THE UNIVERSITY OF TEXAS AT AUSTIN
McCOMBS SCHOOL OF BUSINESS

Introduction to predictive analytics

Lecture 1

STA 371G

Course goals

- Use regression and time series analysis to build predictive models
- Utilize simulations to forecast outputs based on uncertain inputs
- Given a new business situation, select an appropriate analysis, carry it out, and effectively communicate the results
- This is a practical course!

About the course staff

- Instructor: **Brian Lukoff, Ph.D.**
  - Office hours: M/W 11 AM-12 PM in CBA 3.440
  - Contact: `brian.lukoff@utexas.edu` or 415-652-8853
- TAs:
  - Office hours: M 11:30 AM-1:30 PM, 2-4 PM, W 12-2 PM, Th 4-6 PM in CBA 4.304
  - Help session: T 6-7 PM in the ModLab

Vasko Lalkov

Nicole Chia

Zameer Vaswani

Who am I?

- **Educator:** Teaching statistics at McCombs since 2014; previously taught at Harvard University and Boston University
- **Entrepreneur:** Currently co-founder and CEO of Perusall; formerly co-founder and CEO of Learning Catalytics (acquired by Pearson)
- **Engineer/statistician:** Software engineering/analytics background

1. Find someone who...

2. Course logistics

3. Let's do some statistics, yo

For each box on your bingo card, find someone who matches the description in the box. You must use a different person for each box.

The winner will be crowned the STA 371G Bingo Champion™.

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Canvas

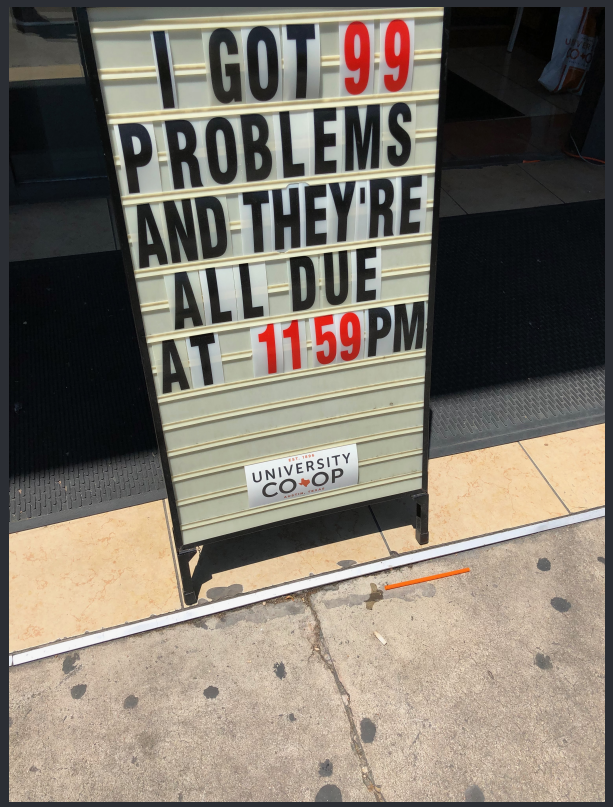
- Access at `canvas.utexas.edu`
- This is your home base for the course
- Make sure you can log in and are enrolled in STA 371G in Canvas

Class participation

- Understanding the concepts really only comes from practice
- We will use Learning Catalytics so you can practice the concepts during class
- No cost to use this
- Graded on participation, not correctness; answer 75% of the questions to get 100% of the credit
- Bring a laptop to every class (check one out from the Media Center if needed)
- A note about devices in class

