UC San Diego
Electrical and Computer Engineering

Air Quality Analysis

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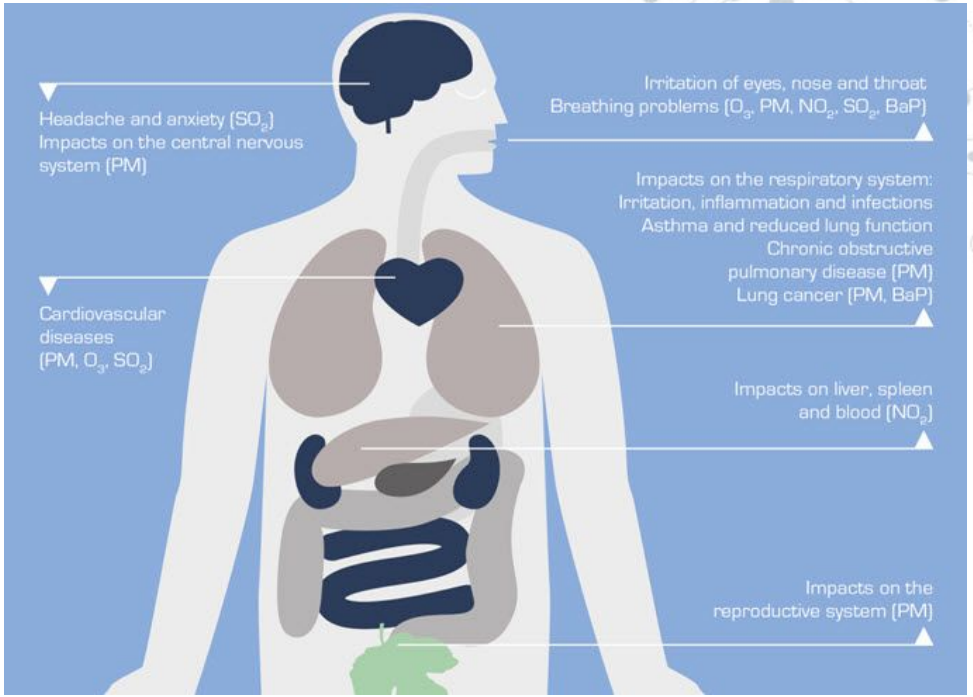
Group 20

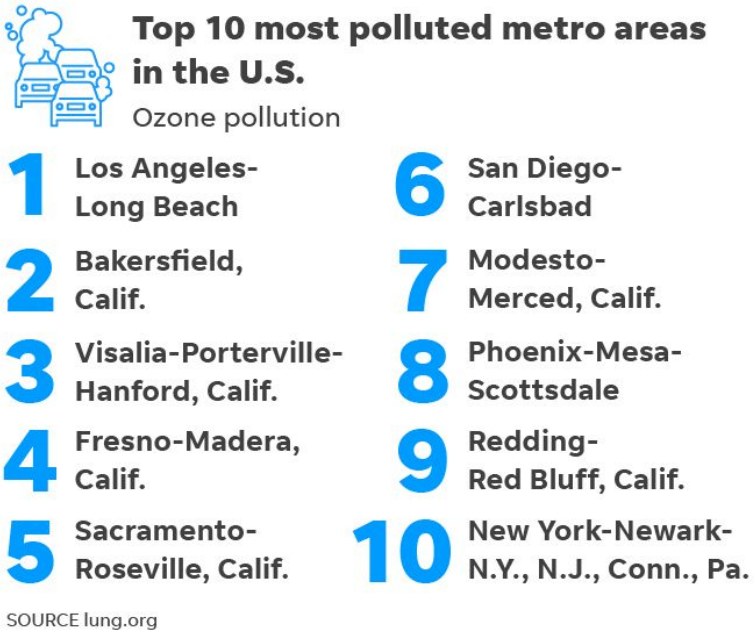
Overview

- Air quality is fundamental to our well-being
- On average, a person inhales about 14,000 litres of air every day, and the presence of contaminants in this air can adversely affect people's health
- Global warming is serious concern



Motivation

Pollution levels from 2014 to 2016



- California has eight out of ten most polluted cities in the nation
- The Los Angeles/Long Beach and San Diego area took the dubious distinction of being the nation's most ozone-polluted city as it has for nearly the entire 19-year history of the report.
- Outdoor air pollution continues to threaten the lives and health of millions of people in the U.S.

