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Thread Count: A Data Visualization

I. Project Goals

Our goal for Thread Count is to be able to visualize the curriculum for Computer Science majors at Georgia Tech. The College of Computing’s Computer Science major consists of eight different specialization choices (called threads) of which students can pick two to focus their areas of study. These eight threads include devices, information internetworks, intelligence, media, modeling and simulation, people, systems and architecture, and theory. Picking two threads from these eight possible choices results in twenty-one possible study plans, each with their own unique set of required courses. All eight threads have some basic requirements, often classes that many new students at Georgia Tech and many new students within the College of Computing have to take. Within these threads there exist subcategories from which students must pick one or more courses. Thus the reasoning and rationale behind our project: the current resources that exist to help students understand their degree requirements do not provide all relevant information in a single place. Students need to consider many parameters when selecting the courses what comprise their major, including; thread requirement, thread subcategory requirement, term offered, course prerequisites, instructor teaching, instructor's average GPA, and number of units. Our information visualization will seek to dynamically present this information in a simple, compelling, and accurate way.

II. Audience and User Questions

Our intended audience for this visualization major is any computer science student at Georgia Tech, or any prospective computer science student. These users will have varying degrees of experience with the computer science curriculum (some may be incoming freshmen or transfer students while others are 5th years), and they may have varying degrees of confidence in the classes they choose. However, despite these differences, all students would benefit from an interactive visualization of the courses and classes offered for their major. Our visualization will allow these users to investigate and answer the following questions:

1. *What prerequisites need to be fulfilled before I can enroll in a given class?*

Thread Count allows students to pick a course and then see all prerequisites that are needed for that course so they are prepared for what classes they are eligible for during registration.

2. *How can I see an over-arching class schedule (or 4-year plan)?*

Any student is able to go through the course list to see what it would take to graduate from Georgia Tech as a Computer Science major by selecting one class for each degree requirement.

3. *What classes fulfill which degree requirements for my major?*

Students can browse through each requirement to see what classes satisfy them. They can also see when multiple classes are needed to satisfy a requirement by the requirement name (such as Media Technologies 1 & 2).

4. *What terms are specific classes offered?*

By showing what terms classes are offered, students can make an effective graduation plan, especially if they need to schedule around co-ops or internships.

5. *What are the implications of choosing different classes? What different degree paths can I take?*

Thread Count helps users see all available options while also conveying the consequences and actions that result from choosing one class over another by displaying the prerequisite chain.

Personas and Use Cases:

1. *What prerequisites need to be fulfilled before I can enroll in a given class?*

Jeffrey, a freshman CS major, is browsing the course catalog for the College of Computing when he comes across the course CS3451, Computer Graphics. After reading the description in the Course Catalog that Computer Graphics deals with:  “Geometric constructions; transformations; perception; reflection models; photorealistic; non-photorealistic, and image-based rendering; rendering software and API's; triangle-mesh processing; graphic acceleration; user-interaction, design and animation,” Jeffrey is captivated and wants to be able to take the class. By pulling up Thread Count and finding the CS3451 course, Jeffrey is quickly able to see that he has to take nine prerequisite classes in order to take that class. He is now able to plan his schedule accordingly so that he can plan to take the course in the future.

1. *How can I see an over-arching class schedule (or 4-year plan)?*

Jessica has just finished her freshman year at Georgia Tech. She has finished all the general freshman, first year classes that everyone has to take, such as English and Health, and is now looking forward to her next years at Georgia Tech. As she starts looking into her classes, Jessica wants to make sure that she is on schedule and makes sure to take the most efficient schedule for herself so she can graduate in a timely manner. Jessica then decides to use to the Thread Count information visualization and with it, she is able to go semester by semester and visualize what her final end class goal will look like by the time she graduates. With this, Jessica is able to successfully see all that it will take for her to graduate from Georgia Tech.

1. *What classes fulfill which degree requirements for my major?*

William, a third year CS major, is struggling to fill his schedule next semester, but he also needs to finish his core degree requirements soon. He isn’t sure how many more classes he has to take to fulfill the requirement but his advisor has told him he should do it sooner rather than later. By using the Thread Count visualization he can now see which classes fall under the core requirements such as Physics and Chemistry, how some classes may be in multiple categories, and how the classes he has already taken fit into that schedule.