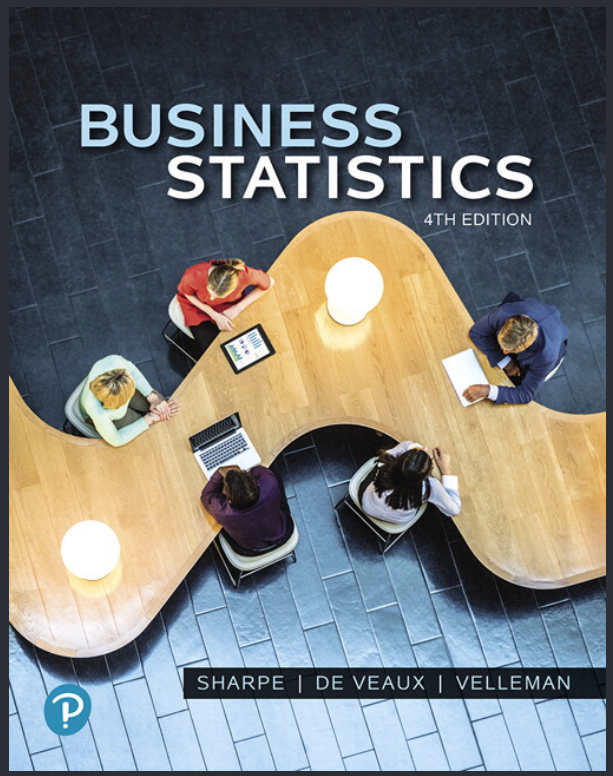
Homework

- Why homework?
- 10 homework assignments during the semester
- We will use MyStatLab for online homework; purchase and register through Canvas (you'll get a 2-week free trial)



Textbook

- Access the textbook as an eBook through MyStatLab OR buy a hardcover or looseleaf textbook (Sharpe, *Business Statistics*, 4th ed) that includes a MyStatLab access code
- Reading "quizzes" are due by 7 PM; submit 2 questions for each reading about things that you found confusing/interesting



Statistical computing

- We will use R for statistical analysis throughout the course
- This is industrial-strength, state-of-the-art, and free software for statistical computing
- We will access R through RStudio, a graphical interface for R
- Download R and RStudio at `rstudio.com`

Exams

- Two midterm exams and a cumulative final exam
- All are given during class time; you'll take the test on your laptop in this room
- You'll have access to R during every exam
- I will drop the lowest of your three exam scores (unless the final exam is your lowest grade)

Team project

- You will pick a data set (or create one, e.g. through a survey) and apply regression techniques (we'll learn about this!) to build a predictive model
- Six deliverables throughout the semester:
    1. Draft proposal
    2. Final proposal
    3. Review of related work
    4. Exploratory data analysis
    5. Write up results as a paper
    6. Presentation to class (during the finals period, on May 17)

Pretest

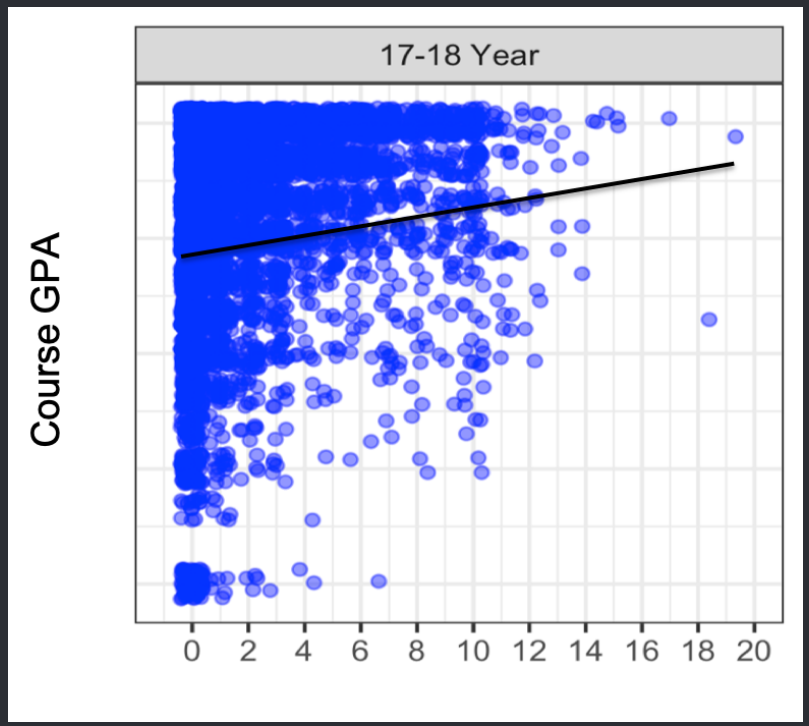
- It is critical that you be up-to-speed on the prerequisite material covered in STA 309
- By January 31, complete a pretest online to confirm your proficiency
- If you don't do well, expect to have to review some material on your own to avoid falling behind

Grading

Pretest	**1%**
Learning Catalytics	**5%**
Reading quizzes	**5%**
Homework	**14%**
Team project	**15%**
Exams	**60%**

PLUS (Peer-Led Undergraduate Studying)

- Weekly, student-run study groups
- You can apply to be a facilitator or just participate in any of the sessions
- Students who attend more PLUS sessions tend to get higher grades!



