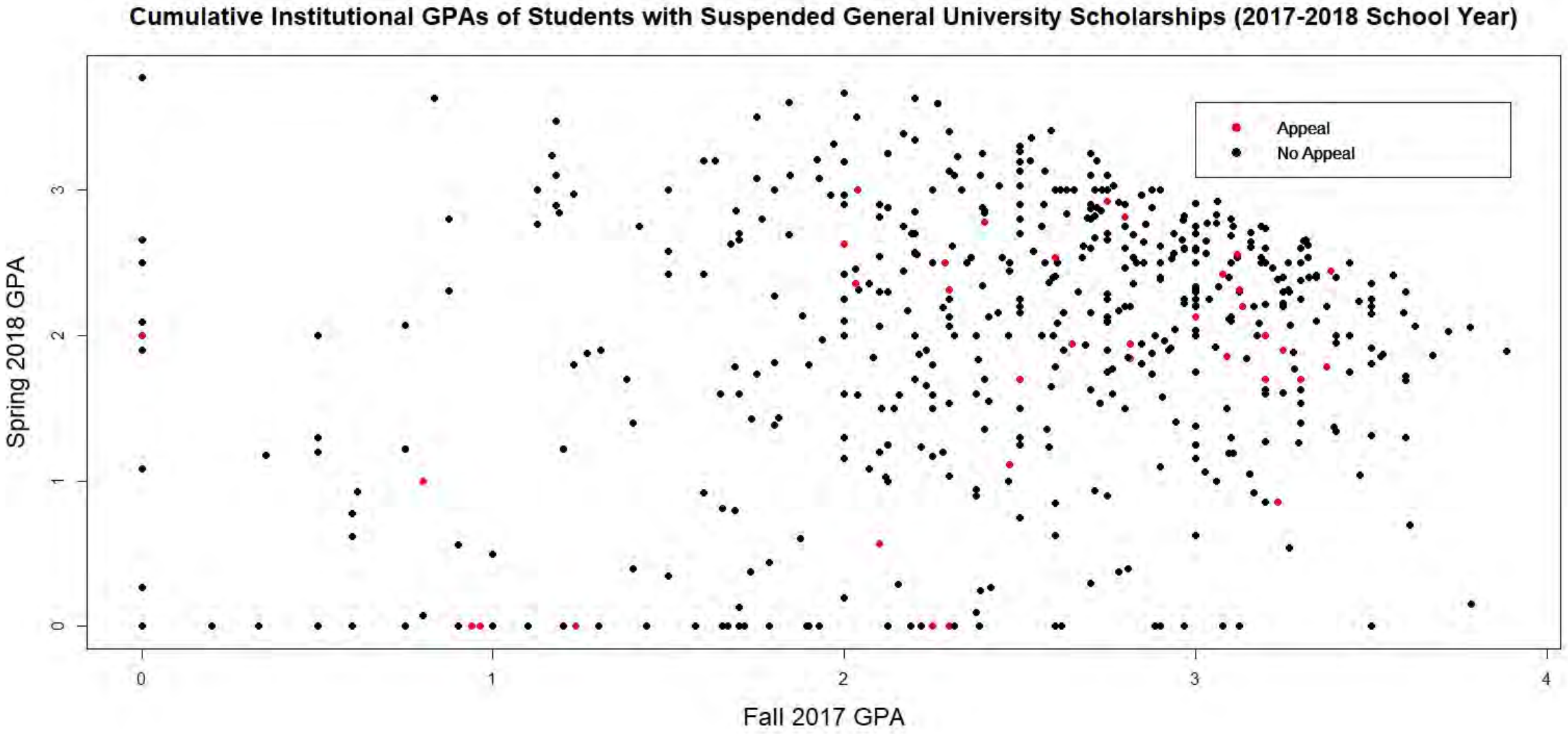
pbinom(105,127,0.8)

dbinom(104,127,0.8)

pbinom(104,127,0.8)

