Real-World Problems, Data and Visualizations Using BRIDGES

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Agenda

- Introduction [20 min]
  - Participant introductions
  - What is BRIDGES and how does it help?
- A First Example [15 min]
- A Tour of BRIDGES [20 min]
- Break [5min]
- Discussions [25 min]
- Workshop Survey, Opportunity to Participate [5 min]

BRIDGES to Improve CS Education through Engagement

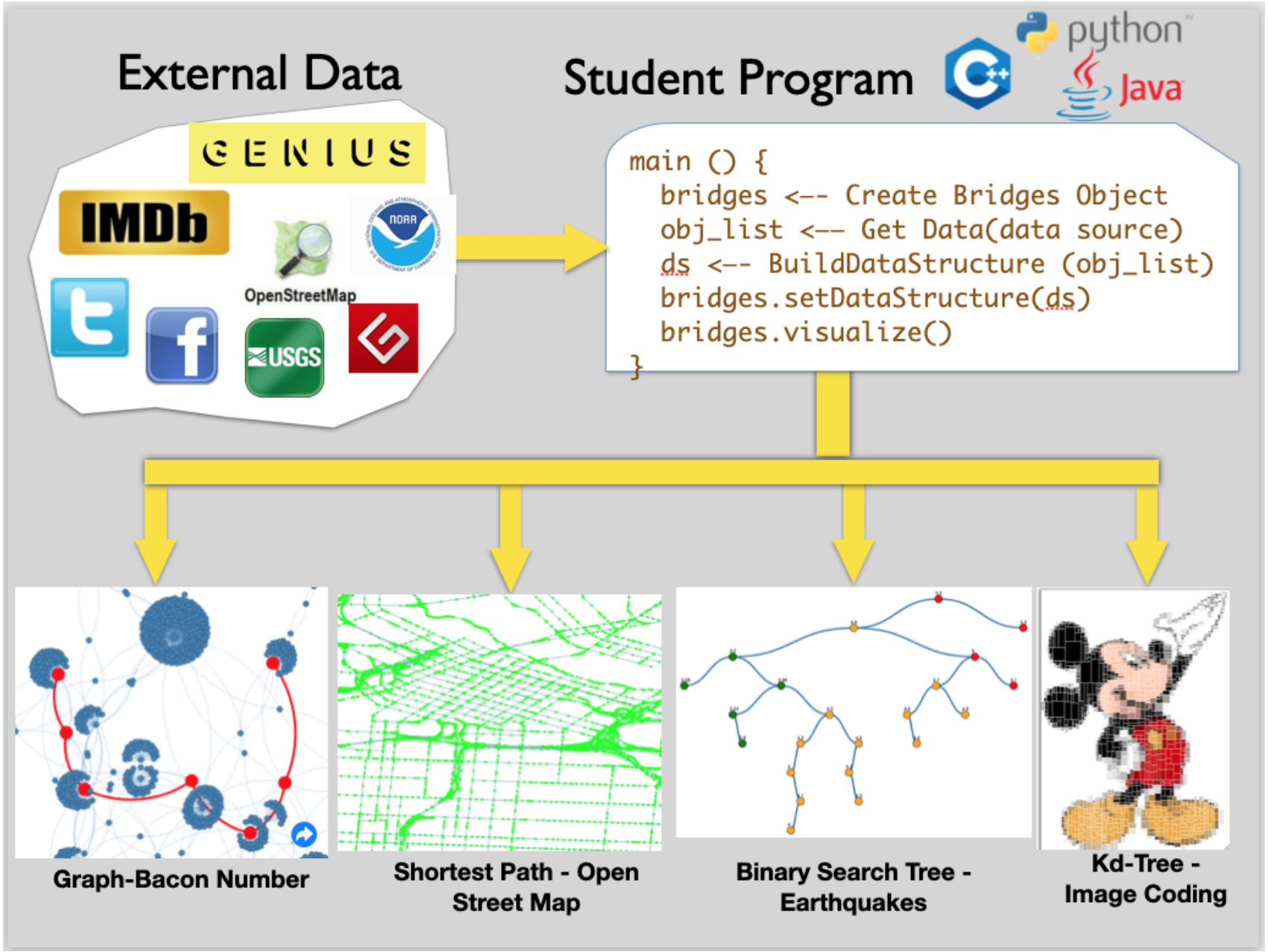
Motivation

Attrition rates in early foundational courses are high (40-60%), need to improve student engagement, and demonstrate the potential of Computer Science to incoming freshmen/sophomore students