How to get an A in STA 371G

- Work on more problems than are assigned in the homework; can find problems in the book and on MyStatLab
- Consider attending the optional R help sessions in the ModLab
- Consider attending the PLUS sessions
- Get help when you need it
  - My office hours (after every class, until 12 PM)
  - TA office hours (see syllabus for schedule)
  - E-mail me to ask questions or set up a special appointment

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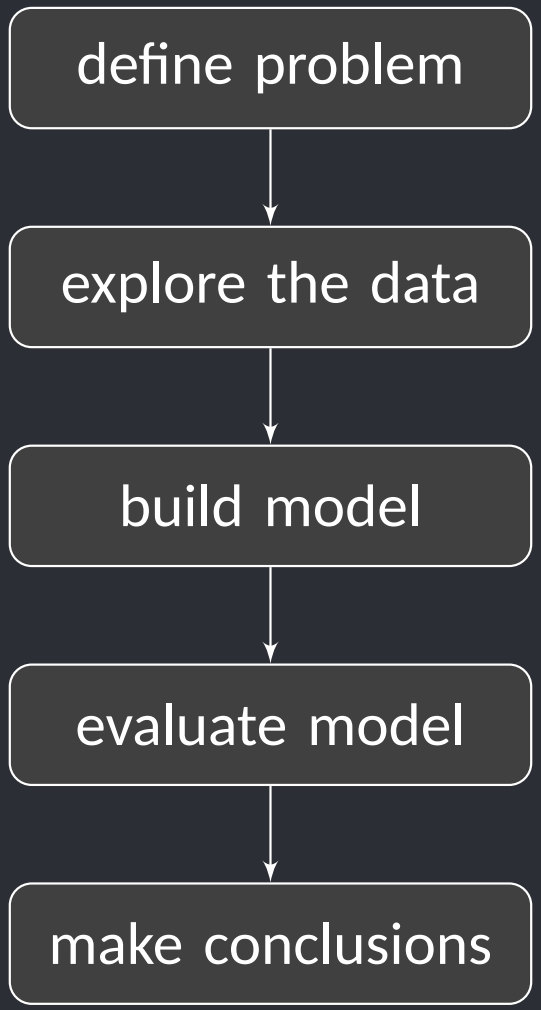
Purpose of a model

- **Make a prediction** about one variable based on the others
- **Understand the relationships** between the variables

Data analysis process



Define the problem

What personal characteristics about an instructor do you think are predictive of the scores they receive on student evaluations?

Economics of Education Review

Volume 24, Issue 4, August 2005, Pages 369–376

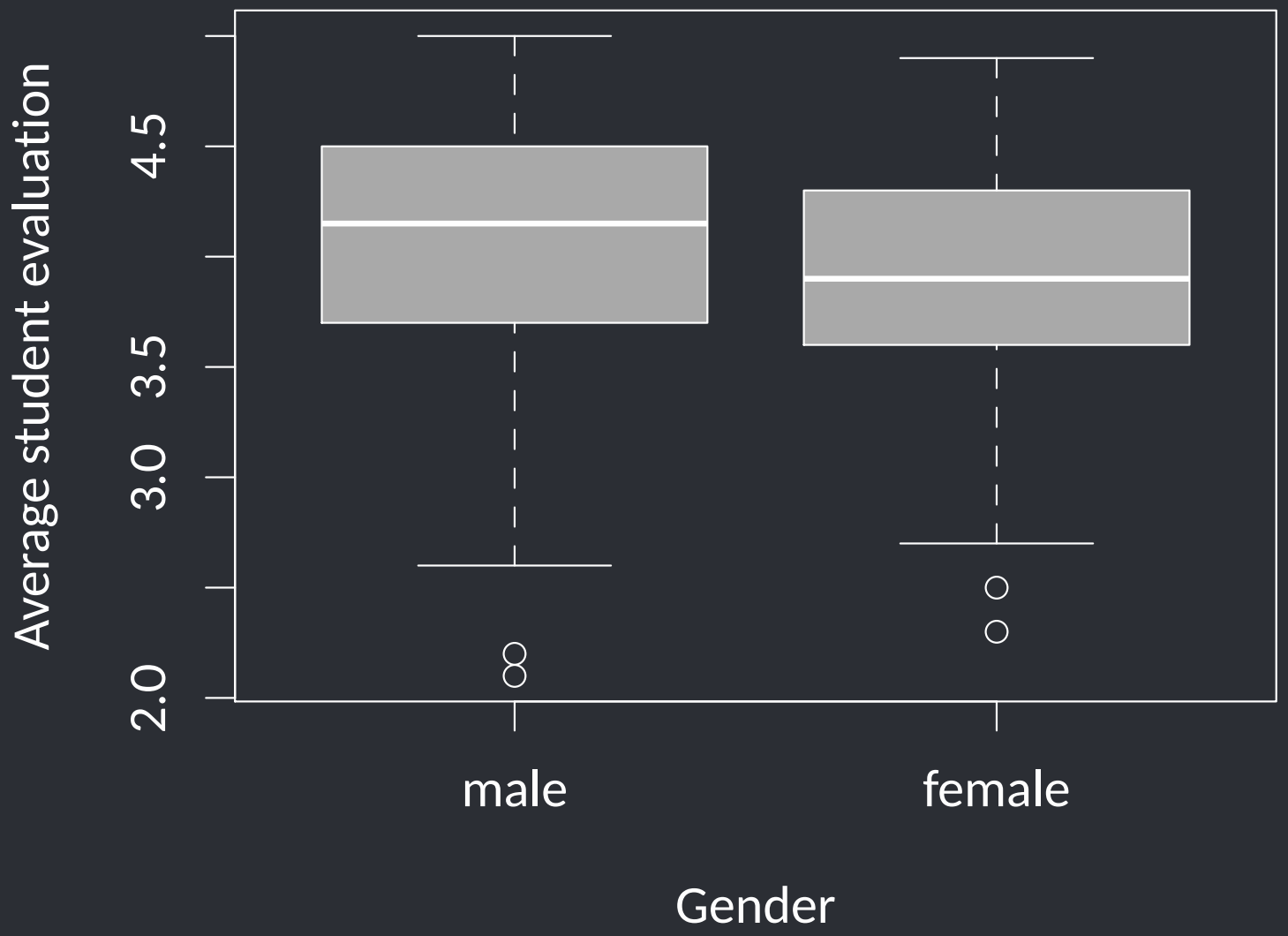
Beauty in the classroom: instructors' pulchritude and putative pedagogical productivity