Sample Student Work

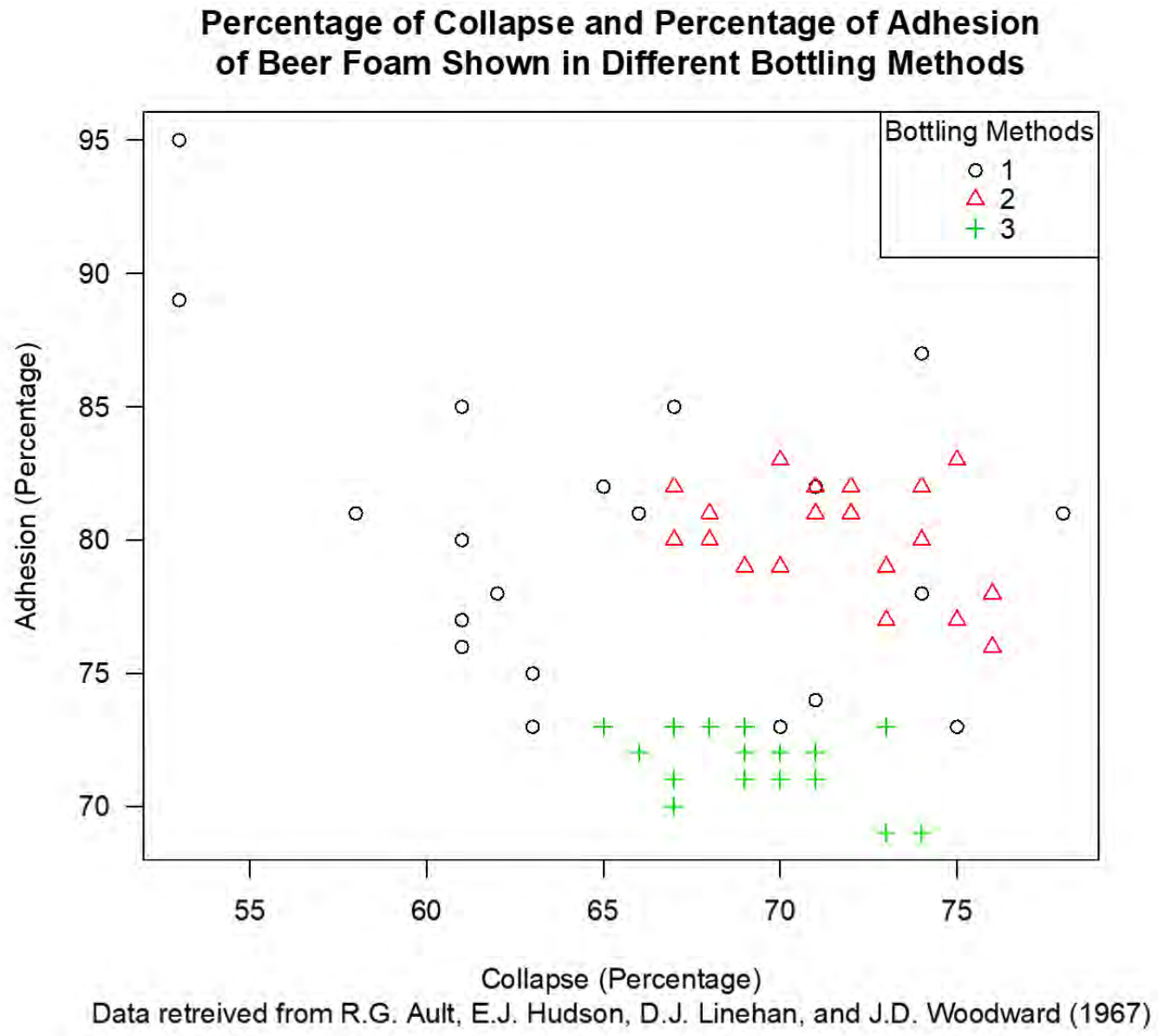
Sample Student Work



Sample Student Work

```
plot(FALL_GPA,SPRING_GPA,pch=20,cex=1.5,col=ifelse(Appeal2018==1,"red","black"
),xlab="Fall 2017 GPA",ylab="Spring 2018 GPA",main="Cumulative Institutional
GPAs of Students with Suspended General University Scholarships (2017-2018
School Year)",cex.main=1.5,cex.lab=1.5)


legend(inset=0.1,x=3.0,y=3.6,legend=c("Appeal","No
Appeal"),col=c(2,1),pch=c(20,20),bty="o",pt.cex=1.8,inset=0.1)
```