III. Data Sources

As stated earlier, one of the inspirations for our project was the fact that Georgia Tech and the Computer Science course catalog separate information regarding threads, prerequisites, and graduation plans across their multiple websites. Therefore, we understood going into this project that data gathering could be a tedious and error-prone manual process. To make this process easier, and so we could begin designing and coding our project as soon as possible, we narrowed down our data set to one thread combination: Media and People. (We also chose this combination as each of our team members are familiar with at least one of the threads and their requirements). Our design is therefore intended to be a proof of concept given our limited data set, but could theoretically be applied to all other threads if time was taken to gather the appropriate data.

To create our data set, we personally went to the websites below, scraped the data, and manually entered the information into a spreadsheet. If we had more time and resources to work with, we would have also included sources like Course Critique, as well as internal spreadsheets from the College of Computing academic advisors.

Our aggregated data set: <https://docs.google.com/spreadsheet/ccc?key=0Ar50ENDIl5-wdFVoVjdnRmVrakRFaExYbWtwVktBc0E&usp=sharing>

Data sources:

* Core requirements: <http://www.cc.gatech.edu/future/undergraduates/bscs/corereq>
* Thread requirements: <http://www.cc.gatech.edu/sites/default/files/2013_study_plans/MediaPeople.pdf>
* Terms offered: <http://www.cc.gatech.edu/three-year-course-outline>
* Course catalog: http://www.catalog.gatech.edu/colleges/coc/ugrad/comsci/threads/degreq/media-people.php

IV. Screenshots

Initial View

*Upon selecting the major “Computer Science”, the student is directed to this preliminary page.*

Two types of users would visit this site.  The first would be a student considering becoming a computer science major.  This user would be interested in exploring an overview of what the computer science curriculum contains.  The second user is a current computer science major.  This user would be interested in considering the specific implications of selecting particular course options, and how these choices will affect their overall 4-year plan.

The user is presented with a drop down menu which divides the curriculum into major categories including, Core, CS fundamentals, and then each thread options.

Expanding Categories

*In this view, the user has clicked on “Media”, which expands to show its requirements.*

After selecting a category, the drop down menu opens up to reveal a secondary drop down menu of course requirements.  The students must select one course from every requirement tab in order to fulfil the major requirement and earn a degree.  For example, in the above image,  a student would have to take four courses to satisfy the media thread requirements.

Expanding Requirement

*The user has clicked “Media Technology 1” which now displays a list of courses.*

After selecting the “Media Technology 1” requirements tab, the individual courses that satisfy this requirement are revealed.  The user will notice that the Category > Requirement > Course hierarchies are color coded for consistency and identification.

Selecting a Course

*The user is hovering over CS 4455 in the list on the right.*

When a user hovers over a course, several pieces of information are displayed.  In the details on demand widow, we see the course description, prerequisites, and the term offered.  It is worth noting that this course is not currently offered during any term.  This would be an important piece of information for a student whose whole purpose for choosing computer science as a major was to take this course.  In the prerequisite wheel, the user sees the extended chain of course prerequisites.  Each rung of the wheel represents how many levels of prerequisites exist in the chain. For example, the outermost rung holds the courses with no prerequisites (e.g. CS 1301).  We also see directional arrows that reinforce the prerequisite hierarchy.

Gray-out

*The user has selected English 1102, and is hovering over the class in the wheel (or the list).*

Once the a course has been selected, it is grayed out in the wheel, so that the highlighted course is more visible.

Wheel-list Linking

*The user is hovering over Math 2605 in the wheel, so the details for this class appear below the wheel.*

A user may explore courses by hovering over them in the wheel. In the above example, we see that two courses have been selected: ENG 1102, and CS 4496.  We also see that the user is hovering over MATH 2605 in the wheel.  On hover, we see details on demand for that course appear in the bottom window. We also see the course changed color and a black arrow appears, linking the class to its immediate prerequisite. In the drop down menu, when the user closes the requirement tab, the name of the requirement will be replaced with the course number that has been selected.  This will help the user to identify at a glance which courses have been selected, as well as which requirements have been fulfilled.

1. Software Architecture Diagram