

Systems for Success:
Creating a Program to Help Aid Classroom Efficiency

All teachers face the challenge of making their classroom efficient. A tool that allows professors to visualize students' performance on certain topics would allow them to dynamically alter the course to improve efficiency. This goal is difficult because it is hard to quantify an entire classrooms' knowledge. Can we create a system that can supply information to a professor on classroom understanding? That is the goal of my research under the supervision of professor Toby Dragon. In order to give the professor of a class better insight into how well students are grasping class concepts, we collect data from the students about their understanding of these core class concepts from different sources. These sources include but are not limited to: homework questions, tests, and quizzes. All of the data is then loaded into our system to produce a graph (Figure 1) that visually ties together the classes' overall knowledge of core class concepts.

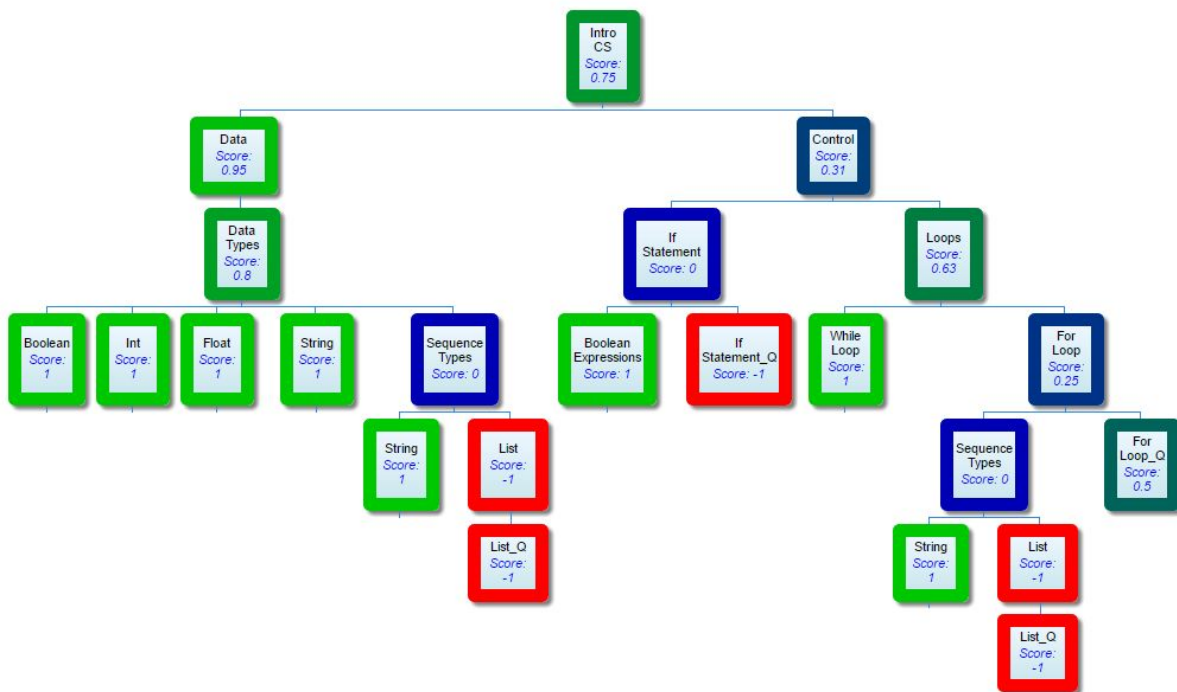


Figure 1: Above is an example graph visualizing class understanding of topics with red being little to no understanding, green being high understanding, and blue resulting in somewhere in the middle

This is what we call a Concept Graph, which consists of all the high level concepts taught in the class and how they are connected to one another. To get the most helpful information the Concept Graph has a color scale that, depending on how well of an understanding of a concept the class has, alters the concepts color. In order to get this visual representation, we use homework, quizzes, and test scores to supply the concepts with quantitative information as to how well the students do on answering questions about that concept. It is important to note, even though it is not visually represented in **Figure 1**, that the concepts colors are determined based on the scores of questions related to those concepts. To further improve estimation of students' knowledge, we have added a data importance to every question that gets added to the graphs which allows us to control the manner in which some concepts lower in the graph affect higher-level concepts. For example, In **Figure 2**, Concept C has 7 questions pertaining to it, whereas Concept B only have 1 and Concept A is comprised of both B and C. A data importance allows the system to understand that when calculating the score of Concept A, Concept C should be considered more important than Concept B.

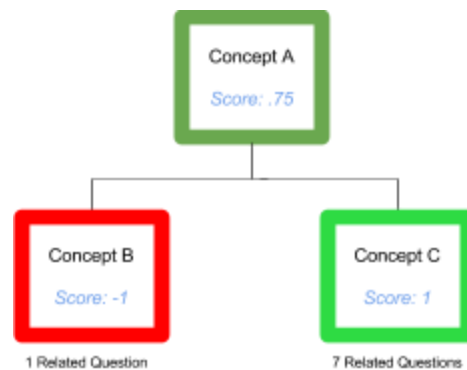


Figure 2: Concept A is a class concept comprised of Concept B and C, each of which has a number of related questions

With this system we are aiming to provide professors a tool to visualize how the classes understanding of concepts is shaping out by supplying them with this graph based on real data from the class. With this tool the professor will be able to alter lesson plans to cater to the needs and issues they may see arising. One future feature that is currently being worked on is the ability for the system to look at a student's Concept Graph and suggest questions to work on to improve in areas they are struggling in. Another addition to this system that we plan to implement is the ability for the system to suggest work groups by pairing students that have differing strengths this way they can come together to share their knowledge with one another and hopefully gain some insight in the concepts they were each struggling with.