**Final Deliverables:**

The final deliverable will be an implementation of the proposed solution (Code repositories) and a 8-15 page paper written in the format of a conference paper submission. Template can be found at this [page](https://chi2018.acm.org/chi-proceedings-format/) and it is **required** to use this template.  There is no length restriction, feel free to use as much space as you need for images. 

The **written report** is expected at the end of the project, that include:

* Introduction: An explanation of the problem and the motivation for solving it.

Research and popularization about Air-pollution meteorology is a vital assignment for China, as the country is facing growing problem of environmental pollution.

**Initial questions:**

**RQ1:** Which season has the best air quality? Regarding PM2.5, PM10, SO2, NO2, CO and O3.

1.Data transformation: a) combine all csv files and select attributes year, month, day, hour and related pollutants from 12 sites’ csv files. b) filter out ‘NA’ value. c) group by ‘month’

2.Visual mapping: Because it is for comparison between quantative information, I choose to use bar chart for visual encoding.

3.Interaction: I design a map representing Beijing city on the right side of the page, and information to show on the left side. When user first enter the page, they will see the city’s total air pollution situation between 2013 and 2017 as a stacked bar chart. Then they can either choose different types of air pollutants or choose different sites to view.

**RQ2:** Which factor affects air pollution most? =>

How does each weather factor correlate with air pollution?

1.Data transformation: …

2.Visual mapping: As for question about relationship, I choose to use scatter plot chart for pollutant concentration and quantative attributes. As for wind direction, I use radar chart, as it is descriptive and effective. As for wind speed …

3.Interaction:

**RQ3:** Which period among the day has the best air quality?

=> Car emissions effect

1.Data transformation: …

2.Visual mapping: heat map

3.Interaction:

**RQ4:** Does the air-quality of Beijing improves from 2013 to 2017? Regarding as different pollutions.

=> (According to the programme for pollution control of motor vehicle emissions by the People’s Government of Beijing Municipality)

1.Data transformation: …

2.Visual mapping: Line graph

3.Interaction:

**RQ5:** How do the population of permanent residents influences air quality?

1.Data transformation:

2.Visual mapping: Line graph

3.Interaction: showing the line dynamically (growing)

**RQ6:** How do the industrial production or GDP influences air quality?

* Related work: A description of previous papers related to your project.

[Cautionary tales on air-quality improvement in Beijing](https://royalsocietypublishing.org/doi/full/10.1098/rspa.2017.0457#d3e496)

The authors conducted several statistical analyses with the PRSA dataset, especially PM2.5, to argue the official statement that the Beijing’s air quality had improvement in 2016 as the 9.9% reduction in PM2.5. On the contrary, they detected a non-significant increase in the seasonal year average PM2.5 in 2016. They also discovered the underlying reason for this situation was that 2016 was the start of an economic recovery. Based on this paper, I got an intuition for solving the initial question RQ5.

* Methods/Design (storyboard, etc.): A detailed explanation of the techniques and algorithms you used to solve the problem.
* Implementation (must include specifics of what other components/libraries you built upon): A detailed explanations on how you implement the visualization.
* Results: detailed description of your visualizations
* Evaluation (e.g. user study or reflections/discussion of your system): The visualizations your system produces and data to help evaluate your approach. For example you may include running times, or the time users typically spend generating a visualization using your system.
* Discussions: What has the audience learned from your work? What new insights or practices has your system enabled? A full blown user study is not expected, but informal observations of use that help evaluate your system are encouraged.
* Conclusions and Future Work: A recap of take-aways and detailed description of how your system could be extended or refined.
* Bibliography