Daniel S. Hamermesh , , Amy Parker

Hamermesh & Parker (2005) data set

- Student evaluations of $N = 463$ instructors at UT Austin, 2000-2002
- For each instructor:
  - **beauty**: average score from a six-student panel)
  - **gender**: male or female
  - **credits**: single- or multi-credit course
  - **age**: age of instructor
  - (and more...)

Explore the data



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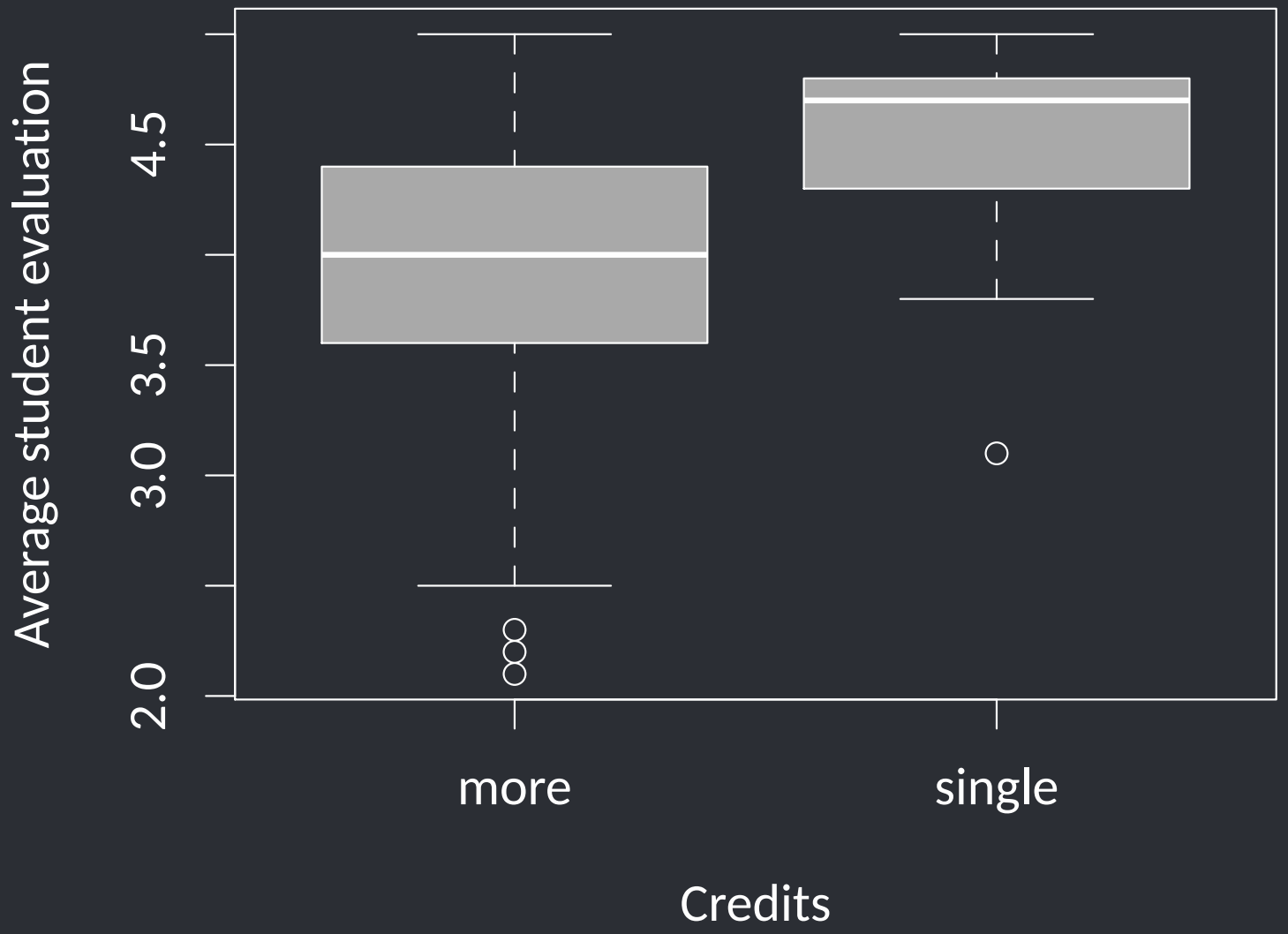

