



Retaining and Engaging CS Majors Using BRIDGES

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BRIDGES Data



Example Bridges Program

```

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

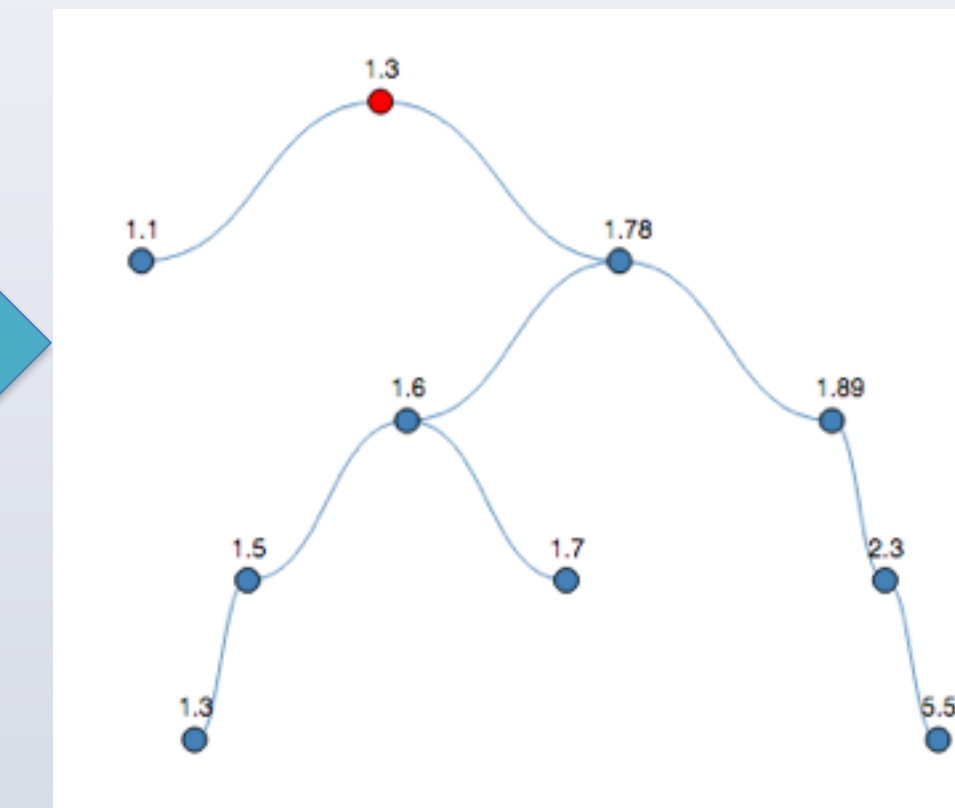
//retrieve maxElements USGS earthquake data records
List<EarthquakeUSGS> eq_list=bridges.getEarthquakeUSGSData(maxElements);

//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(eq_list.get(i).getMagnitude(), eq_list.get(i));
}

// provide BRIDGES a handle to the data structure
bridges.setDataStructure(root);
// insert elements into binary search tree
// provide BRIDGES a handle to the data structure
bridges.setDataStructure(bst);
// visualize the tree
bridges.visualize();