BRIDGES' approach

- Bring real-world datasets into the classroom.
- Visualizations of *student generated* data structures, interactions, algorithm performance/complexity.
- Student output shared (with friends, family) via web link

BRIDGES provides engaging Input and Output

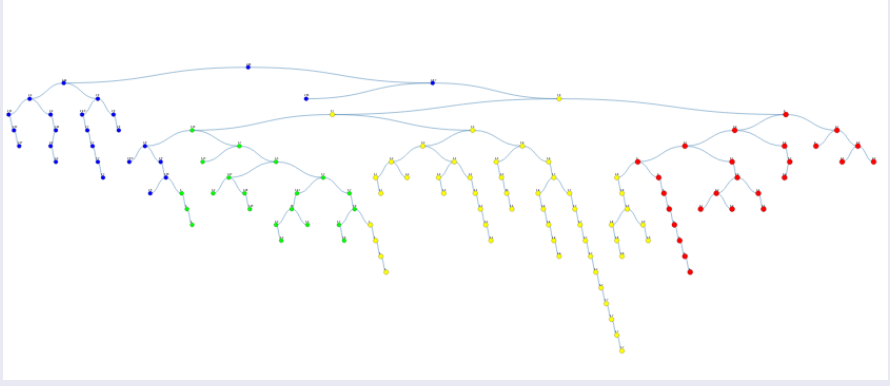


BRIDGES in Data Structures Course

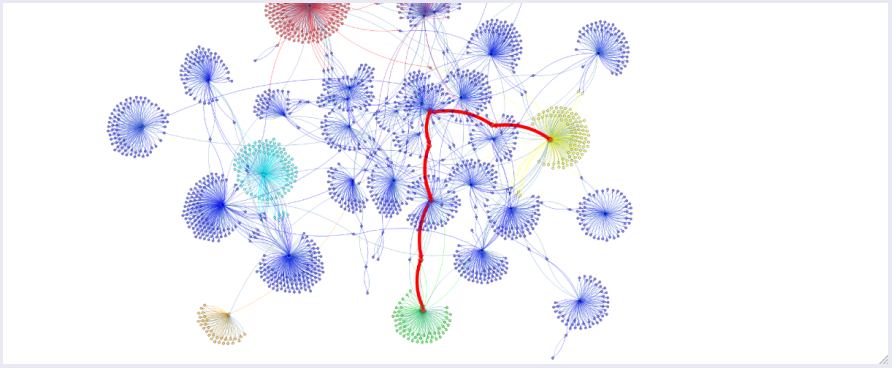
What is hard in a Data Structure course?

- Debugging is haaaard.
- I don't understand what the data structure looks like!
- Does any of this matter in the real world?
- Two examples below: Binary Search Tree with USGS earthquake Tweet data, Bacon Number problem wiht IMDB Data (BFS algorithm)