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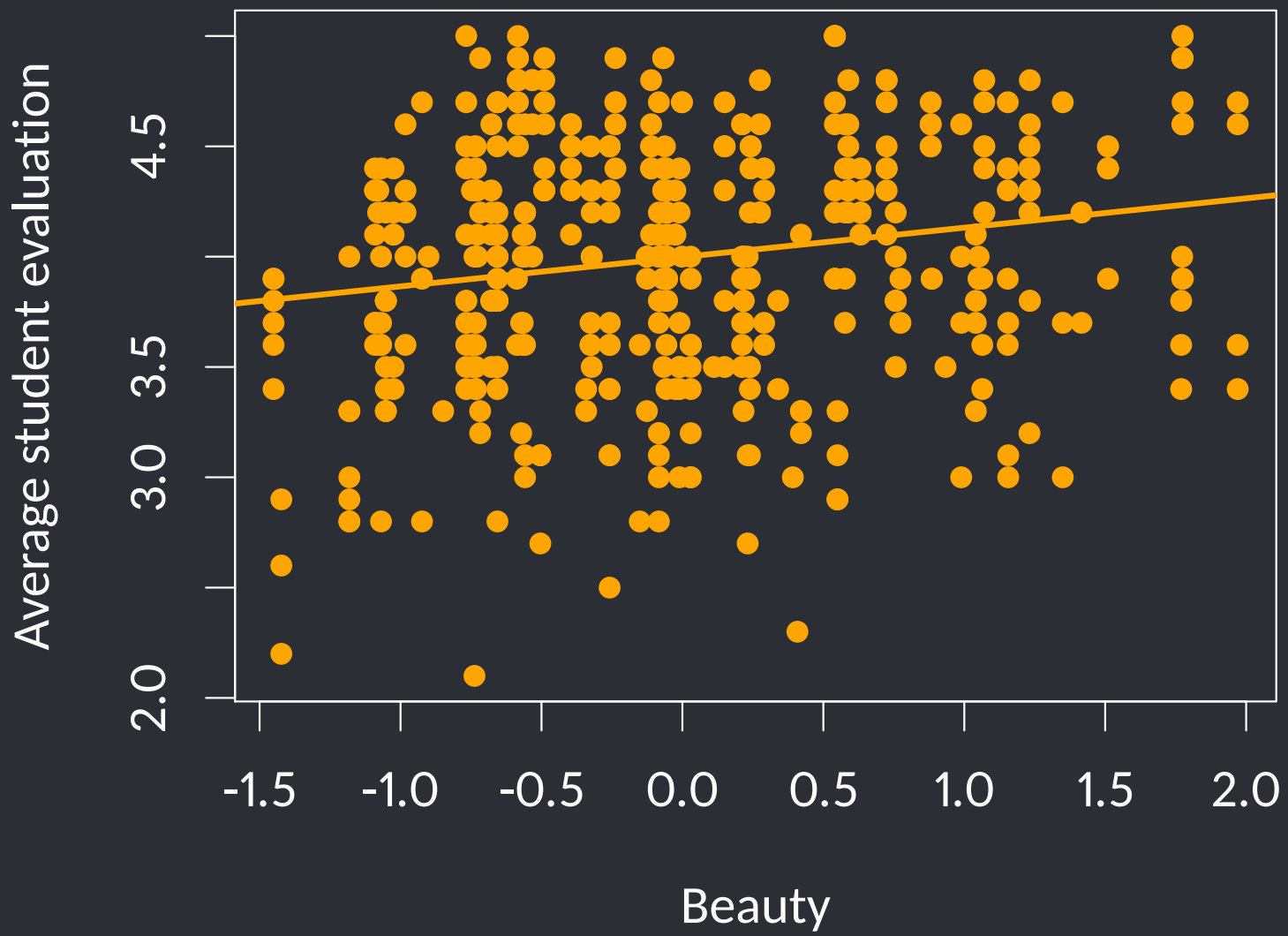