```

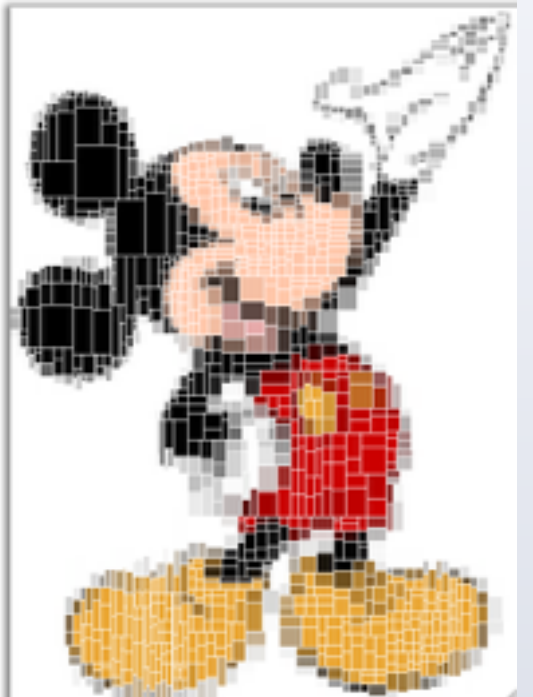
Bridges Visualizations



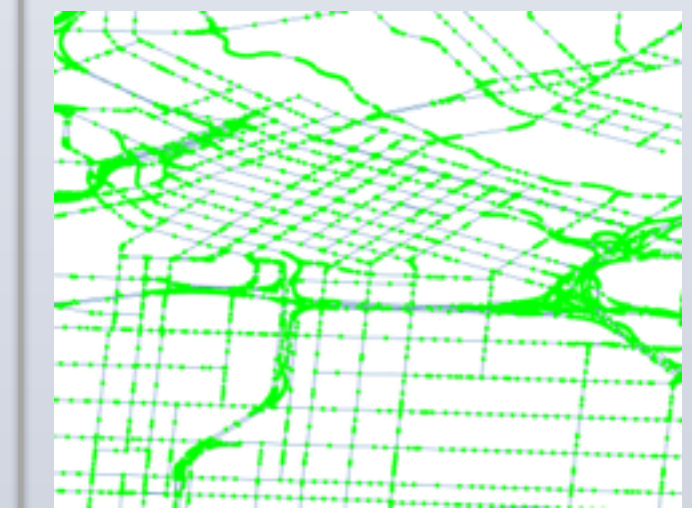
Binary Search Tree (Earthquake Data)



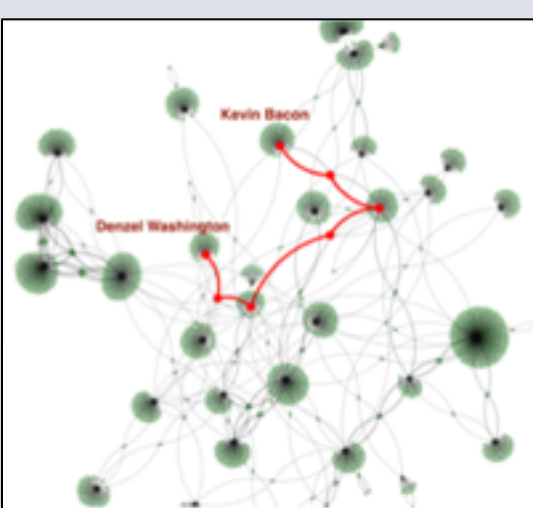
Color Grid Data Type



Kd-Tree - Image Repr.



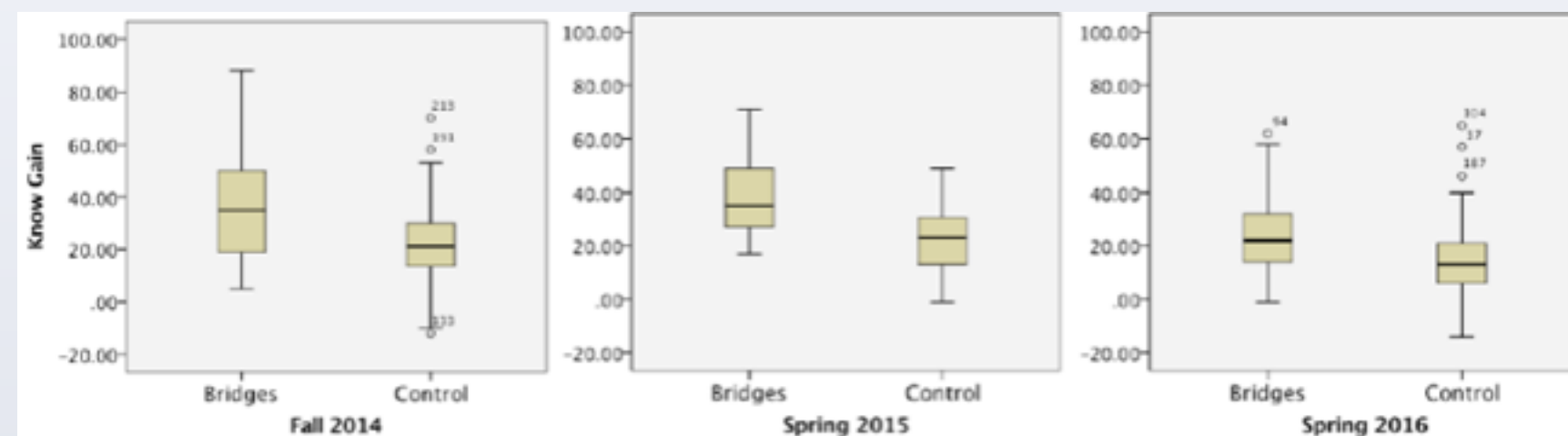
Graph - OpenStreet Map (Minneapolis!)