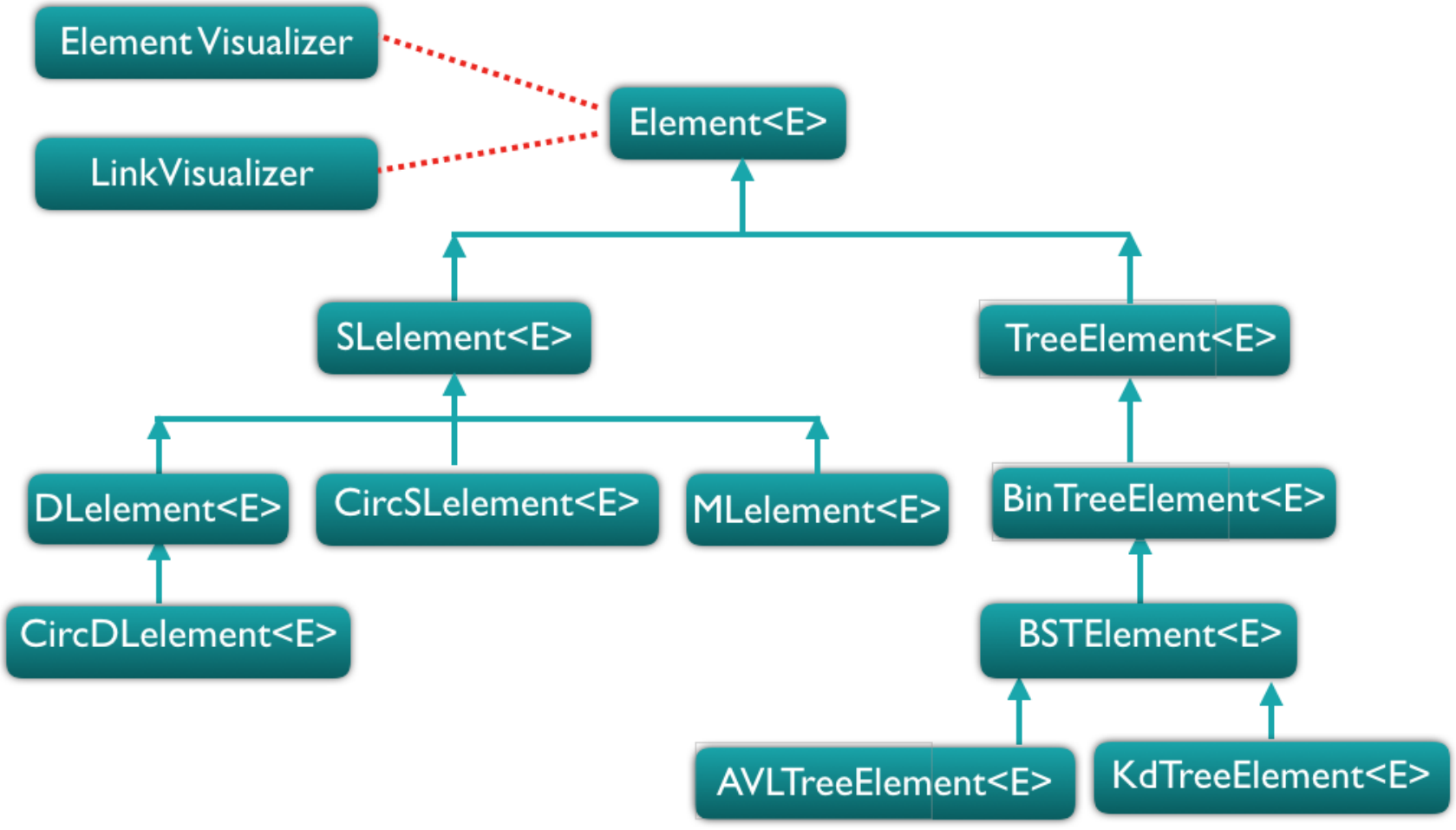
Indexing USGS Earthquake



Bacon Number [IMDB Data]



BRIDGES Element Hierarchy (Lists, Trees, Graphs)

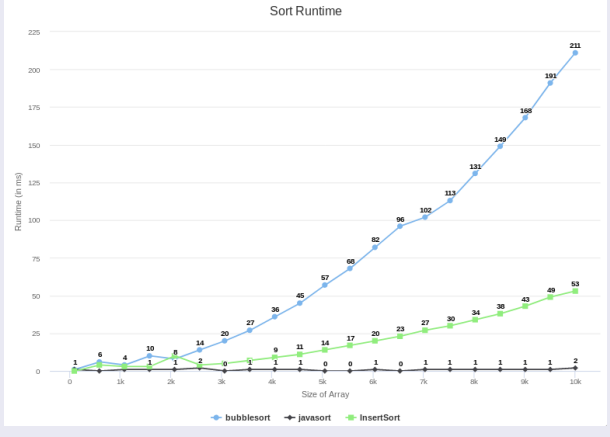


BRIDGES in Algorithms Course

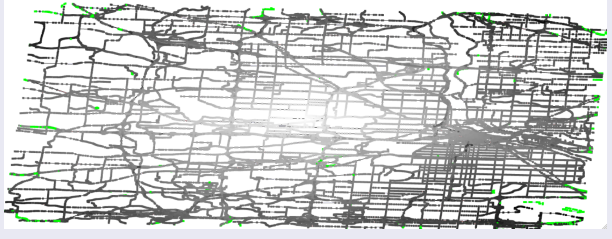
What is difficult in an Algorithm class?