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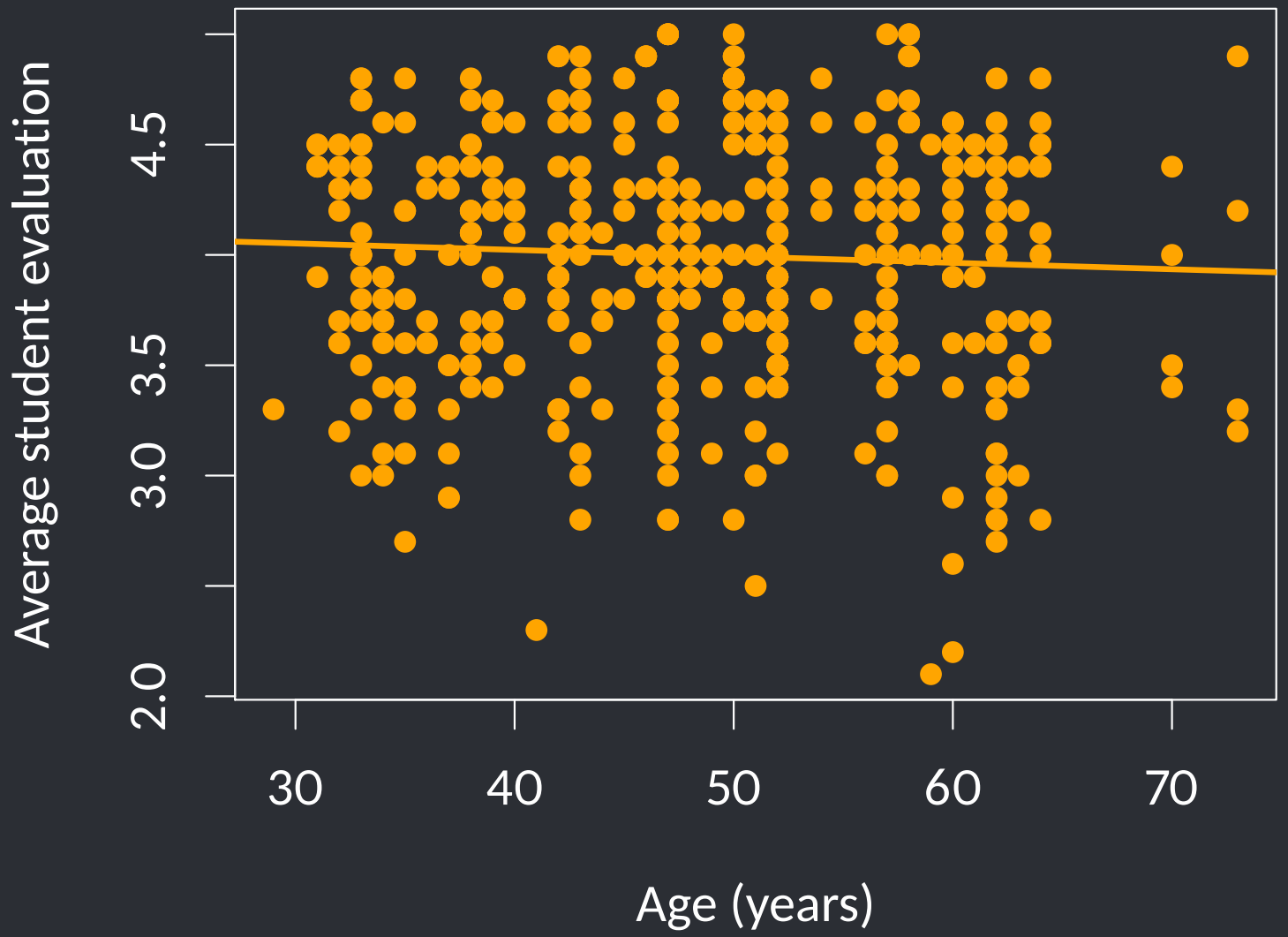

