Outline

https://topdocumentaryfilms.com/slave-algorithm/

https://www.nbcnews.com/mach/video/the-algorithm-helping-police-predict-crime-993822787736

Intel Neural computer stick

https://software.intel.com/en-us/neural-compute-stick

- Explain and discuss the concept of time series mining models.
- Perform a project to predict future sales using Microsoft time series

Definition of Time Series

- **Definition of Time Series**: *An ordered sequence of values of a variable at equally spaced time intervals*.

Applications:

- Usage of time series models:
- Obtain an understanding of the underlying forces and structure that produced the observed data
- Fit a model and proceed to forecasting, monitoring or even feedback and feedforward control.

look for job in January, February. this is the slow period, system can slow down without as much consequences. looking for ppl to update the system.
also time to buy car since consumer spendings lower, they may reduce prices after December

Many applications of time series

- Economic Forecasting
- Sales Forecasting
- Budgetary Analysis
- Stock Market Analysis e.g. sept-oct, may show lots of activity near end of year
- Yield Projections
- Process and Quality Control
- Inventory Studies
- Workload Projections
- Utility (Electricity, Gas) Studies
- Census Analysis

Time series patterns

- Trend
- Seasonal
- Cyclic

Trend

- Exists when there is a long-term increase or decrease in the data.
- Does not have to be linear.
- Sometimes we will refer to a trend “changing direction” when it might go from an increasing trend to a decreasing trend.

Seasonal

- A seasonal pattern exists when a series is influenced by seasonal factors (e.g., the quarter of the year, the month, or day of the week).
- Seasonality is always of a fixed and known period.
- These are short term movements occurring in data due to seasonal factors.
- Generally considered as a period in which changes occur in a time series with variations in weather or festivities.
- For example, it is commonly observed that the consumption of ice-cream during summer is generally high and hence an ice-cream dealer's sales would be higher in some months of the year while relatively lower during winter months

Cyclic

e.g. stock market. last crash at 2008, another one coming

important bc this info tells u when u can buy houses, etc.

- Exists when data exhibit rises and falls that are not of fixed period.
- The duration of these fluctuations is usually of at least 2 years.
- These oscillations are mostly observed in economics data and the periods of such oscillations are generally extended from five to twelve years or more.
- These oscillations are associated with the well known business cycles. These cyclic movements can be studied provided a long series of measurements, free from irregular fluctuations, is available.

Cyclic behavior vs seasonal behavior

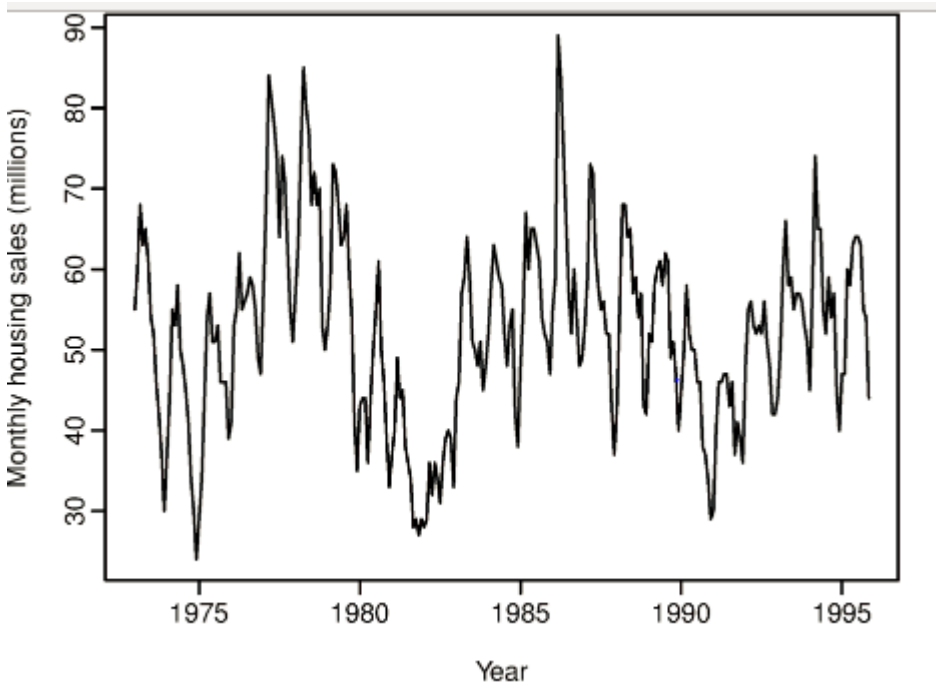
- If the fluctuations are not of fixed period then they are cyclic;
- if the period is unchanging and associated with some aspect of the calendar, then the pattern is seasonal.
- In general, the average length of cycles is longer than the length of a seasonal pattern, and the magnitude of cycles tends to be more variable than the magnitude of seasonal patterns.

Irregular Fluctuations

- These are sudden changes occurring in a time series which are unlikely to be repeated.
- They are components of a time series which cannot be explained by trends, seasonal or cyclic movements.
- Are sometimes called residual or random components. These variations, though accidental in nature, can cause a continual change in the trends, seasonal and cyclical oscillations during the forthcoming period.
- Examples: Floods, fires, earthquakes, revolutions, epidemics, strikes etc., are the root causes of such irregularities.