Source: https://www.usatoday.com/story/news/nation/2018/04/18/california-has-eight-10-most-polluted-u-s-cities/524815002/

Objective

Creating a system to analyze the air quality based on locations, its content and time

Datasets

- Pollution in US open dataset: https://www.kaggle.com/sogun3/uspollution

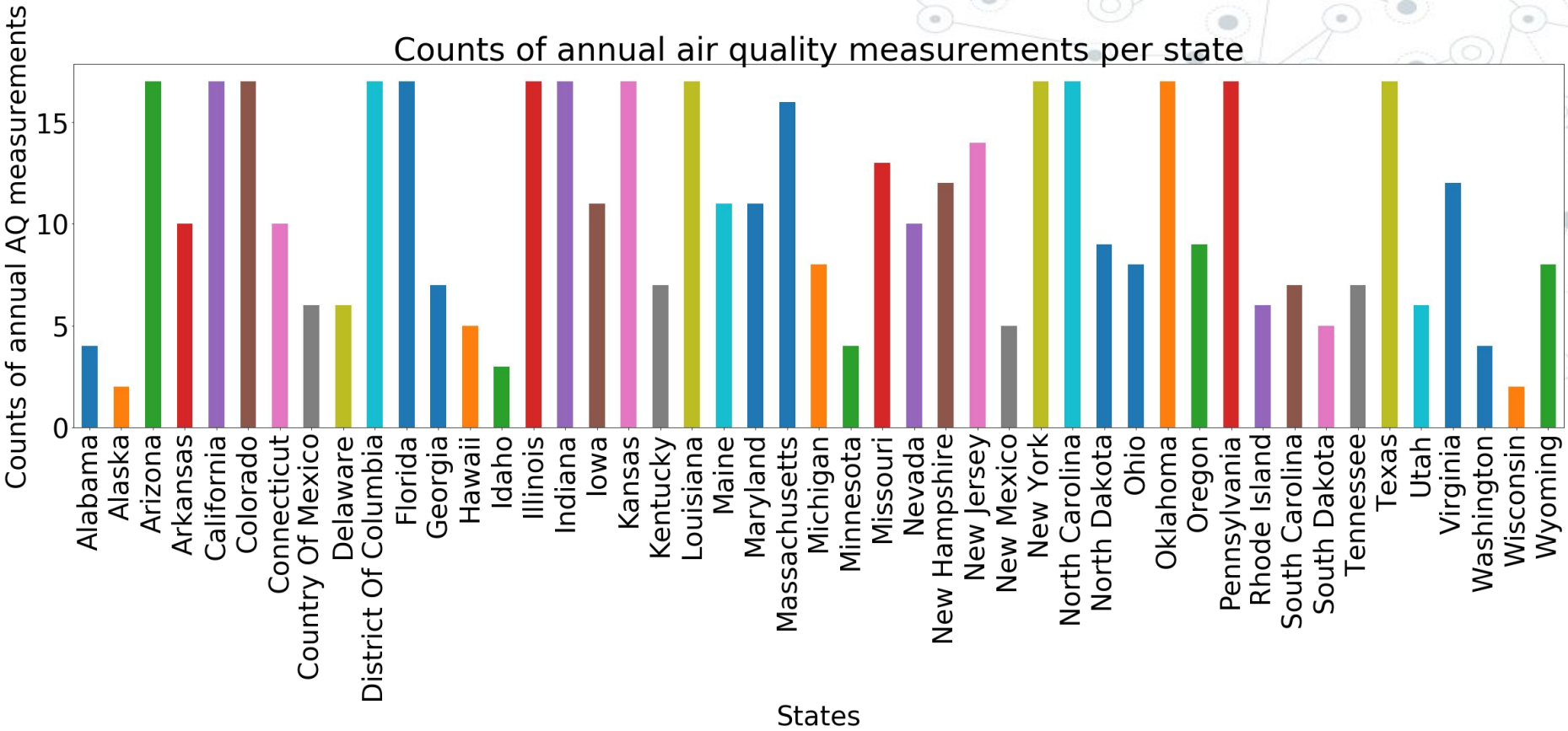
- The dataset presents information about the state, the county, the city, the date of the measurements (from 2000 to 2016), and measurements of the pollutants level in the air

- The dataset format is csv (size: 382 MB)