Build the model

A regression model lets us create a model that incorporates all of these relationships to best predict evaluation scores:

$$\widehat{\text{eval}} = 4.13 + 0.16 \cdot \text{beauty} - 0.2 \cdot \text{female} + 0.58 \cdot \text{credits} + 0 \cdot \text{age}$$

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We predict a 40-year-old female, with a beauty score of 2, teaching a multi-credit course would get an evaluation score of

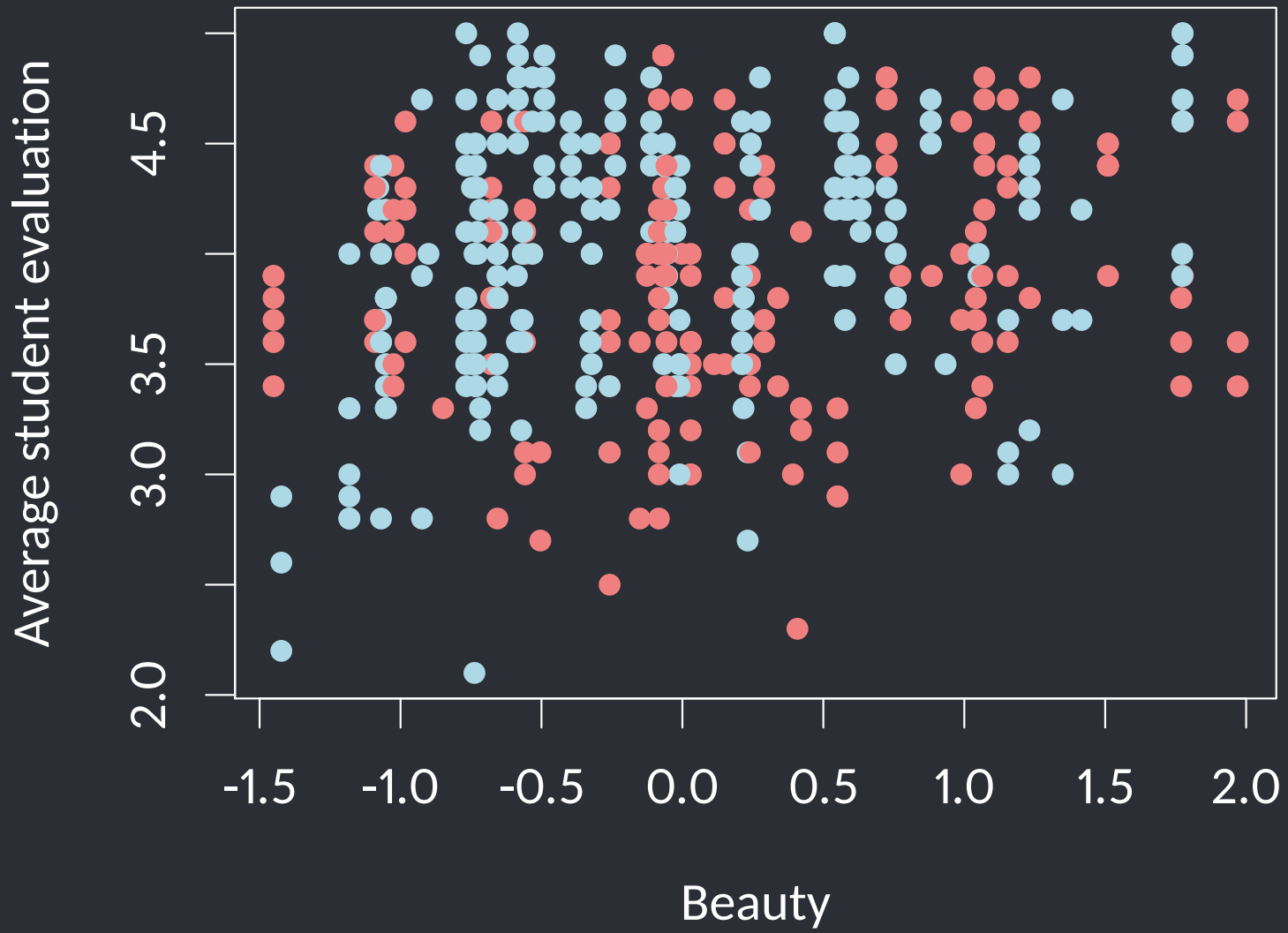
$$\widehat{\text{eval}} = 4.13 + 0.16 \cdot 2 - 0.2 \cdot 1 + 0.58 \cdot 0 = 4.18.$$

Evaluate the model

How could you evaluate the quality of this model?

