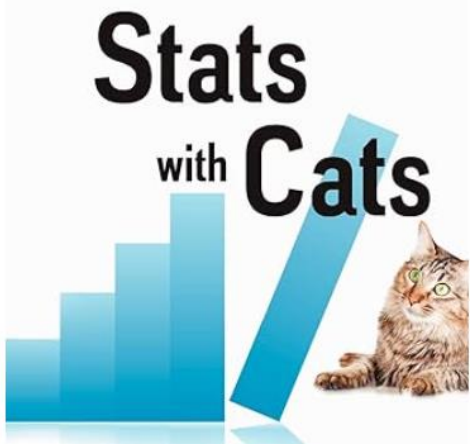
The Benefits of Implementing Git & GitHub in a Data Science Curriculum

Eric Burnheimer
Massachusetts Bay Community College
eburnheimer@massbay.edu

Hypothetical Student "Octo"*

- Octo had a keen interest in analyzing cat data.
  - ➢ Job Satisfaction in Data Science (DS) work is high (Baumer & Horton, 2023)
    - ❖ Passion for the work, strong job growth, and high salaries



Credit: Charles Kufs

- Octo began to explore data science options at nearby two-year colleges
  - ➢ Two-year colleges positioned to play large role in DS education
    - ❖ Affordability and Accessibility (Kotz, 2020; Amstat, 2022; Glantz, et.al. 2023)

*Adapted from Baumer & Horton (2023)

Data Science Programs in Two-Year Colleges

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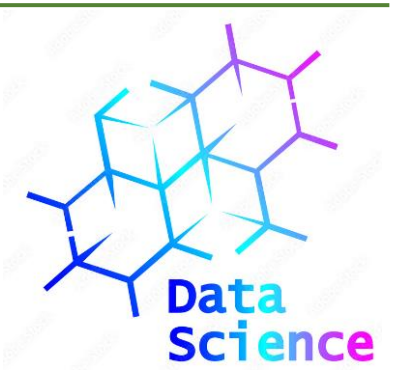
- Octo's local two-year college had just started a DS certificate!
  - Dozens of programs recently created; many others likely to emerge soon (Kotz, 2020; Amstat, 2022)
  - Important curricular decisions to be made



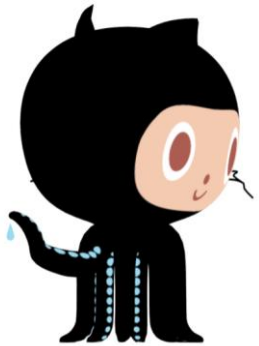
- One important curricular decision involves when and how to teach reproducibility and workflow (Baumer & Horton, 2023; Çetinkaya-Rundel & Rundel, 2018)
  - Version Control Systems (e.g., Git)
  - Collaboration and Project Management Venues (e.g., GitHub)

Two things happen to Octo during winter break…

Credit: Zoom

"It's on my **GitHub**"

"Work collaboratively through **GitHub**"



"Most of the folks that we interview have their GitHub pages listed on their resume," says CiBo Technologies talent acquisition manager Jamieson Vasquez. "I think that is important."