Methodology: EPA Category

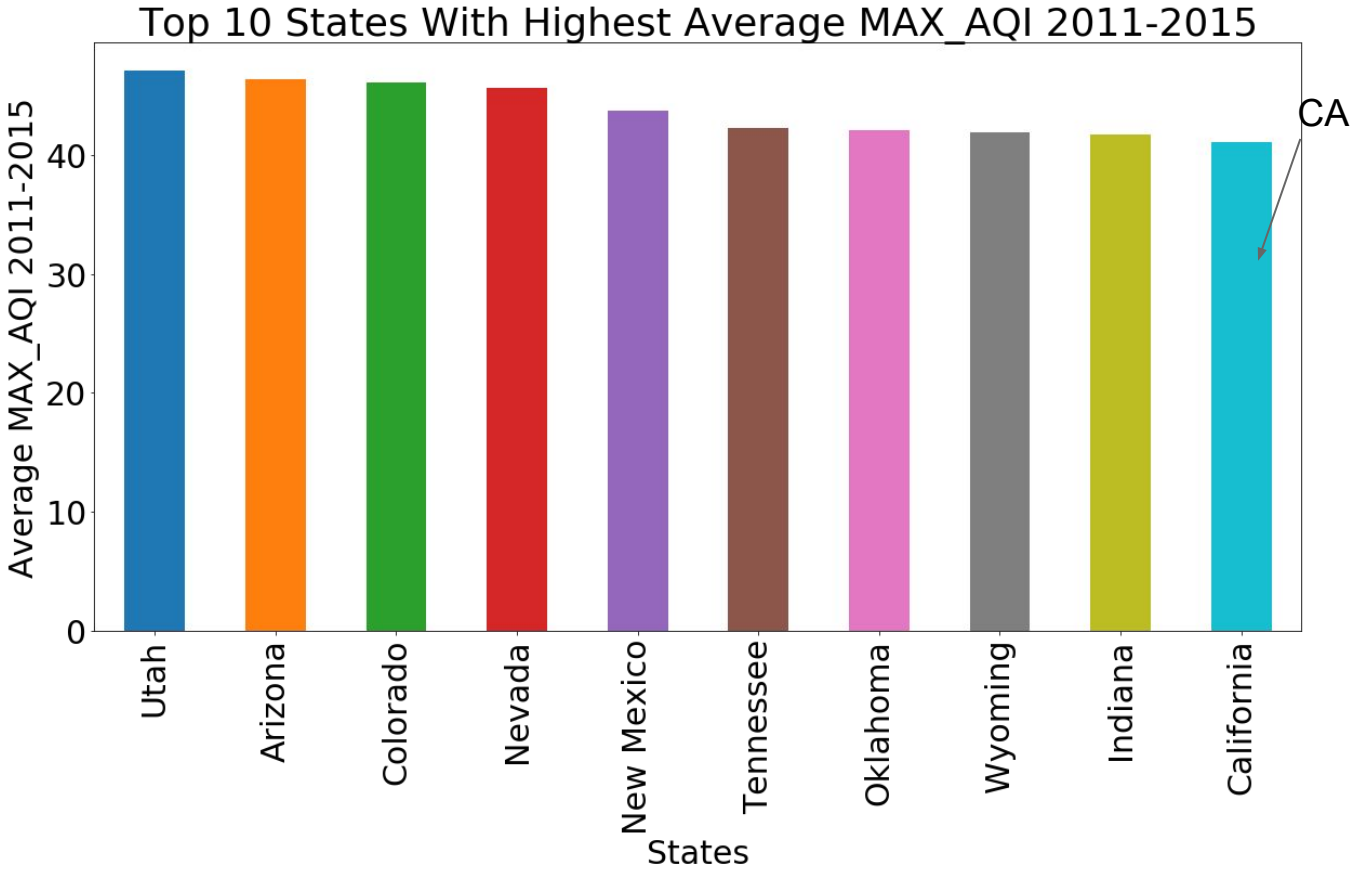
Using the data from **Air Quality Index (AQI) Basics to rate the air quality of each state and difference time of the year**

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
When the AQI is in this range:	*..air quality conditions are:*	*...as symbolized by this color:*
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