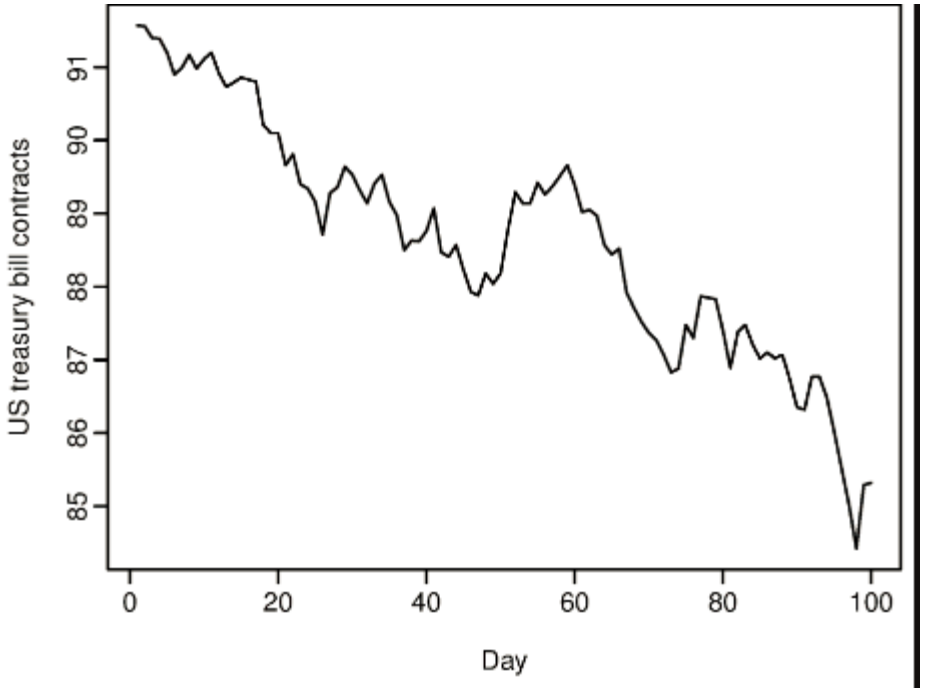
Cyclic and Seasonal

- The monthly housing sales (top left) show strong seasonality within each year, as well as some strong cyclic behavior with period about 6–10 years. There is no apparent trend in the data over this period.



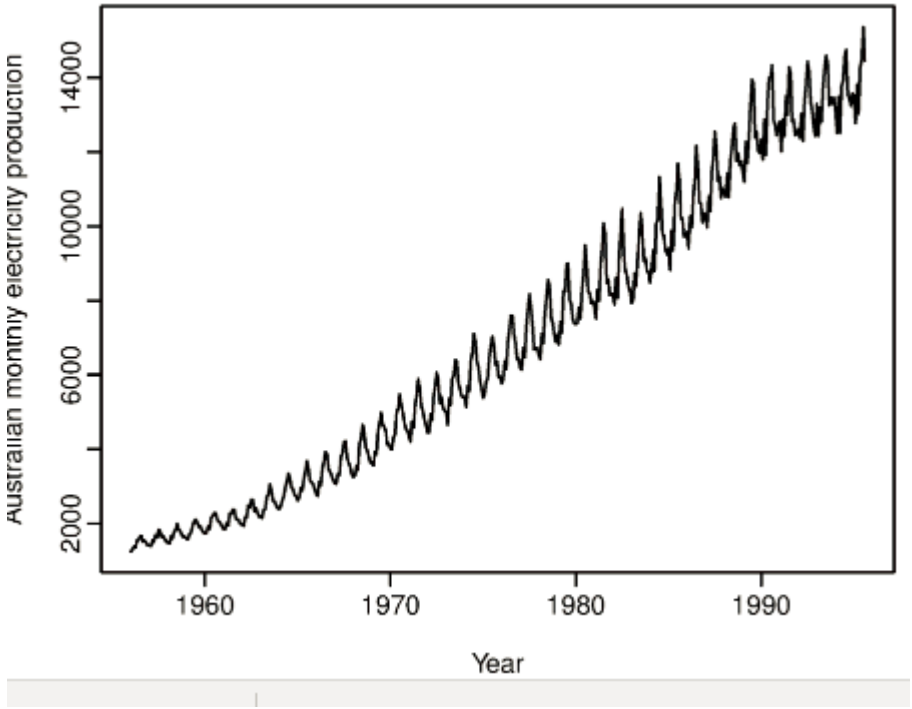
Trend

- The US treasury bill contracts (top right) show results from the Chicago market for 100 consecutive trading days in 1981. Here there is no seasonality, but an obvious downward trend.



Trend

- The Australian monthly electricity production (bottom left) shows a strong increasing trend, with strong seasonality.



Random

- The daily change in the Dow Jones index (bottom right) has no trend, seasonality or cyclic behavior.
- There are random fluctuations which do not appear to be very predictable.