- Complexity is confusing!
- I am never going to use any of these crazy things.
- Why is he still talking about complexity?
- BRIDGES provides **benchmarking** features and large datasets, so asto to demonstrate algorithm performance.

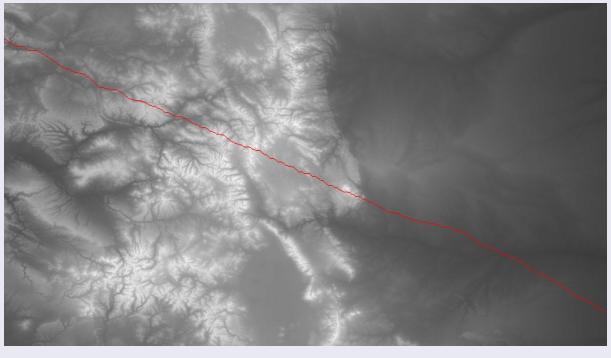
Sorting Benchmark



Shortest Path (OSM)



Mountain Path (DP)

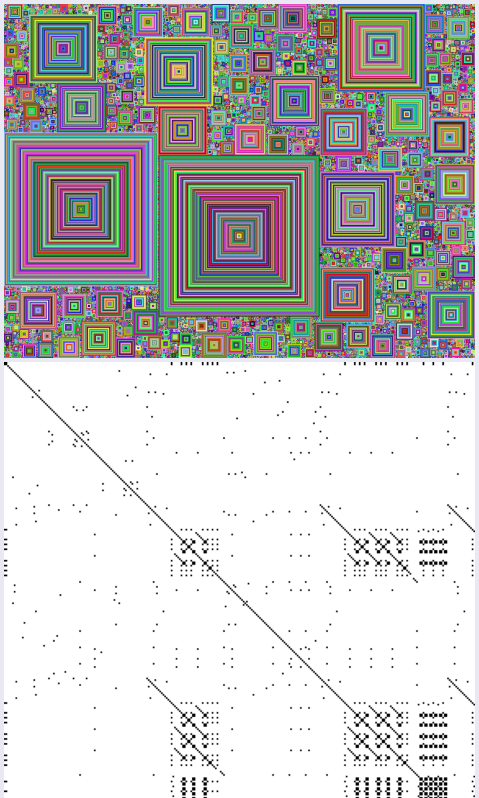


BRIDGES in CS1/CS2 Courses

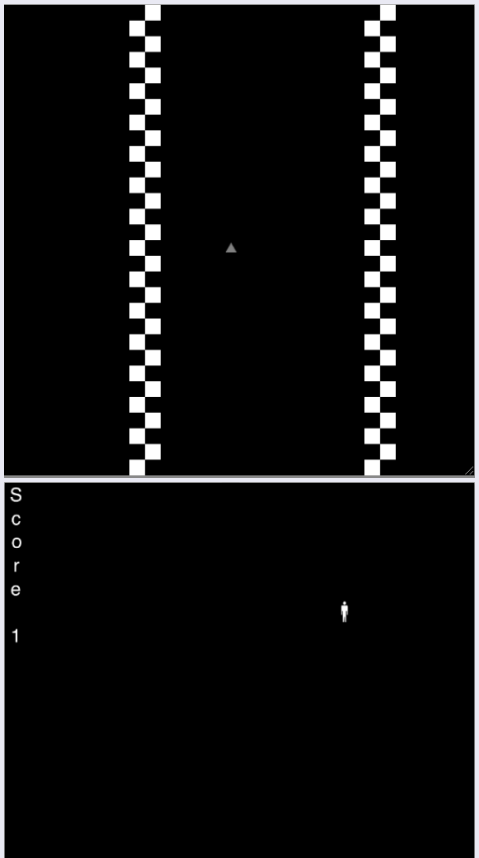
What is difficult in a CS1 course?

- Hello World is BOOOOOOOORING...
- We added two arrays of integers, I am soooo impressed...