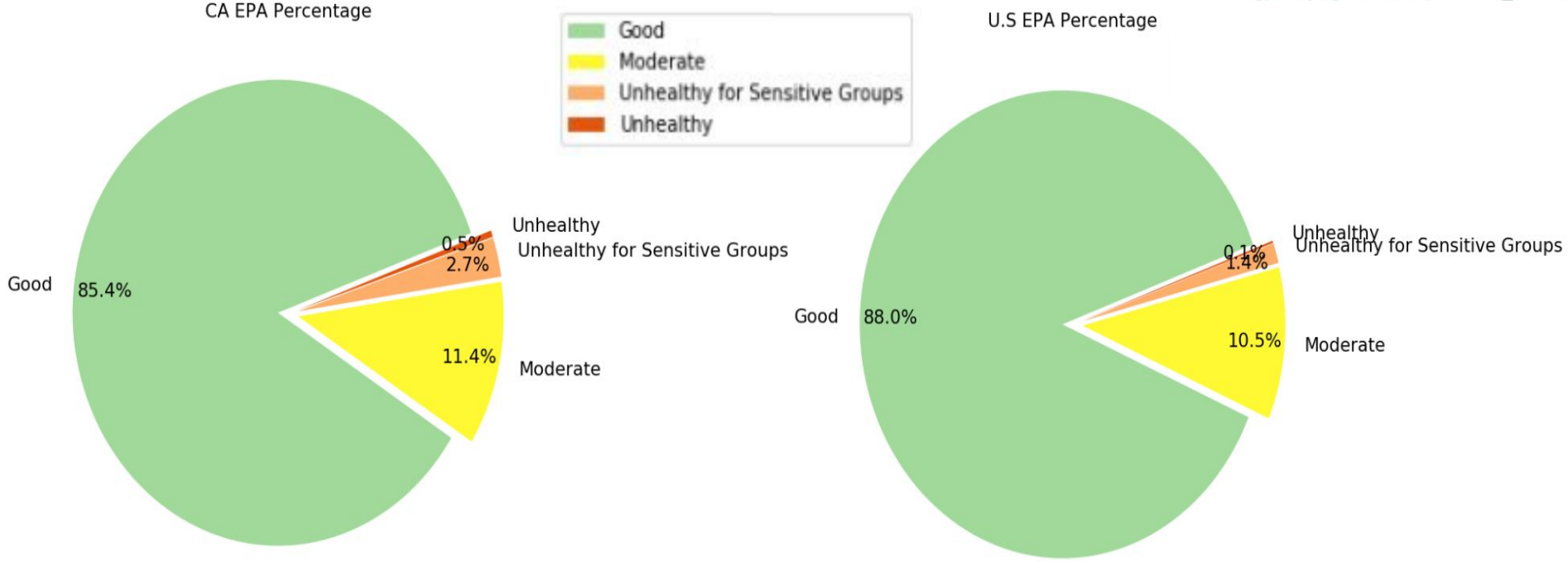


Air quality was measured across 50 states. However, the number of data values were vary from state to state.

