Topic, and questions to be addressed (½ page)

1. The description of the general topic can be short -- a paragraph. It is ok to add a separate appendix with relevant background.
2. The questions should be reasonably clear. It is good to have several questions, some more complicated or ambitious than others. It is good to have at least one fairly straightforward question (e.g., “what factors are correlated with X?”) to get you started.
3. For Spark!-partnered project, at least one of the specific questions should be formulated by you (the students). We encourage you to discuss with and get feedback from the partners.

Ideas for specific data sets (¼ to ½ page)

1. A brief description of the initial data sets you intend to use.
2. If possible, please provide details on the size of the data sets (number of records, types of features, and how they are accessible.

**Proposal: Mapping the Intensity of Energy Use Across Boston University**

Team member: Mengxi Wang, Rui Chen, Jialiang Shi

**1. Project Description:** The goal of this project is to analyze BU's building energy usage and discover relationships between driving factors to help the University achieve its goal of becoming carbon neutral by 2040. Part of the project would include building a database with energy usage and building characteristics as these are currently under different departments. Ideally, the analysis would help inform decisions made by sustainability@BU, the Climate Action Plan and the buildings team of Carbon Free Boston.

**2.Questions to be answered:**

**2.1 How does BU's building energy use intensity vary with weather(tempreture)/location/building direction/year built/type/year built/height/building material?**

* Weather
* How frequent does the weather deviate from "normal"?
* How greatly do these extremes/anomalies affect energy consumption?
* Assumption: The energy consumption gets higher if it is cloudy (lights) or cold (heat) or hot (cooling).
* Location
* What different location characteristics should be classified? -
* How greatly does each location characteristic affect energy consumption?
* (Not clear yet) How to define the location? (adjacent to river/ adjacent to road/ west or east or central/ north south)

Assumption: It is hard to find the different location characteristics among the building in BU(almost all is near the road). So maybe the energy consumption will not vary greatly with location.

Building direction

* How do building direction affect energy consumption?
* (Not clear yet) How to describe the direction of a building?
* Type of building (hospital, lab, business area, dormitory)
* How does the type of building affect energy consumption
* (Not clear yet) How to classify the type? (For example: Some building has more than one type of room.)
* The year built
* How does the year the building built affect energy consumption?
* Assumption: The older the building is the more energy it should use.
* The height of building
* How does the height of building affect energy consumption?
* Assumption: 1) The higher the building is, it may use more energy to heat or cooling or lighting. 2) On the other hand, the higher it gets, the better natural lights it gets, thus the less light it need to consume. (But we are not clear yet that its daylighting rate is more related to the height of the building or the density of buildings around it.)
* Building material
* How does the building material affect energy consumption?
* (Not clear yet) We haven’t figured out how to quantify this characteristic. Also, even if we find a way to quantify building material, in most cases, buildings are not built by one material, in this case, should we compare the main material? And how to define the main material?

**2.2 What factors are most responsible for energy use intensity (EUI) at BU? What are these relationships?**

* EUI: energy per square foot per year[1]
* (Not clear yet) How to analyze the most responsible for energy use intensity? Since when we analyze one factor, we need to control the other factors to be the same.
* According to the question above, we are considering focus on a few factors that affect energy consumption and go deeper on these areas.

1. **Datasets:**

* **Energy related:**
* Building Energy Reporting and Disclosure Ordinance (BERDO): <https://www.boston.gov/environment-and-energy/building-energy-reporting-and-disclosure-ordinance>
* Datasets found for Electricity usage of Boston:

<https://data.boston.gov/dataset?q=electricity&sort=score+desc%2C+metadata_modified+desc>

* **Weather related**
* National Oceanic and Atmospheric Administration (NOAA): <https://www.ncdc.noaa.gov/data-access>
* Degree Days Statics:

<http://www.cpc.ncep.noaa.gov/products/analysis_monitoring/cdus/degree_days/>

***Reference:***

*[1]: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager/understand-metrics/what-energy*