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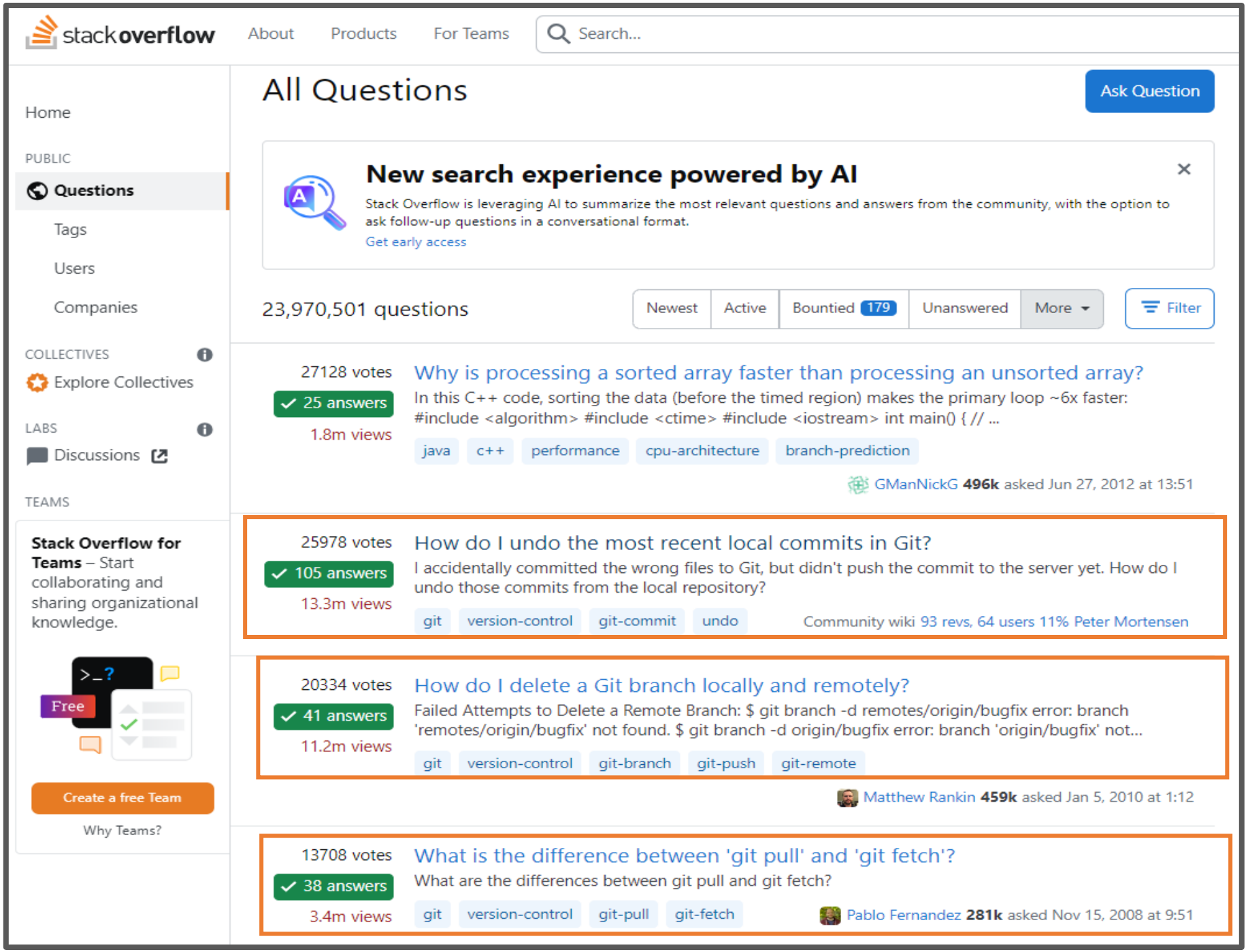
"Whoa, I've just read this quick tutorial about git and oh my god it is cool. I feel now super comfortable using it, and I'm not afraid at all to break something."

— said no one ever (de Wulf)



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3 of top 4 questions on Stack Overflow relate to **Git!**

What is Version Control?

- “A system that records changes to a file or set of files over time…” (Chacon & Straub, 2014)

Credit: Jorge Cham

What is Git?