Top 10 States with Highest Average of AQI Max from 2011-2015



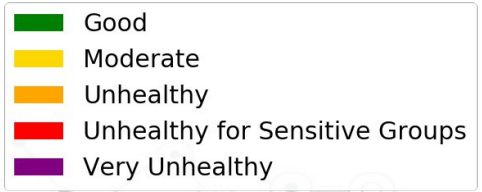
EPA Classification CA vs U.S.A Average

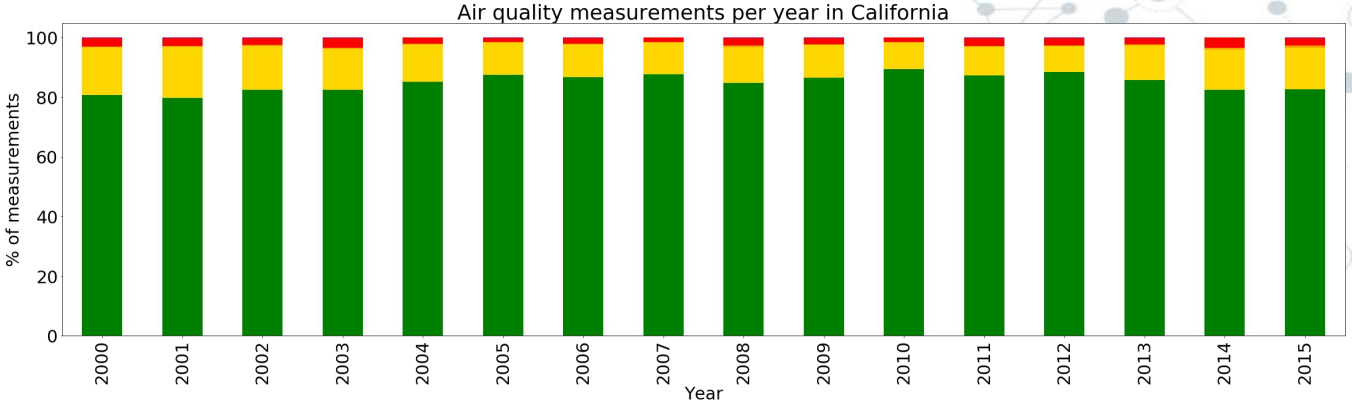


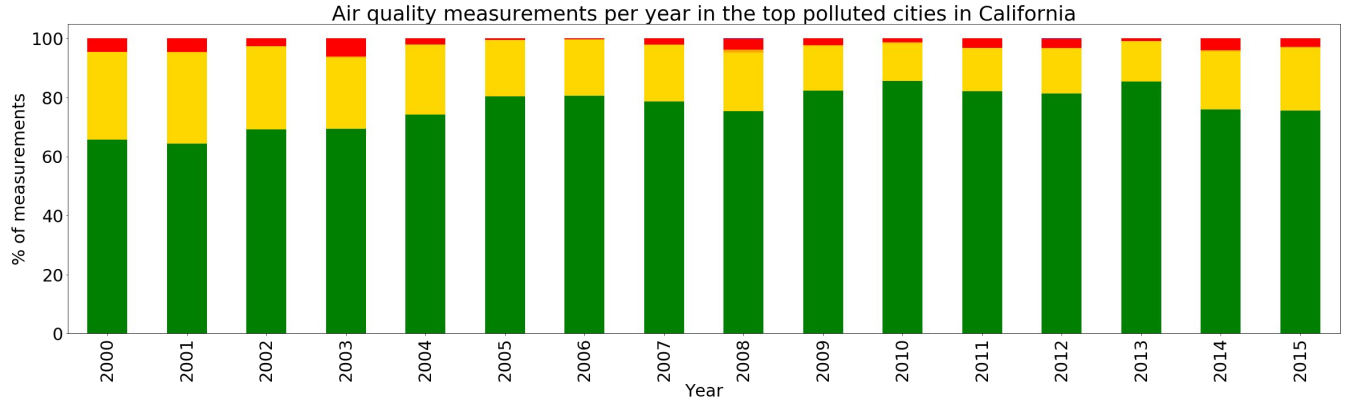
- California has much more percentage of unhealthy days than U.S average

Air Quality CA versus Top Polluted Cities in CA

- The number of Moderate air quality measurements increase when we filtered only top polluted cities in CA
- Unhealthier air quality measurements were verified between 2000 and 2004