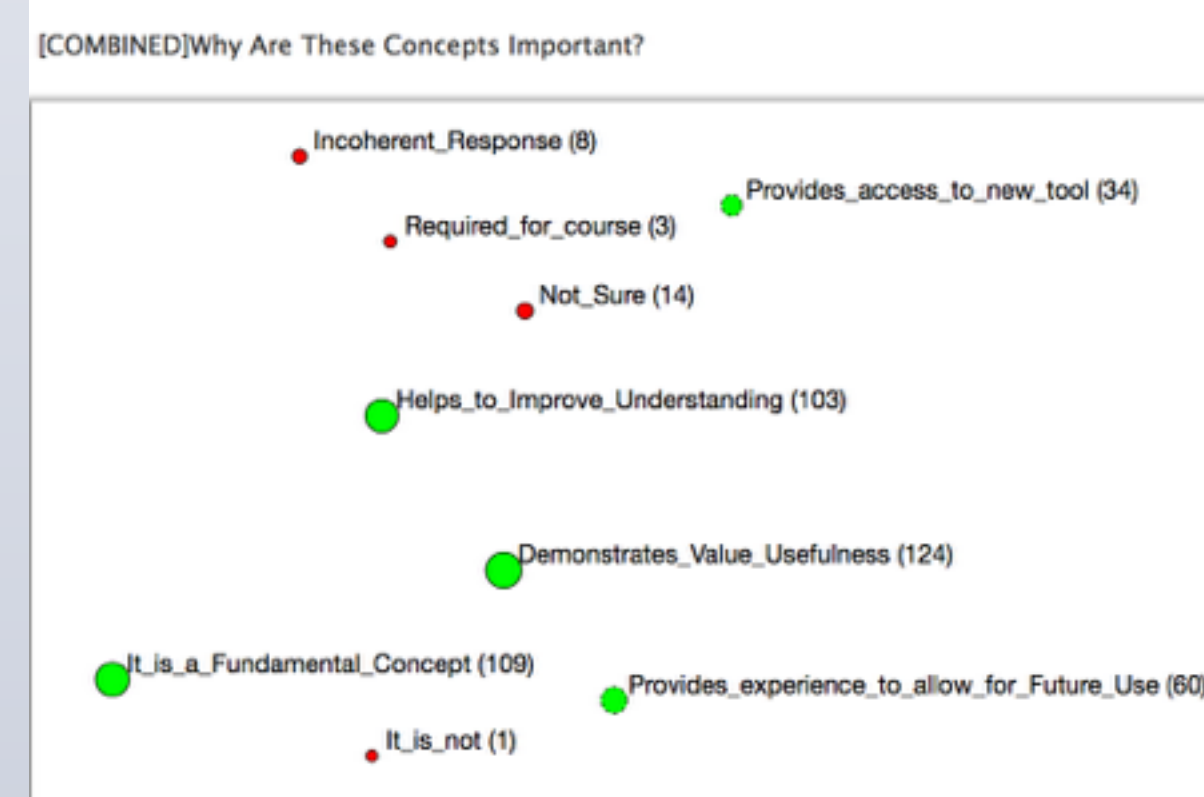