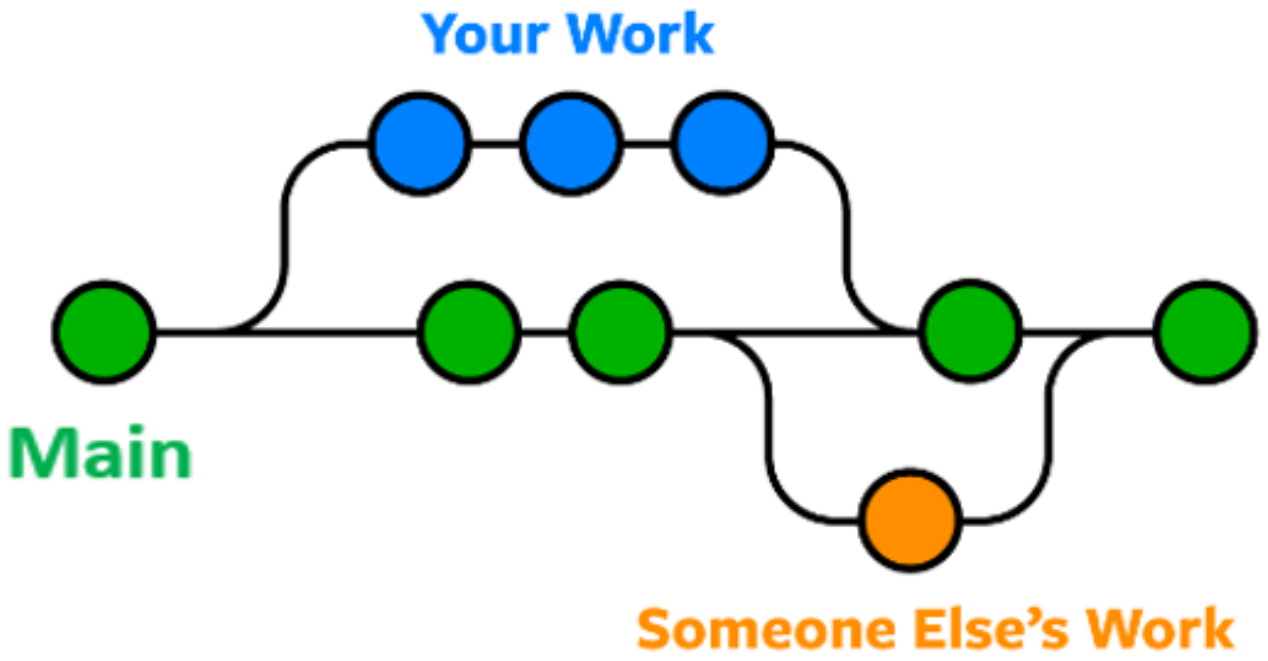
- **Git** is a free version control system
  - ➢ Tracks and manages changes to files over time
    - ❖ Revisit earlier versions of files
    - ❖ Compare changes between versions
    - ❖ Undo changes

- **Git** use is enabled through a repository (repo)
  - ➢ Place that tracks & manages files within a folder

Credit: Modified from Steele 2021

What is GitHub?

- **GitHub** hosts git repositories in the cloud
  - Provides a venue for people to collaborate on repos
  - Allows teams (e.g., students) to work on files together (such as R scripts)



Credit: Noble Desktop

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A Pathway for Implementing Git and GitHub in a DS Curriculum

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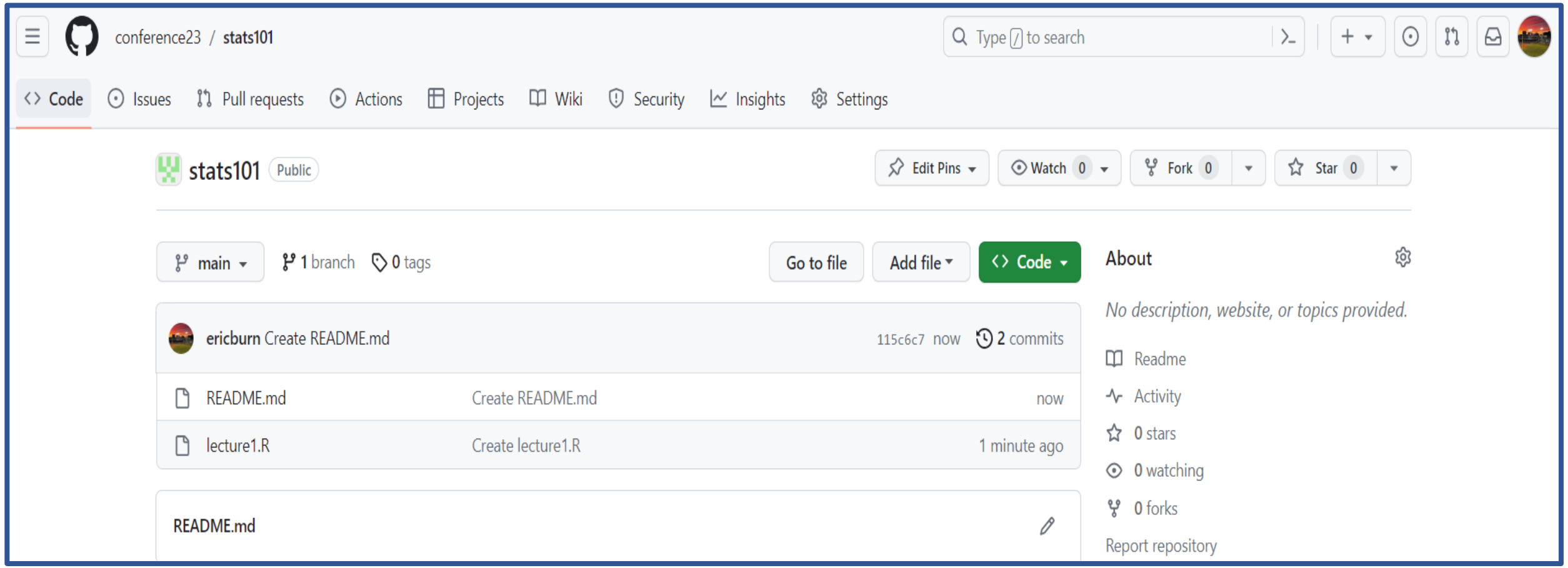
Semester I: Use GitHub Issues to Collaborate in Introductory Statistics