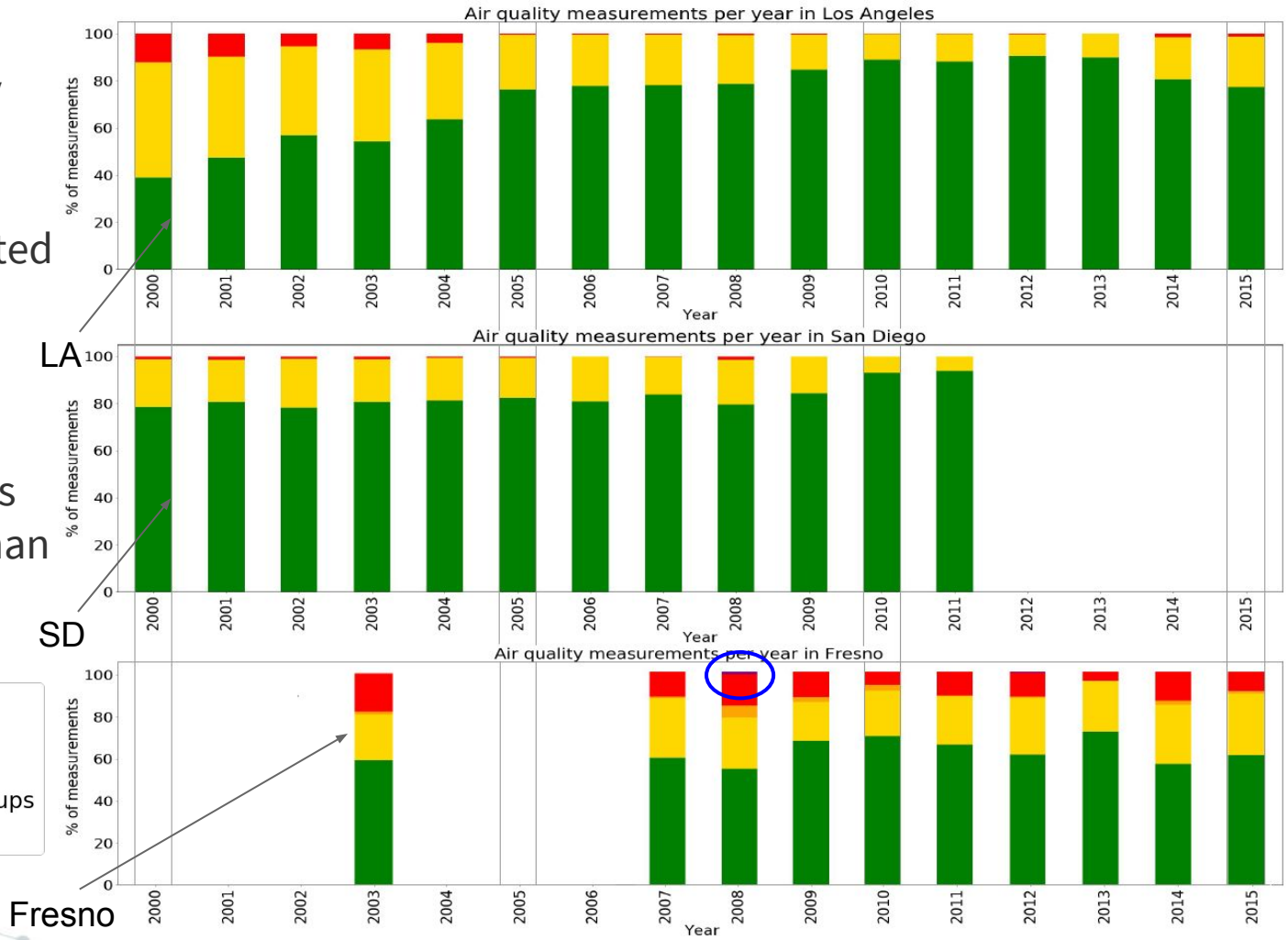


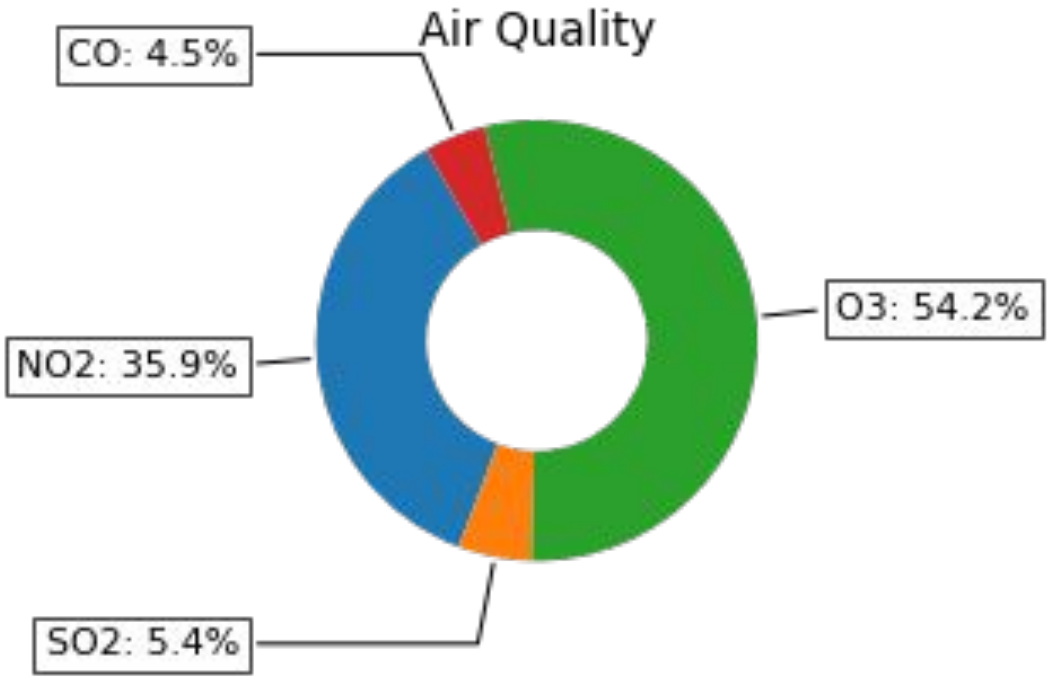




- Fresno was the city that presented the worst air quality among other polluted cities, especially in 2008

