

# Foundation of Data Science

## Lecture 8, Module 2

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# Time Series Discussions

- Overview
- Basic definitions
- Time domain
- **Forecasting**

# Objectives

- Give the fundamental rules of forecasting
- Calculate a forecast using:
  - moving average
  - weighted moving average
  - exponential smoothing
- Calculate the accuracy of a forecast

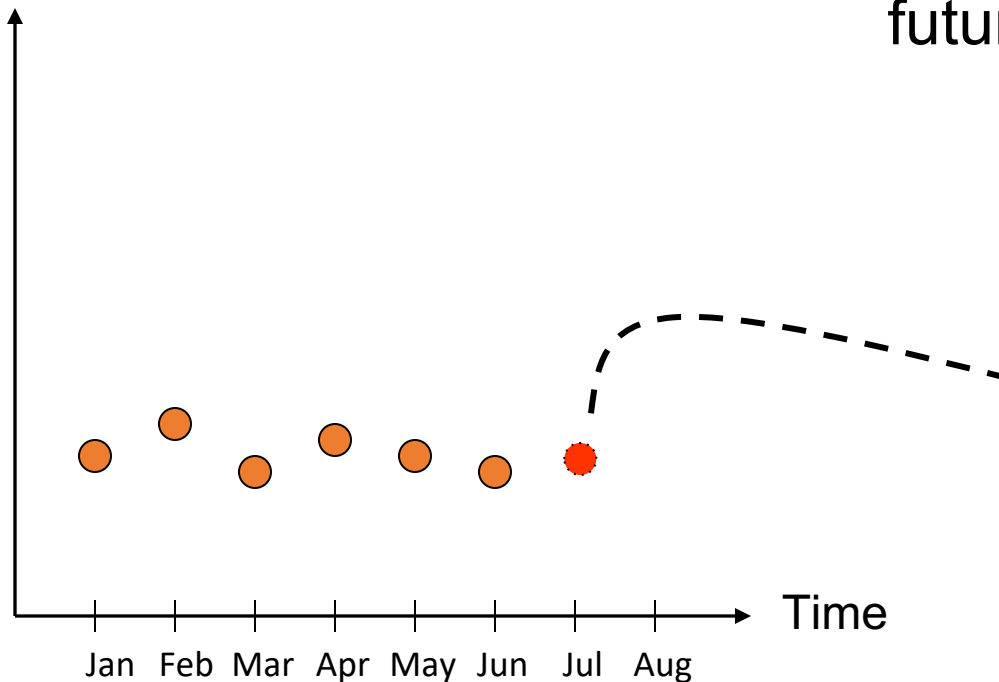
# Why is Forecasting Important?

- Demand for products and services is usually uncertain
- Forecasting can be used for:
  - Strategic planning (long range planning)
  - Finance and accounting (budgets and cost controls)
  - Marketing (future sales, new products)
  - Production and operations

# What Is Forecasting All About?

Demand for Mercedes E Class

We try to predict the future by looking back at the past



**Predicted demand  
looking back six  
months**

- Actual demand (past sales)
- Predicted demand

# Key Issues in Forecasting

- A forecast is **only as good as the information included in the forecast** (past data)
- History is not a perfect predictor of the future (i.e.: **there is no such thing as a perfect forecast**)
- Forecasts are more accurate for **shorter time periods**
- Every forecast should include an **error estimate**

REMEMBER: Forecasting is based on the assumption that the past predicts the future! When forecasting, think carefully **whether or not the past is strongly related to what you expect to see in the future...**

# Example: Mercedes E-class vs. M-class Sales

Month	E-class Sales	M-class Sales
<i>Jan</i>	23,345	-
<i>Feb</i>	22,034	-
<i>Mar</i>	21,453	-
<i>Apr</i>	24,897	-
<i>May</i>	23,561	-
<i>Jun</i>	22,684	-
<i>Jul</i>	?	?

**Question:** Can we predict the new model M-class sales based on the data in the the table?

**Answer:** Maybe. We need to consider **how much the two markets have in common**

# Some Important Questions

- What is the purpose of the forecast?
- Which systems will use the forecast?
- How important is the past in estimating the future?

Answers will help determine time horizons, techniques, and level of detail for the forecast!



# How Should We Pick A Forecasting Model?

- Data availability
- Time horizon for the forecast
- Required accuracy
- Required Resources

# Which Forecasting Method to Use

1. Gather the historical data for forecasting
2. Divide data into initiation set and evaluation set
3. Use the first set to develop the models
4. Use the second set to evaluate
5. Compare the residuals, MADs and MFEs of each model

# To think about...

- Is what we are forecasting/predicting strongly related to past data, and how do we know? What time horizon is reasonable?
- Where is the data from? Was it collected for the purpose you are using it? Are there any limitations to the data due to this?
- For your project, what are the appropriate evaluation metric(s)?
- Are there any important subgroups in the data? How does performance compare across subgroups?
- Who are your stakeholders? What are important results to communicate?