Part I: Create An Organization & Class Repo

- Invite students as collaborators to your repo (e.g., stats101)



Part II: Introduce Git & GitHub through GitHub Issues

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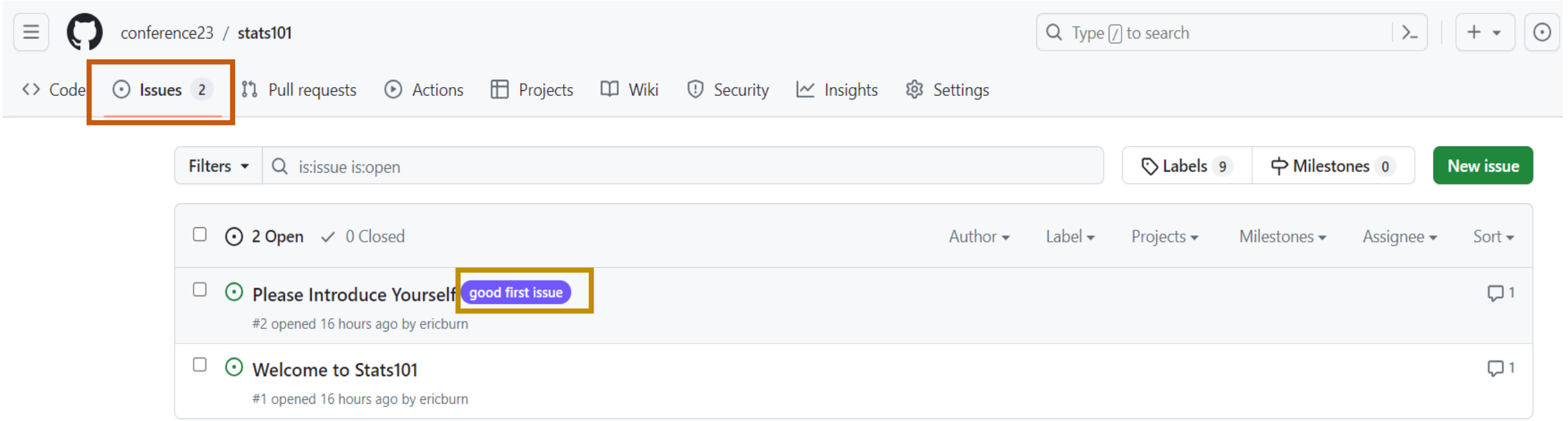
- **GitHub Issues** acts a message board
  - ➢ Students can ask questions, give feedback, share ideas, etc.
  - ➢ Students can be grouped into teams to increase small group collaboration
  - ➢ Students can “mention” others & add labels



Part II: Introduce Git & GitHub through GitHub Issues

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Please Introduce Yourself #2

Open **ericburn** opened this issue 16 hours ago · 1 comment

ericburn commented 16 hours ago — Member

Hi, I'm Eric Burnheimer. Outside of teaching, I enjoy running, tennis, and reading.

MagicElizabeth commented 16 hours ago — Member

My name is Elizabeth, I enjoy magic tricks and math.

ericburn added the good first issue label 5 minutes ago

Add a comment

Write | Preview

@MagicElizabeth

What was the last magic show you attended?

Close with comment | Comment

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Mini-Session After Semester I:

Introduction to Git & GitHub

Git & GitHub Course (1 credit course?)