- Overall, LA presents worse air quality than SD over time

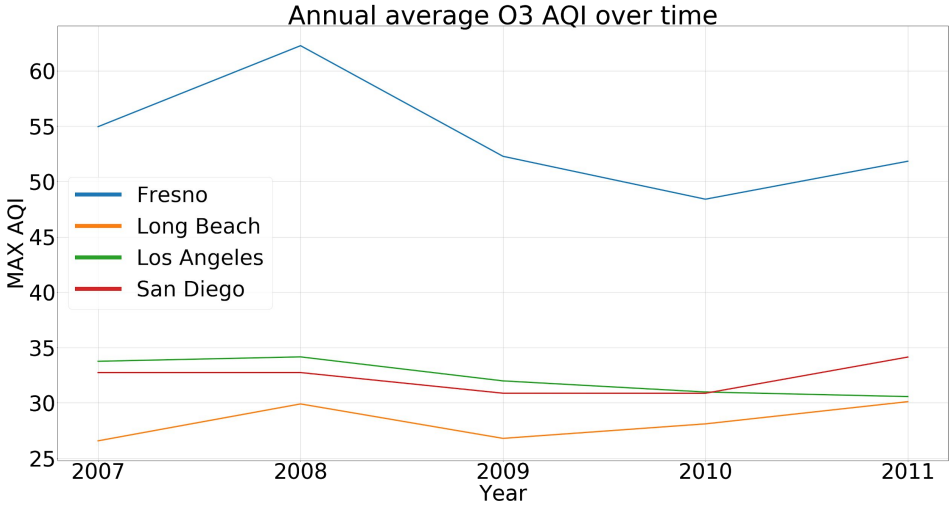


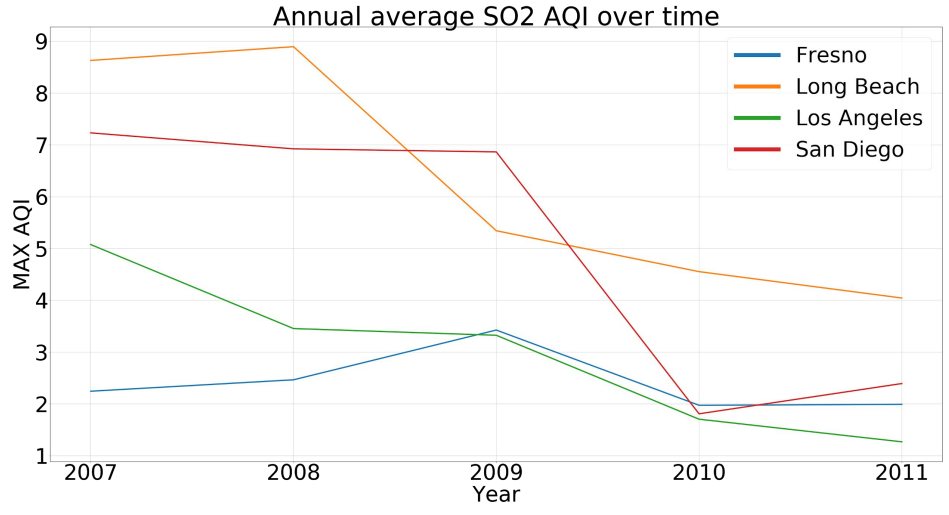


- O3 was the most prevalent pollutant gas followed by NO2, SO2 and CO over the period of 2000 to 2016

- Fresno was by far the city that presented the highest ozone AQI over time

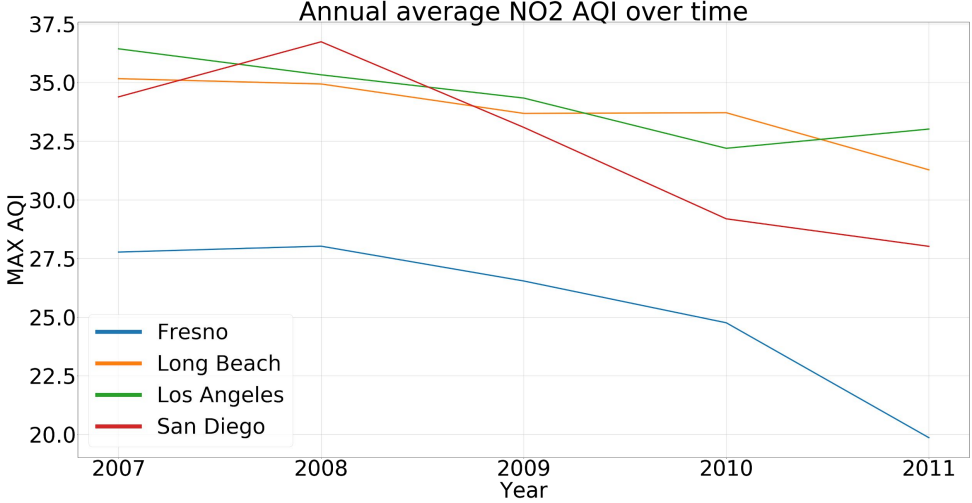
- Long Beach and San Diego presented the highest values for sulfur dioxide AQI over time

