# Retaining and Engaging CS Majors Using BRIDGES

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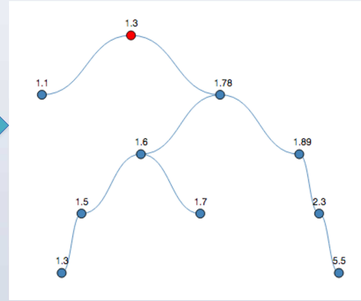
## Easily Use External Data…

## … in Student Assignments…

```
Bridges bridges =new Bridges (assign_number, “user-name”, “appl-id”);

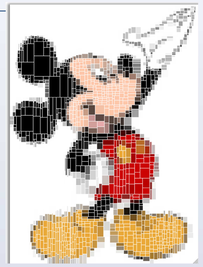
            //retrieve maxElements USGS earthquake data records
List<EarthquakeUSGS> eq_list=bridges.getEarthquakeUSGSData(maxElements);
           //adding earthquake data to BST tree using magnitude as key
BSTElement<double, EarthquakeUSGS> bst = new
                        BST<double, EarthquakeUSGS> ();
           // insert elements into binary search tree
for (i=0; i < eq_list.size(); i++) {
    bst.insert(eqlist.get(i).getMagnitude(), eqlist.get(i));
}
           // provide BRIDGES a handle to the data structure
bridges.setDataStructure(root);
           // provide BRIDGES a handle to the data structure
bridges.setDataStructure(bst);
           // visualize the tree
bridges.visualize();
```

## …to Produce Compelling Visualizations

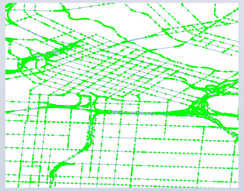



Binary Search Tree (Earthquake Data)

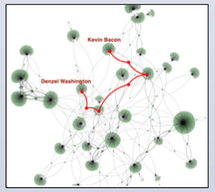
Color Grid Data Type



Kd-Tree - Image Repr.



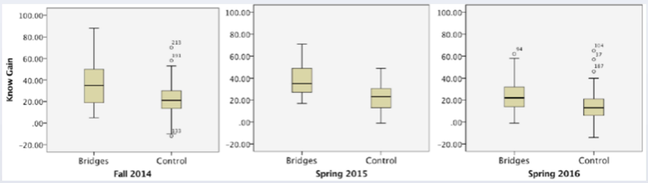
Graph - OpenStreet Map (Minneapolis!)



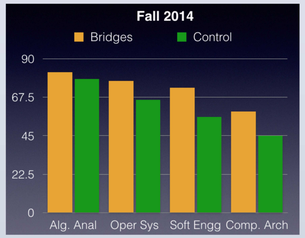
Graph- Bacon Number

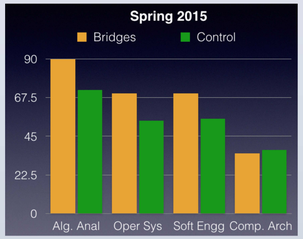
## BRIDGES Works!