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- Create small groups of students to work together during course
  - Create R Script for students to collaborate on in group repos within the organization

Week 1: Core Concepts

- Git Installation
  - Command Line
- Basic Workflow
  - git add/commit/push
- Correcting Mistakes
  - git reset/revert
- Observing
  - git status/log/diff

Week 2: Branching

- Creating Branches
  - git branch/checkout
- Merging Branches
  - Fast forward/3-way
- Resolving Conflicts
  - git rebase
- Retrieving
  - git pull/fetch

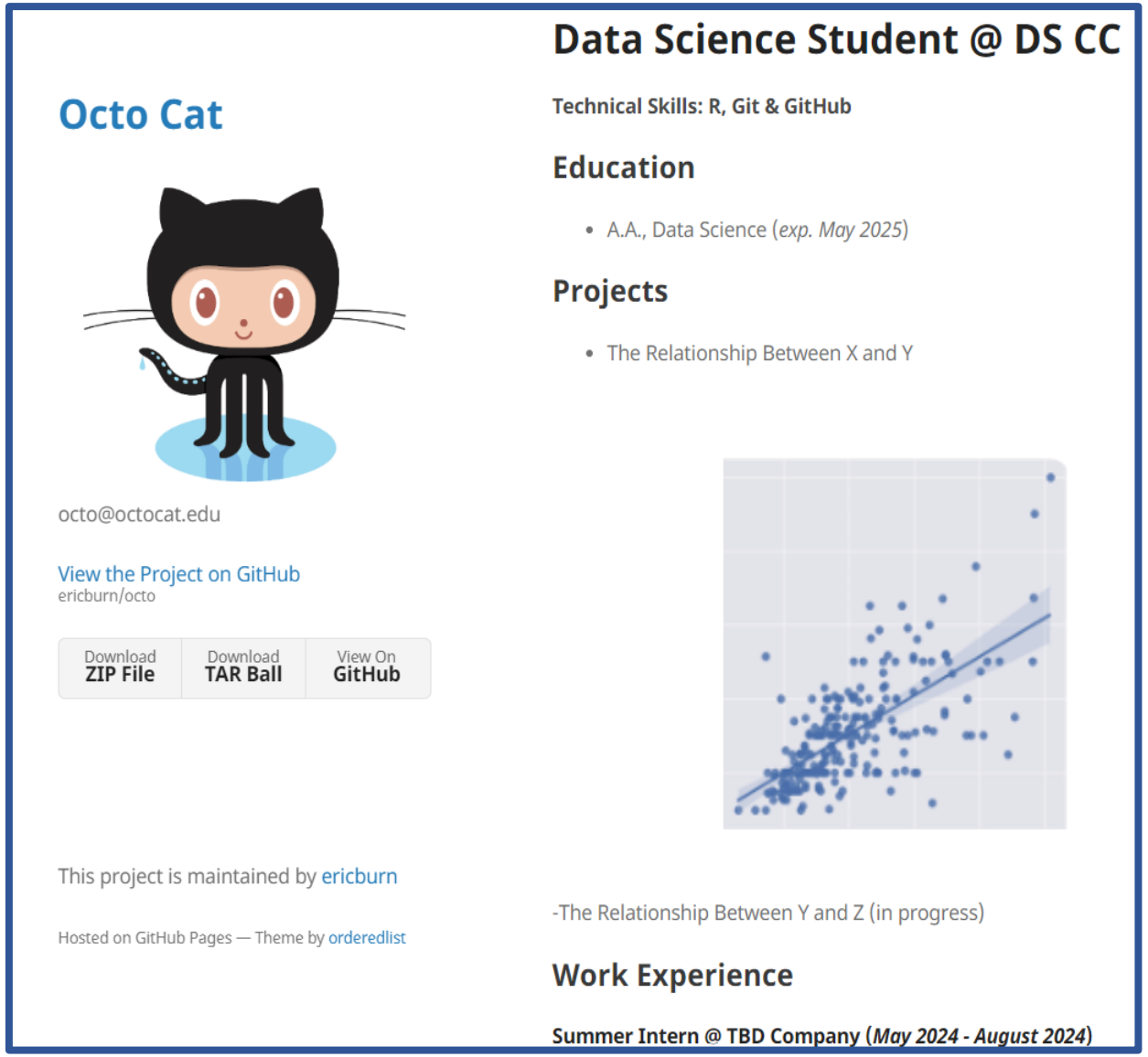
Week 3: Other

- Create personal site
  - GitHub Pages
- Workflow
  - Pull Requests
- Final “Mini-Project”
  - Students decide when to use git tools