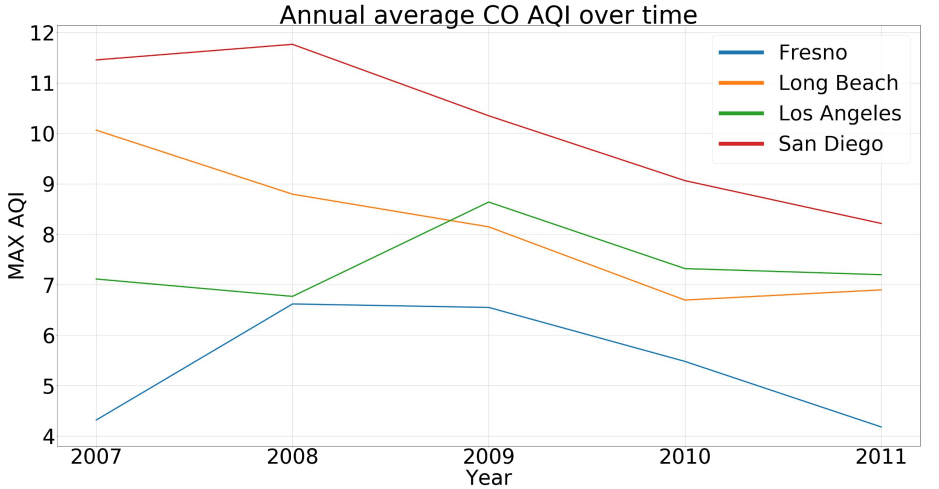




- Long Beach, LA and SD had similar nitrogen dioxide AQI behavior over time

- San Diego presented the highest carbon monoxide AQI over time





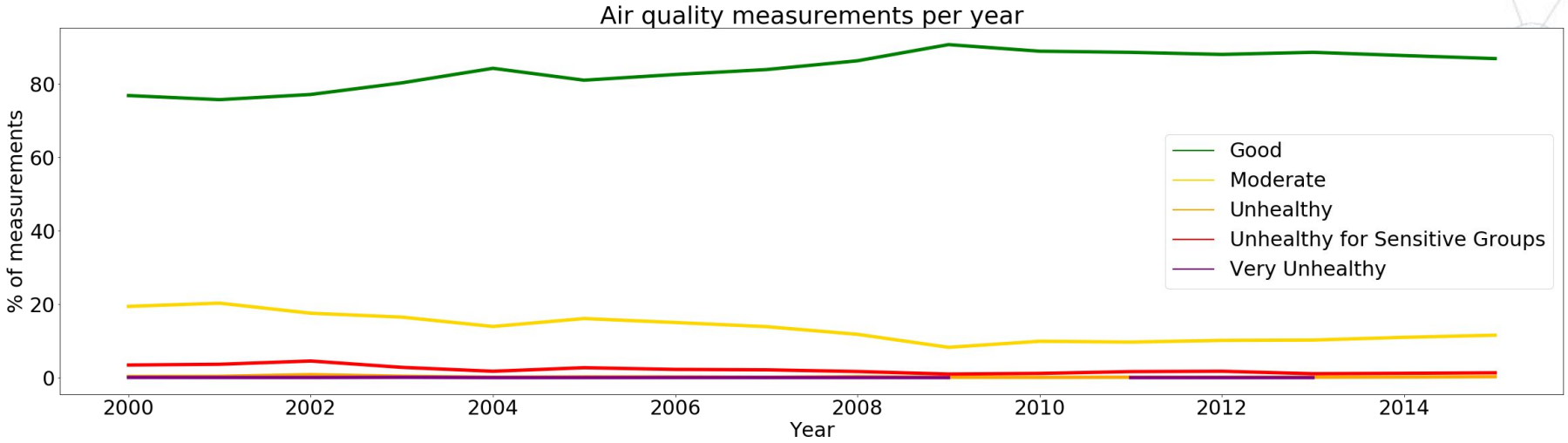
Conclusion

- California air quality is one of the worst in US and it presents bad performance compared to the average of US
- Top most polluted cities in CA presented higher AQI than the average in CA
- Ozone is the most prevalent pollutant gas in the US, with the highest recorded O3 AQI levels recorded in Fresno

THANK YOU

Appendix

Air quality measurements over time per category



Air Quality Index (AQI) - EPA

$$I = \frac{I_{high} - I_{low}}{C_{high} - C_{low}}(C - C_{low}) + I_{low}$$

where:

I = the (Air Quality) index,

C = the pollutant concentration,

C_{low} = the concentration breakpoint that is ≤ C,

C_{high} = the concentration breakpoint that is ≥ C,

I_{low} = the index breakpoint corresponding to C_{low},

I_{high} = the index breakpoint corresponding to C_{high}.