Sample Student Work

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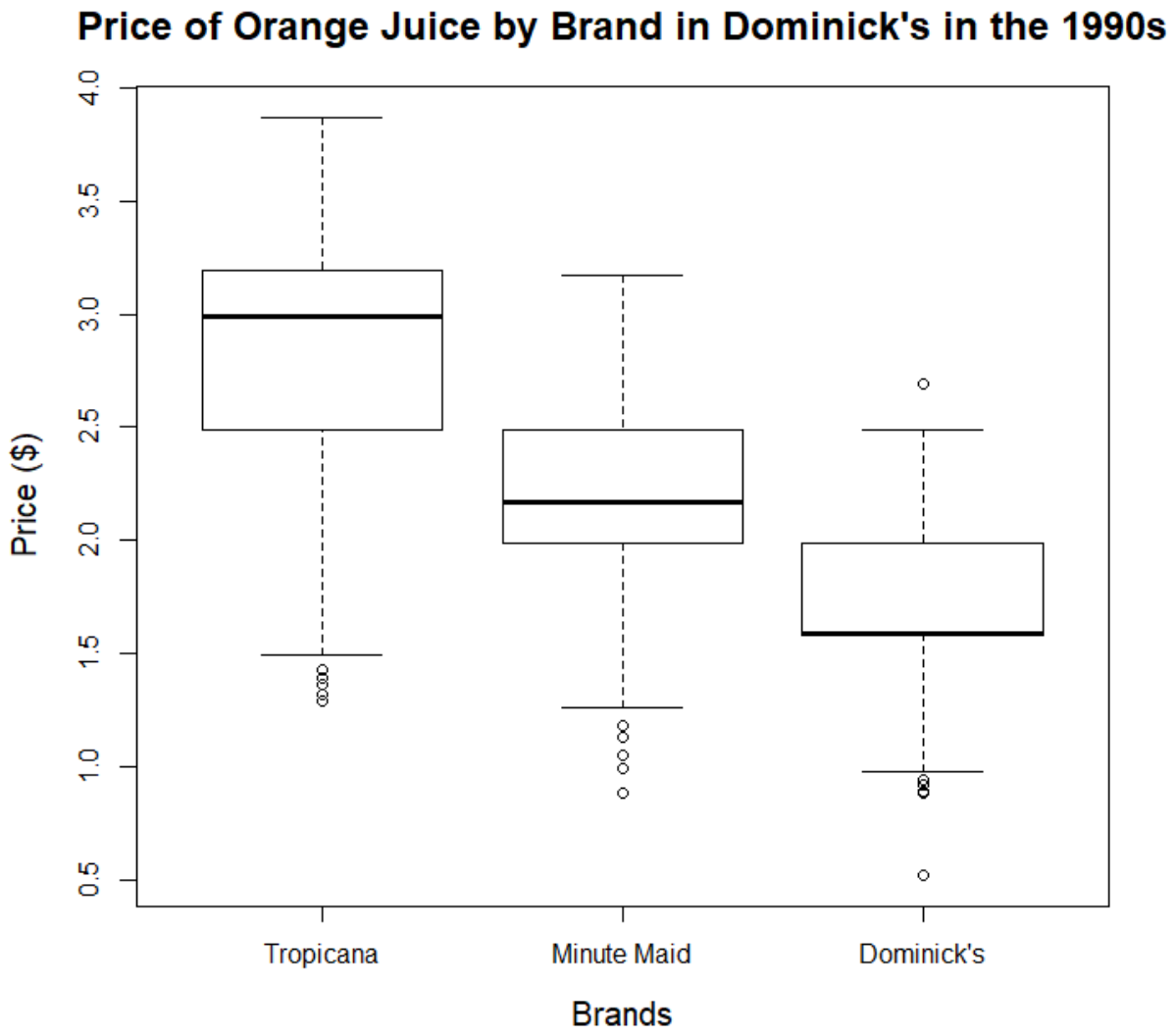

Challenges and Ideas

- Grading!
- Work on student perception
- Make R help pages better
- Training of Data Lab staff
  - Let Data Lab staff grade MGSC 291 projects