Other Topics to Explore

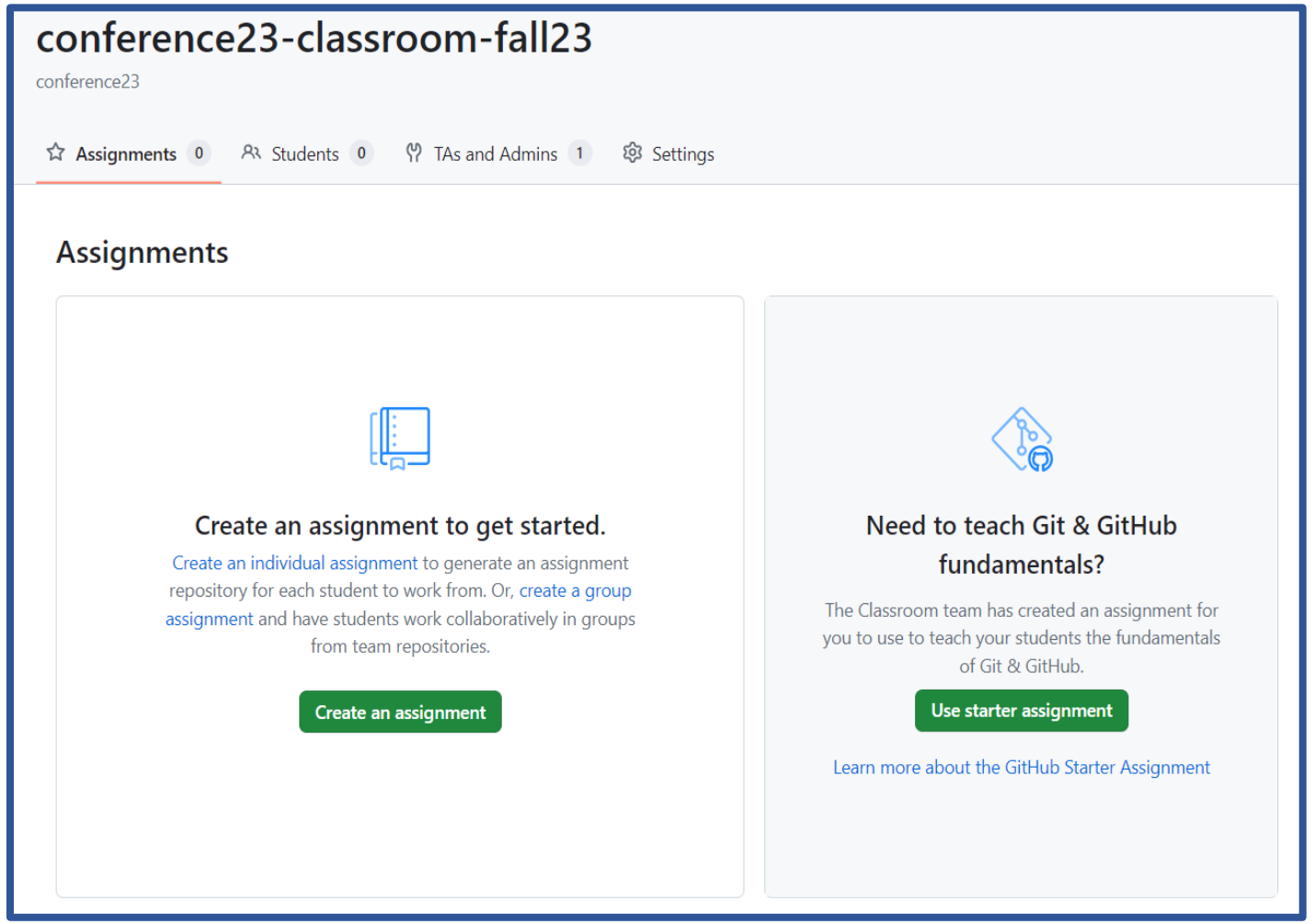
GitHub Pages Site

- **GitHub Pages** enables and eases the creation of a personal site
  - ➢ Provides aspirational template for students to fill as they progress