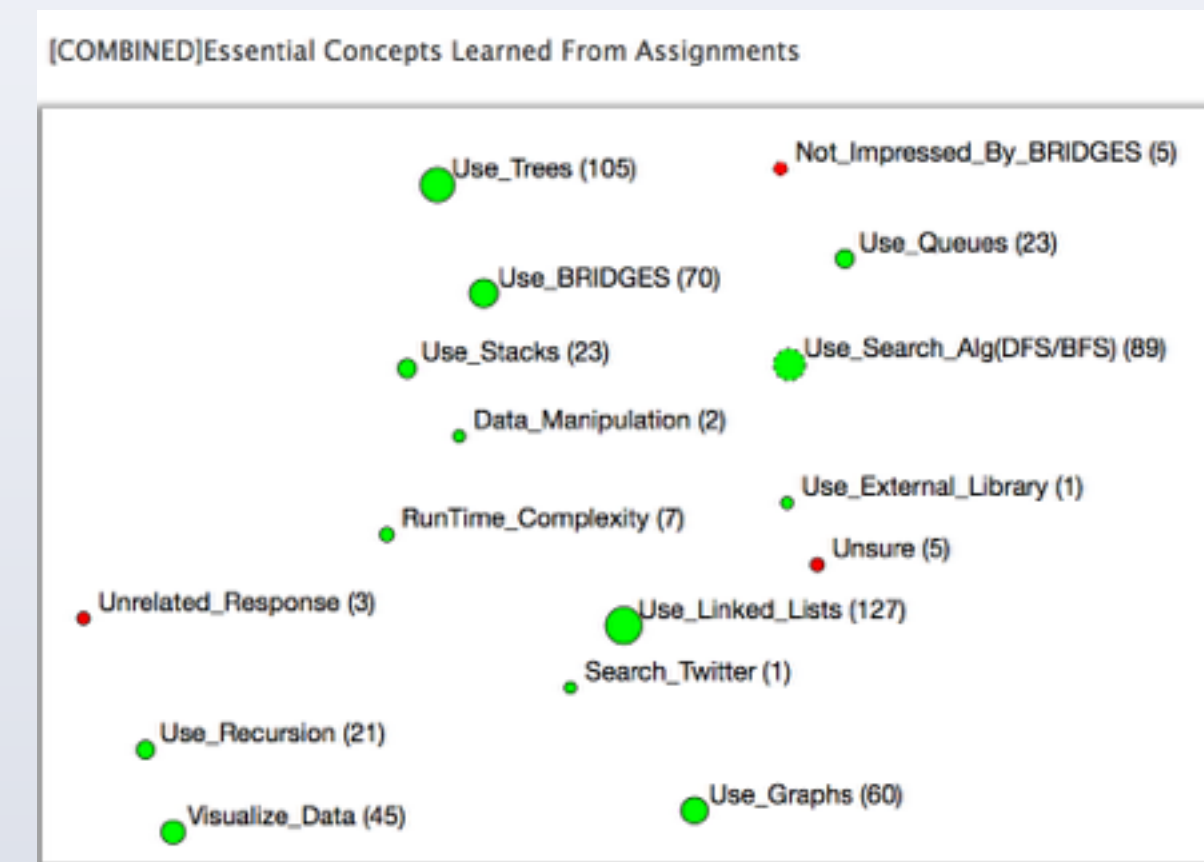
Graph- Bacon Number