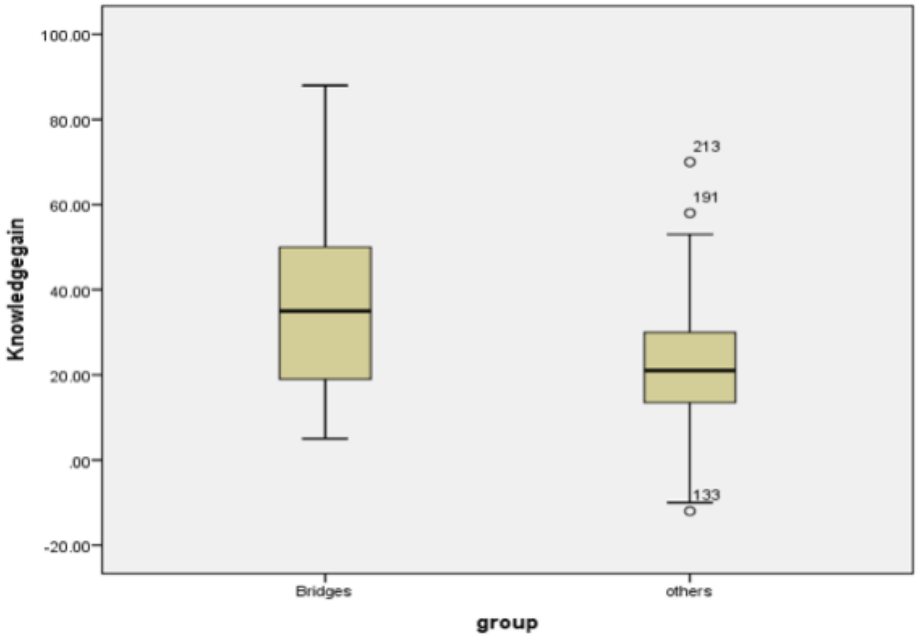
Graphical Patterns and Analysis



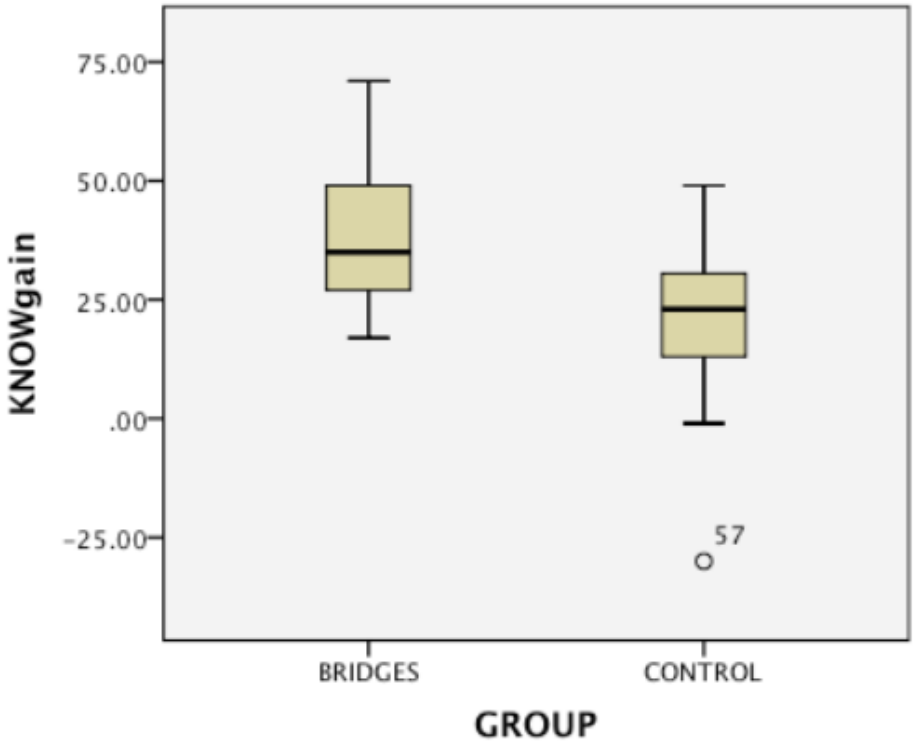
Games



Students in BRIDGES sections gained more knowledge