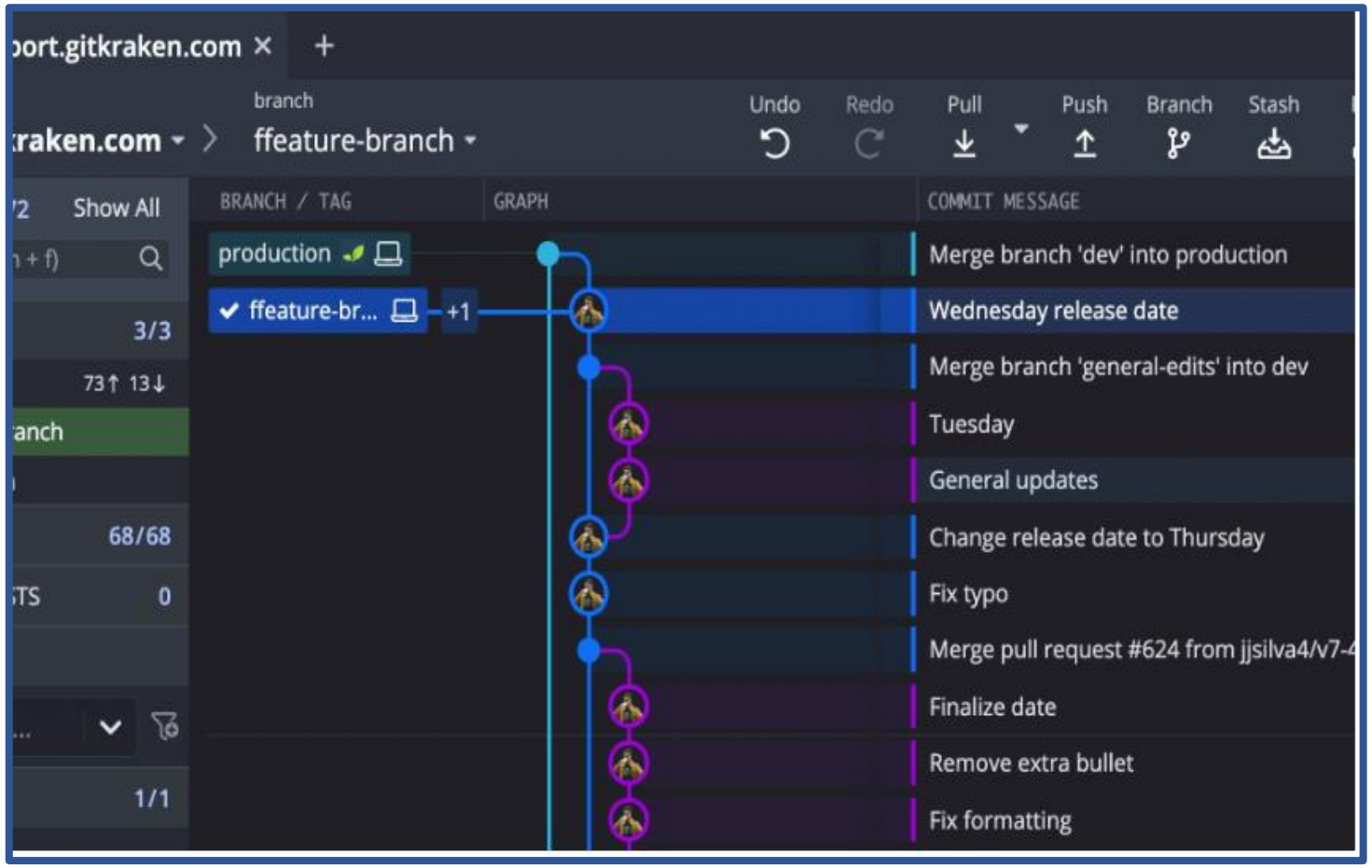
GitHub Classroom

- **GitHub Classroom**
  - ➢ Manage a virtual classroom
    - ❖ Make Assignments
    - ❖ Auto-grading
    - ❖ Connect to some LMSs



GUIs such as GitKraken

- **GUIs such as GitKraken**
  - Point-and-Click
  - Nice visualization of branches