BRIDGES Works!

Knowledge Gains



Student Feedback



Student Progression through the major



Adopting BRIDGES

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



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Results/Current Work

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

BRIDGES System Design

An example BRIDGES program

```

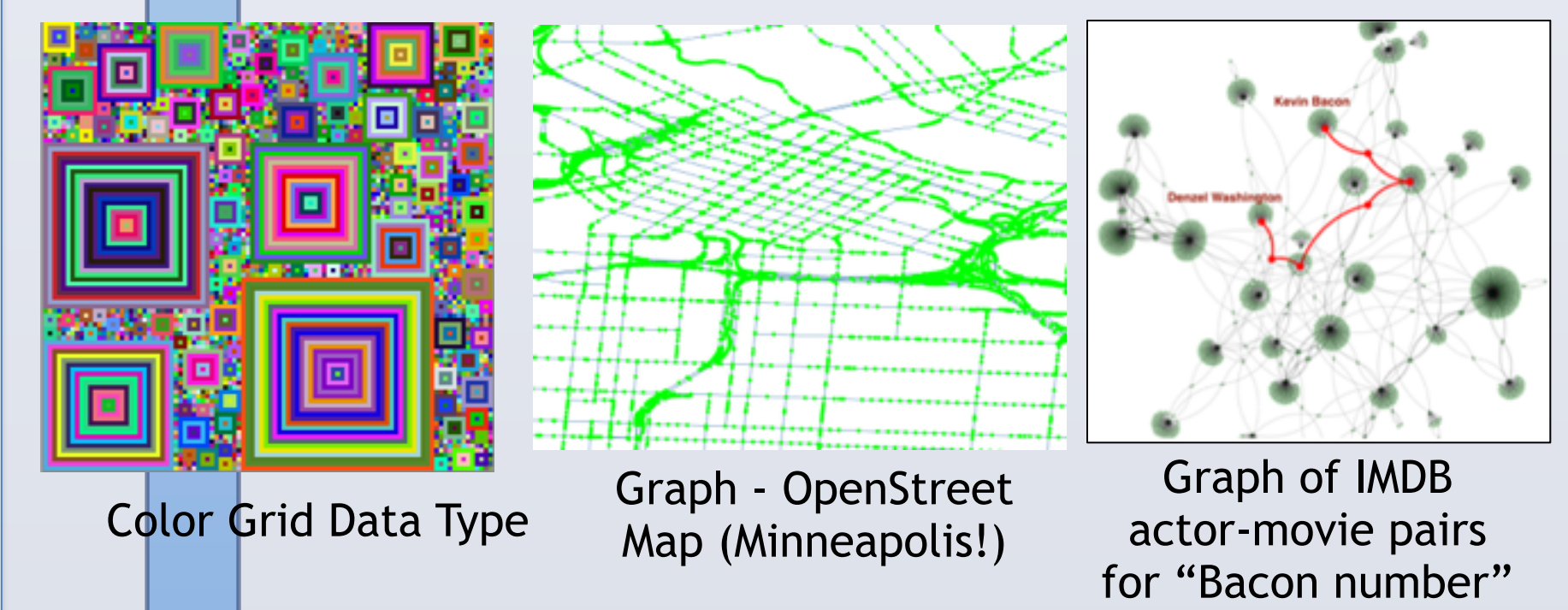
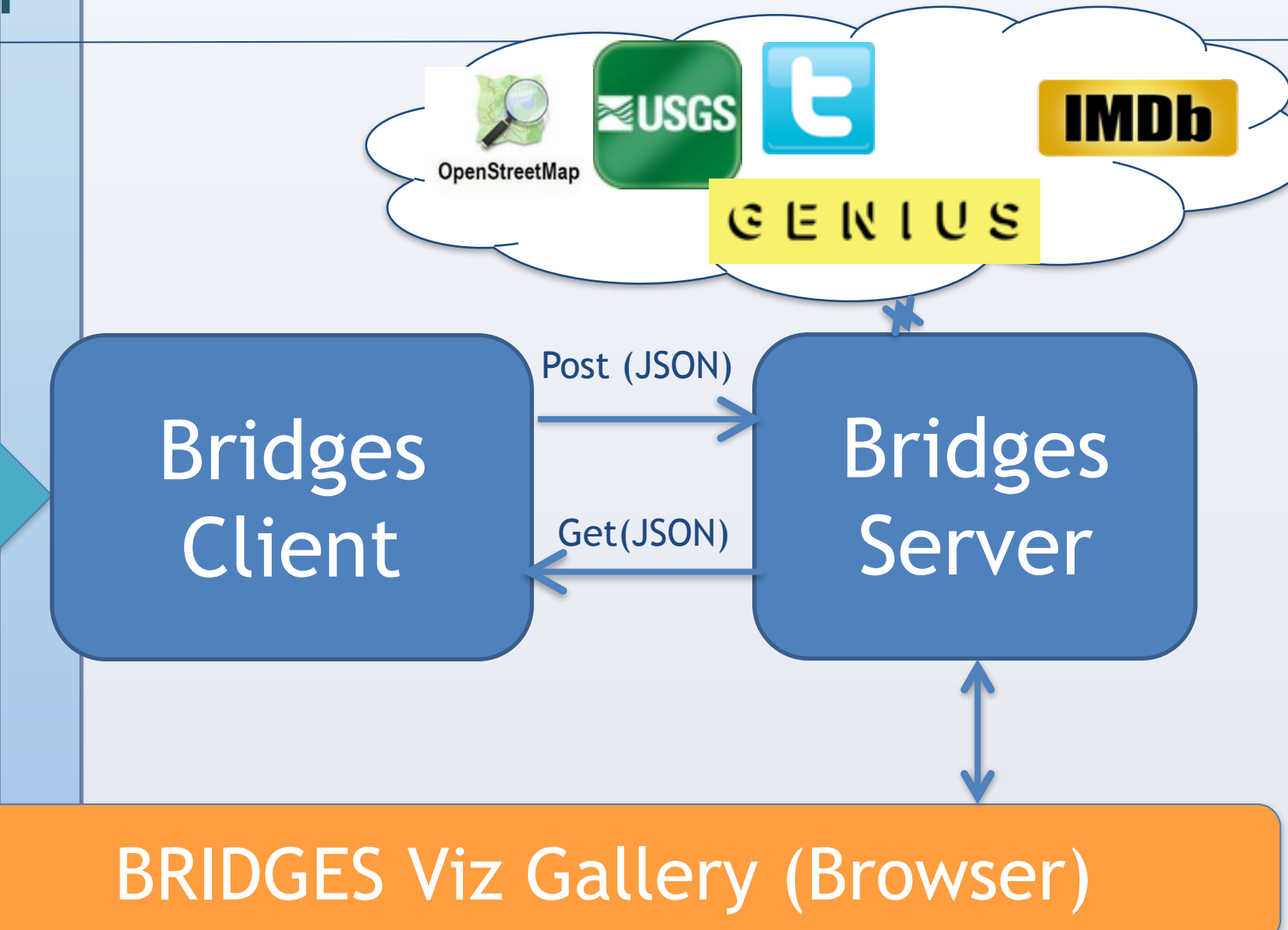
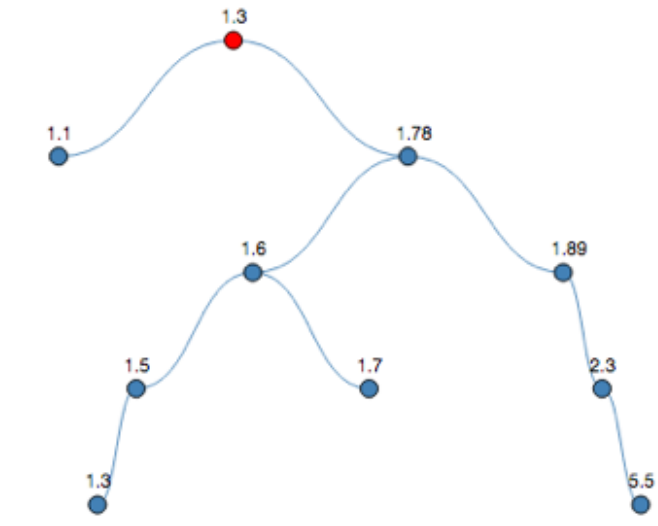
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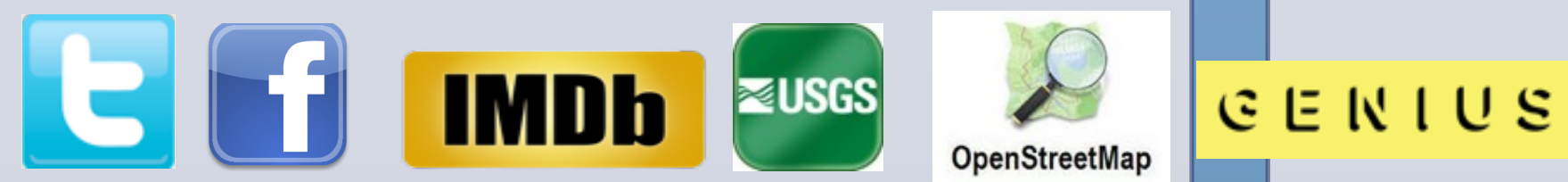
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```



- **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



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.