STAT 436 / 536 - Lecture 3

September 5, 2018

Time Series Decomposition - Visually

```
library(datasets)
library(ggplot2)
library(ggfortify)
data(AirPassengers)
autoplot(AirPassengers) + ylim(0,650) +
    labs(title="Monthly Airline Passenger Count", y="Number of Passengers(thousands)", x= 'Year')
```









Monthly Airline Passenger Count



Exercise: Mauna Loa CO_2 Observations

Using the Mauna Loa dataset, create three figures: 1.) the complete time series, 2.) annual decomposition, and 3.) monthly series. Think carefully about the appropriate scale for the y-axis of these plots.

data(co2)

Time Series Decomposition - Modeling and Notation

Time Series Mathematical Notation

- Let $\{x_t\} = \{x_1, \dots, x_T\}$ be a time series of length T.
- A time series is a
- The hat notation will often be used for prediction,
- For those of you familiar with Bayesian notation,

Time Series Models

• We have seen how to visually decompose a time series into an annual trend and a seasonal pattern. So this additive model could be written as:

- What is missing from the previous model?
- Question: how should we think about estimating a trend?
 - _

_

• Question: Now how about the seasonal effect?

• With a ts object in R, the decompose() function will automatically do this procedure. decompose(AirPassengers)