Credit: Medium

Summary

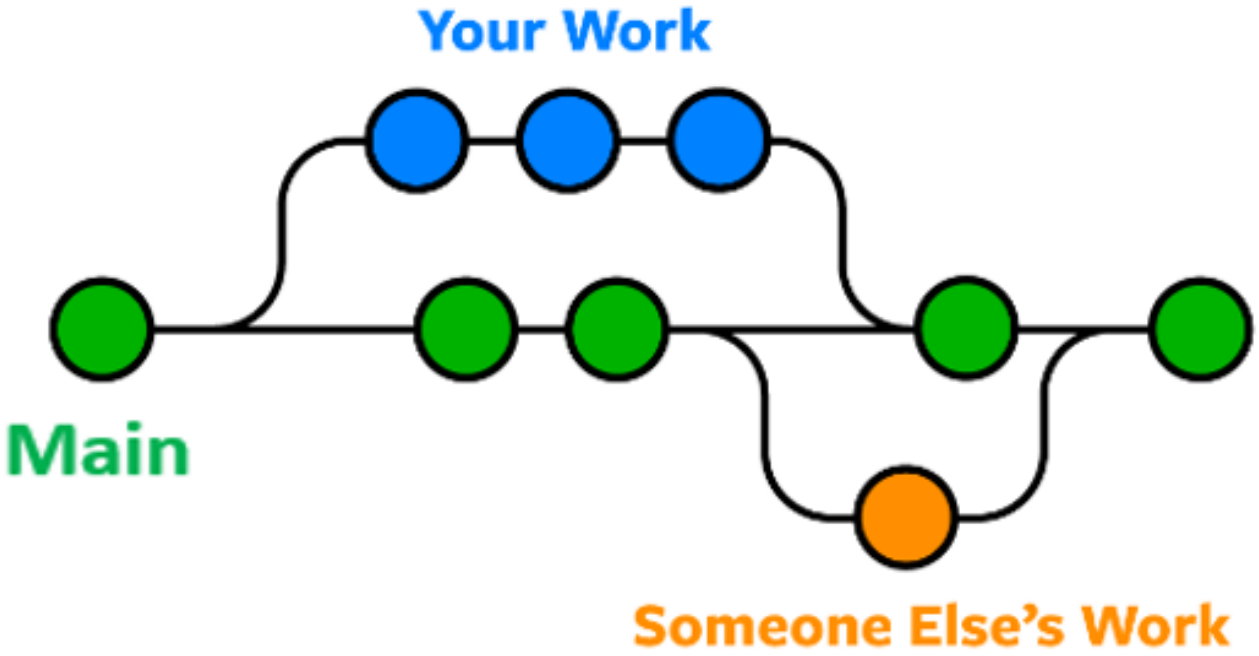
The Benefits of Implementing Git & GitHub in a DS Program

- Potential for Increased Collaboration
- Version Control and Project Management Skills
- Workforce Readiness

A Pathway for Implementing Git & GitHub in a DS Program

- Semester I: Introduce GitHub (and preview git) by communicating via Issues
- Mini-Session after Semester I: Git & GitHub focused course

Octo is Ready to Collaborate!



Credit: Noble Desktop

Credit: Charles Kufs

References

Baumer, B. S., & Horton, N. J. (2023). Data Science Transfer Pathways From Associate's to Bachelor's Programs. *Harvard Data Science Review, 5*(1). https://doi.org/10.1162/99608f92.e2720e81

Çetinkaya-Rundel, M., & Rundel, C. (2018). Infrastructure and tools for teaching computing throughout the statistical curriculum. *The American Statistician*, *72*(1), 58–65. https://doi.org/10.1080/00031305.2017.1397549

Chacon, S., & Straub, B. (2014). Pro Git (2nd edition). *Apress.*

Glantz, M., Johnson, J., Macy, M., Nunez, J. J., Saidi, R., & Velez, C. (2023). Students' Experience and Perspective of a Data Science Program in a Two-Year College. *Journal of Statistics and Data Science Education*, 1–10. https://doi.org/10.1080/26939169.2023.2208185

Kotz, B. (2020). The Opportunities of Two-Year College Data Science. *Harvard Data Science Review*, *2*(4). https://doi.org/10.1162/99608f92.75aed58b

New Two-Year College Data Science, Analytics Programs on the Rise. (2022, August 1). *Amstat News. https://magazine.amstat.org/blog/2022/08/01/new-two-year-programs/*

Thank you!

Eric Burnheimer
Massachusetts Bay Community College
eburnheimer@massbay.edu