# Knowledge and Visual Analytics Final Proposal

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**The Goal**: Create an interface that allows a users to visualize data on the history and future of global CubeSat missions

**Background**: CubeSats are small platforms that have a relatively low barrier for space-based research that can be flown on rockets planned for upcoming launches through NASA's CubeSat Launch Initiative [1]. Unfortunately, most CubeSat data remains on private hard drives or in non-standard formats, maintained by groups that do not have the time or resources to publish and disseminate that data. I am currently part of a research team working to create an open source, ready-to-use, CubeSat data system, that will allow researchers to reduce time spent on developing ad hoc systems and invest more time in the mission and instrumentation. We're calling it The Space Library [2]. With an open solution like the one my team is proposing, educators and the public will gain access to live space data that will be ripe for current and future citizen science projects. Researchers in astronomy and astrophysics will also be more capable of building on the experimental work that CubeSats enable. The data visualization I'm proposing to create will help us make the case for the importance of our Space Library project and the significance of CubeSat programs around the world to the future of space-based science.

**Description**: Gathering comprehensive data on CubeSats has historically been challenging. Many CubeSats are built by students or not tracked in a public capacity. There are though a few valiant efforts to gather this information:

- St. Louis University's CubeSat Database [3]
- The Nanosatellite Database [4]

I plan to pull data from both of these sources to create both improved and novel charts (and potentially maps) illustrating the importance of opening up CubeSat data to the world with a project like The Space Library. Some of my ideas for visualizations include:

- Create a choropleth map showing the origins of CubeSats on a global scale - this could be interactive and show details about the most recent launch from a particular country or state when selected, thus highlighting how global an issue CubeSat data is.

- Create charts exploring the types of funding sources for US CubeSats - privately funded or military funded sats may not have any designated structures or archives for sharing their data. Our project would help give that data a place and make it findable (even government-funded sat data from NASA projects are very difficult to find).

- Create more visually pleasing charts showing projected launches for future CubeSat missions to show the increasing importance of making CubeSat data accessible to society.

I am uncertain at this point what tools I want to use to create these visualizations, but I am going to look into using R and the R plotly package [5] in particular. As an alternative or supplement to this approach I many use D3.

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[1] http://www.nasa.gov/mission$_p ages/cubesats/overview$
[2] bit.ly/space$_l ib$
[3] https://sites.google.com/a/slu.edu/swartwout/home/cubesat-database
[4] http://www.nanosats.eu/
[5] https://plot.ly/r/
[6] https://d3js.org/