Can we do better?

Do you see a difference between men (blue) and women (red)?



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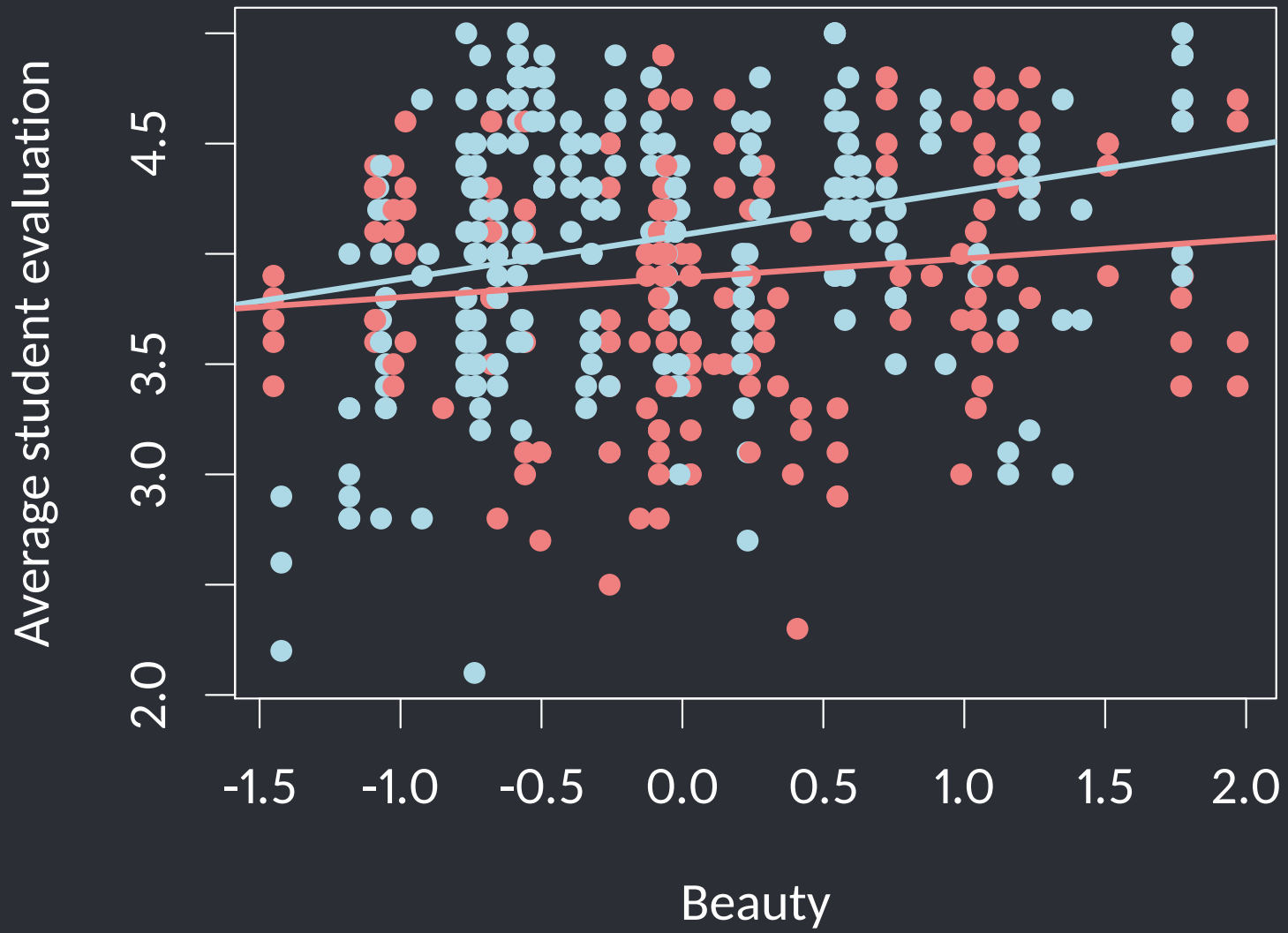

Five for the weekend

1. Read the syllabus
2. Install R and RStudio on your computer
3. Make sure you can log in to Canvas
4. Bring a laptop to class on Monday (and every day)
5. Take the pretest (by January 31)