### *Knowledge Gains*

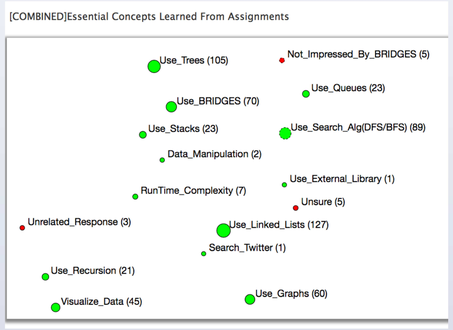


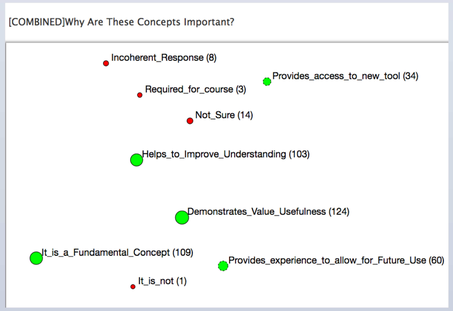

### *Student Progression through the major*




### *Student Feedback*




## Adopting BRIDGES

- **BRIDGES in use for 4 years, fully open source.**
- **Language Support: Java, C++, Python**
- **Impact: 1500 students at over 10 universities.**
- **Call for Participation: Faculty Stipends** for using BRIDGES, collecting student feedback.
- **BRIDGES Expansion:** Algorithms, CS1, CS2, AP CSP
- **New datasets and assignments:** (Open Street Map, Lyrics (Genius) API, Gutenberg Book collection)
- **More Information: Dr. Kalpathi Subramanian, krs@uncc.edu, http://bridgesuncc.github.io**

## Acknowledgements

National Science Foundation, DUE-1245841 and DUE-1726809

While enrollment in CS programs has been increasing, retention of CS majors remains a concern,

**BRIDGES** (Bridging Real-world Infrastructure Designed to Goal-align, Engage, and Stimulate) targets retention of CS majors at the sophomore level, a particular point of vulnerability in our CS degree program.

The project introduces two key innovations:

## An example BRIDGES program

```
Bridges bridges =new Bridges (assign_number, "user-name", "appl-id");

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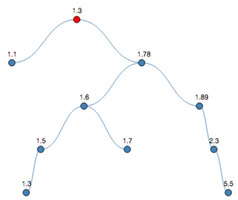


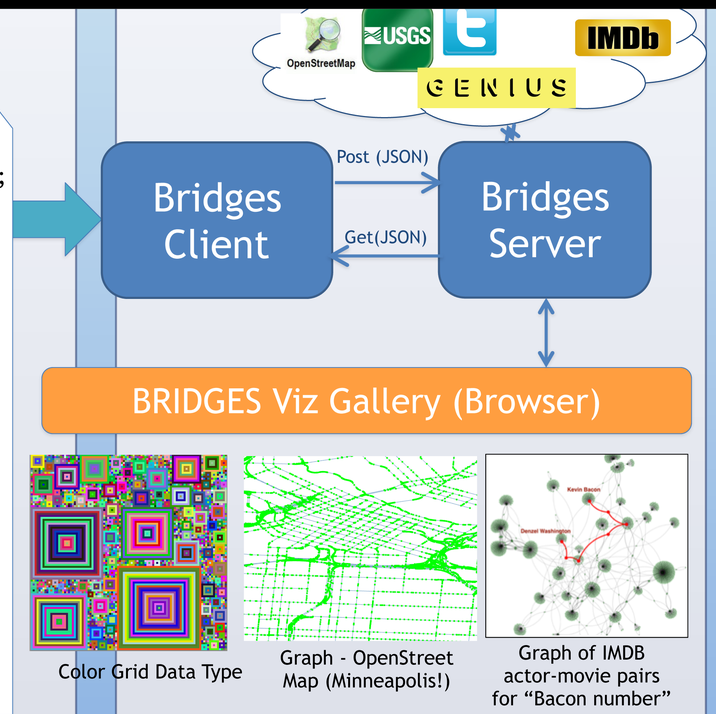


- **History:** We have used BRIDGES over the past **4 years** in **data structures and algorithms** courses. **Support for C++, Java, Python. Fully Open Source.**
- **Impact:** To date, **BRIDGES has impacted over 1300 students and used at over 10 universities.**
- **Evaluation:** Detailed quantitative and qualitative analysis of student feedback (project surveys, pre/post knowledge tests, attitude surveys) has illustrated **significant knowledge gains and the positive engagement** of students using BRIDGES.
- **Current work:** Focused on **expanding BRIDGES across the CS curriculum - Algorithms, CS1/CS2 and high school APCS courses.**
- **New datasets and assignments** (Open Street Map, Lyrics (Genius) API, Guttenberg Book collection) provide potential for larger datasets that can be more applicable for algorithms courses for teaching complexity measures with engaging assignments.
- **Users/Opportunity:** Expand BRIDGES to more institutions and students; **Looking for educators to partner with and use BRIDGES in the classroom**

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