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Project Proposal

Eye to the Sky - Chandra Edition

1. **Background and Motivation**
    a. We all have a fascination with the cosmos, largely inspired by Carl Sagan's show of the same name. With the recent release of Neil Degrasse Tyson's Cosmos series, we have decided to do a space-focused project. Katy works for the Harvard Center for Astrophysics, and will be our scientific liaison, as well as providing us access to astronomical datasets.
2. **Project Objectives**
    Questions:
    a. What is a good way to explore Chandra observation data in a visually friendly format?
    b. Which data values will be useful to display to the user, based on the target audience?
    c. How can R.A and Declination star positions be mapped to geo-coordinates in a way that correctly maps star positions in the visible sky?
    Goals and benefits
    d. We would like to create a visual representation of science categories and the time-resource allocation of the telescope, along with providing an engaging visual experience to share the joy of the cosmos with others who might find such data inaccessible.
    e. We would like to learn how to accurately map star data from the viewable sky by using the zenith position at any given longitude and latitude. This includes learning how to leverage D3's geographic scale functionality.
    f. The target audience for this visualization will be professionals working with the Chandra data, and anyone else interested in viewing the night-time sky at any position on earth in an interactive way. This visualization would benefit both target audiences by combining this data and representing it in a way that makes it easier to understand, group and explore.
3. **Data**
    a. Page scraping from: http://cxc.harvard.edu/target_lists/index.html, more specifically from each cycle's (year of observations) allproposals##.html:
        i. http://cxc.harvard.edu/target_lists/cycle15/allproposals15.html
        ii. http://cxc.harvard.edu/target_lists/cycle14/allproposals14.html
        iii. http://cxc.harvard.edu/target_lists/cycle13/allproposals13.html
        iv. etc. for the life of the mission (15 cycles so far)

4. **Data Processing**
    a. Data Cleanup should be minimal after it is scraped from the tables. Desired quantities are:
        i. Proposal Number (int)
        ii. Science Category (string)
        iii. PI (Principal Investigator) Name (lead scientist) (string)
        iv. Time of Observation (in kiloseconds) (int)
        v. Title (Of original science proposal) (text?)
        vi. Target-Specific Data, since proposals can be for multiple targets:
            1. Right Ascension (float)
            2. Declination (float)
            3. Target Name (string)
            4. Individual Exposure time per target (int)
    b. There could be significant data processing when it come to mapping positions of targets on our projected sky
5. **Visualization**
    a. We plan to make the primary view of our Data to be divided up into 1 or 2 subsections:
        i. A rotating globe with an area selected on the ground which will project stars and their information onto an area of the page, providing a 2 dimensional representation of star locations.
        ii. A Cycle-by-cycle bubble chart of Proposals per cycle. Options to include two or more cycles in one bubble chart or view each cycle individually. Data encoded as such:
            1. Science Category as color
            2. Exposure time as area
            3. Proposal Number as text in center of circle
            4. Meta Data in a tooltip:
                a. PI name (string)
                b. Title (string)
                c. Science Abstract (text field?)
        iii. Bar Charts of % differences in time devoted to each science category by cycle over the life of the mission. When/if did NS Binary observations become popular? What about Clusters of Galaxies? Will we be able to see trends like this?
6. **Must-Have Features**
    a. Stationary Globe with at toggleable positions for projected data
    b. Projected data based on telescope data
    c. Cycle-by-cycle bubble representation of proposals
7. **Optional Features**
    a. Rotating globe with dynamically updating projected data
    b. Possible bar chart showing shifts in observation time allocation
    c. Doesn't cause seizures in users

8. **Project Schedule**
    a. **Week 1 --**
        i. Analysis of our dataset
        ii. Processing and cleanup of our dataset
        iii. Sanity check on feasibility of our project based on results of analysis
    b. **Week 2 --**
        i. Basic visual structure/layout of projected data -- 1 static frame, pending spinning globe progress
        ii. Spinning globe (maybe)
        iii. Layout of cycle-by-cycle data (not yet populated/animated)
    c. **Week 3 --**
        i. Continued work on spinning globe, hopefully leading to dynamic projected data views
        ii. Population of data for cycle-by-cycle layout
    d. **Week 4 --**
        i. Polish on styling of the modules, based on what data we're able to represent at this point in time.
        ii. Begin work on barchart module (time pending)
        iii. Begin discussing screencast (script, narration, visual storyboard)
    e. **Week 5 --**
        i. Continued polish on styling and user interactions (addressing potentially slow rendering/transitions, long loading times due to dataset size)
        ii. Setting up domain and hosting for website
        iii. Finalize screencast storyboard and script
        iv. Begin recording voiceover for screencast
    f. **Week 6 --**
        i. Finalize recording screencast visuals
        ii. Finalize and sync audio to video