Fall 2014



Spring 2015

Students in BRIDGES sections performed better in follow on core CS

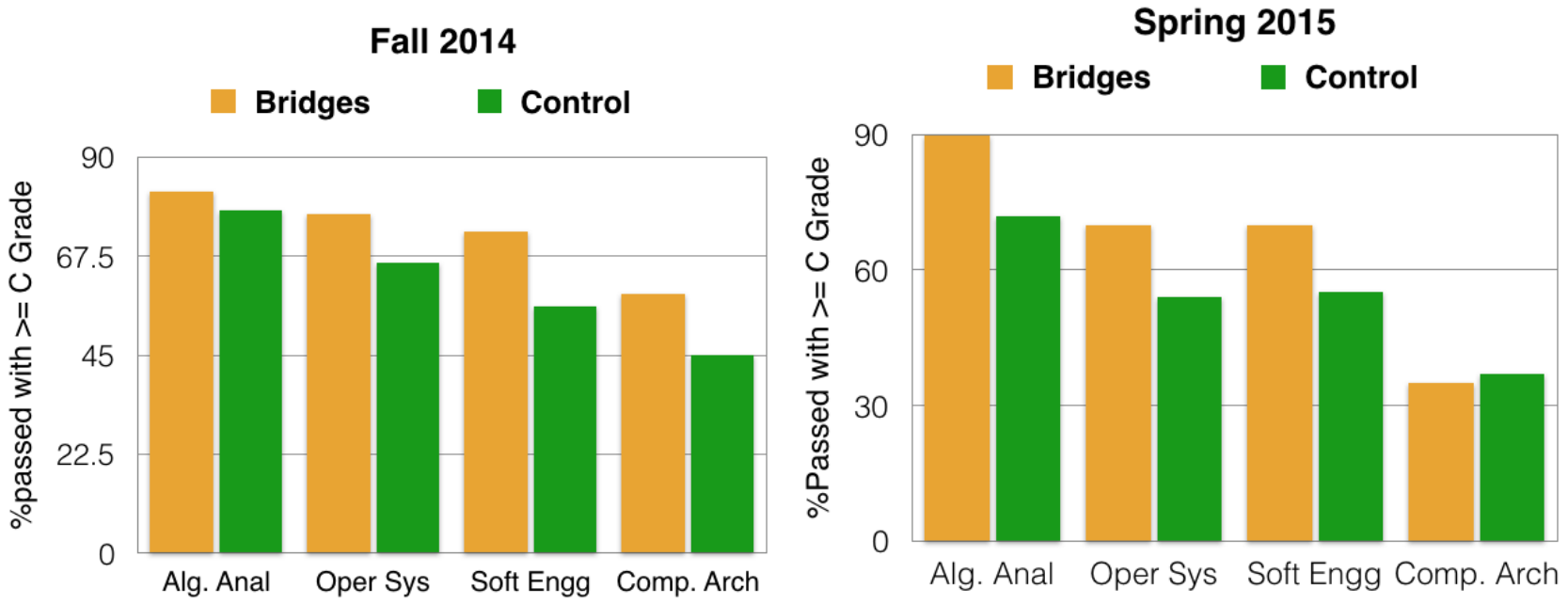
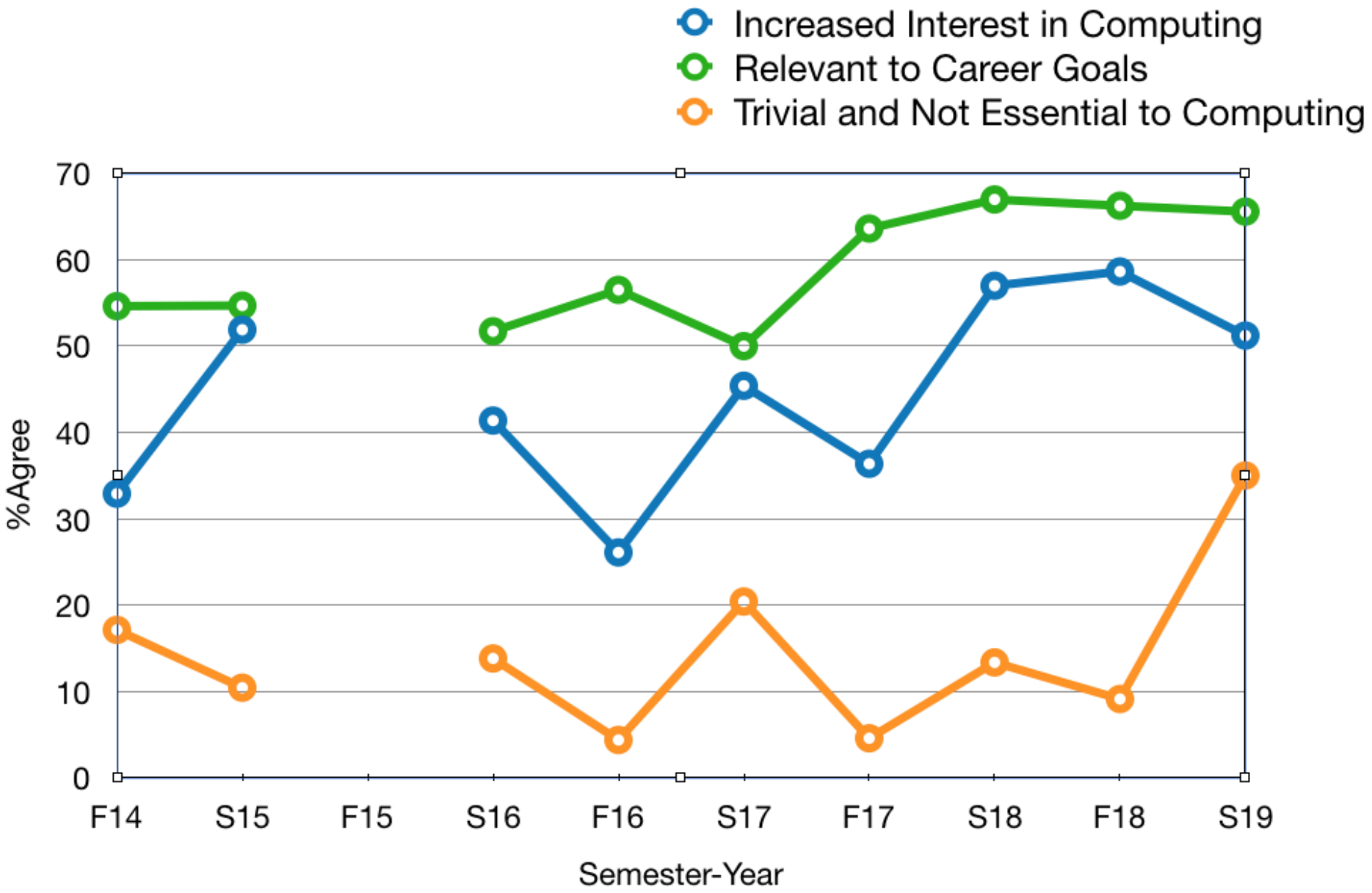


Figure: Comparing long-term student achievement between students who used the BRIDGES toolkit in the Data Structures course vs. Control group. The evaluation was performed with 2 cohorts of students (Fall 14, Spring 15). Analysis performed Spring 2019.

Students using BRIDGES appreciate CS better



Thank you!

Why adopt BRIDGES?

- Well tested: over 2000+ students, 20+ institutions
- Increased engagement
- A growing set of pre-designed assignments
- Full Support from the BRIDGES team
- Stipends available for adopters

How to adopt? Contact us!

- esaule@uncc.edu
- krs@uncc.edu
- payton@temple.edu

Support

This material is based upon support from NSF DUE-1726809.

A Tour of BRIDGES[15-20 min]

Open up your laptops and try out some of the BRIDGES examples and their ouptputs from a sampling of BRIDGES assignments

Discussion [15-20 min]

Possible Talking Points

- What issues do you face in teaching (early CS) courses?
- Can tools like BRIDGES be helpful? What are the hurdles?

BRIDGES Survey (25min)

Workshop Survey

https://uncc.qualtrics.com/jfe/form/SV_bgxw85Ztuirjltz

BRIDGES Participation - Opportunity

- BRIDGES under active development - funded by an NSF IUSE grants - **to disseminate BRIDGES to external users!**
- Need help in **adopting, contributing, and extending** BRIDGES.
- Build **engaging assignments** and data sources that also reinforce CS rigor.
- Use BRIDGES in the classroom, collect data and provide feedback; all evaluation materials provided through online Qualtrix surveys by project evaluator.
- **Stipends** available for instructor; alternately **TA support** can be provided.
- Full technical support provided, and interaction with Bridges team/community, monthly user meetings.