Week 6

LATEST SUBMISSION GRADE

80%

1. In which of the following examples would you expect to see a linear relationship (and hence be able to apply linear regression)? **0 / 1 point**

- [ ] The last digit of a person's phone number as compared with the street number of their address.
- [x] The income of a person as compared with the amount of tax they pay, under a progressive tax system.
- [ ] Height (in cm) of a person as compared with their weight (in kg).
- [ ] All of the above.

! **Incorrect**

Incorrect. In a progressive tax system, we would expect to see a curve when we plot tax paid against income.

2. In the first video of this week's material, we discussed the idea of (linear) regression analysis. We saw that we could generate a lot of useful insights using this tool. However, it is not a magic wand that we can use to analyse every problem. If we had some data and , which of the following is an example where it would NOT be appropriate to apply linear regression? **1 / 1 point**

- [ ] If and have a negative relationship, so that when plotted, there is a clear downward trend.
- [ ] Have a low correlation (close to 0).
- [x] If and , when plotted, forms a pattern that is not a straight line (for example, and may form a curve).
- [ ] If it turns out and are independent.

✓ **Correct**

Correct. If we saw a different pattern emerge (say, a curve), then we should use a different model (such as non-linear regression)

3. Wade is studying the efficacy of a new type of fertiliser claimed to be formulated specifically **1 / 1 point**

for wheat production. He has run experiments using various concentrations of the new fertiliser, and measures the total amount of wheat grown in each case. He has applied linear regression on the data he has collected, and found that Wheat grown=5×Concentration+100. Which of the following statements is true?

- [x] All of the above.
- [ ] The fertiliser concentration is the independent variable, the wheat grown is the dependent variable.
- [ ] The amount of wheat grown is positively correlated with the concentration of fertiliser used.
- [ ] If a fertiliser concentration of 3 is used, then the predicted amount of wheat grown is 115.

Correct
Correct. All of the above statements are true.

4. In the context of time series, which of the following is an example of a trend? **1 / 1 point**

- [ ] A restaurant finding that the Thursday dinner service tends to be the busiest part of the week.
- [ ] An athlete's heart rate increasing when they are exercising.
- [x] The global population of Bengal tigers declining over the past century.
- [ ] The number of parcels delivered by the Dutch postal service each day over the past year.

Correct
Correct. Since this is a pattern over an extended period of time, this is a trend.

5. In the context of time series, what is the difference between seasonality and a cyclic pattern? **1 / 1 point**

- [ ] In most cases, these terms are completely interchangeable.
- [ ] Seasonality refers to effects directly linked to the 4 seasons of the year (spring, summer, autumn and winter), and other periodic patterns are called cyclic patterns.
- [ ] Seasonality generally does not follow a fixed periodicity and is typically caused by an internal decision, whereas a cyclic pattern has a fixed periodicity and is typically caused by external factors.
- [x] Seasonality refers to effects with a fixed periodicity and is typically caused by external factors, whereas a cyclic pattern generally does not follow a fixed periodicity and is typically caused by an internal decision.

Correct
Correct.

6. Hayley is an engineer responsible for maintaining machines in a factory. She has noticed **1 / 1 point**

from the machines' sensor data that they run at a higher efficiency in the weeks coinciding with her using a particular brand of oil to lubricate them. This is an example of a:

- Trend.
- Seasonality.
- Cyclic pattern.
- None of the above.

Correct
Correct. The increased efficiency appears to be a direct result of using this brand of oil

7. In Practice task 1, *Practice regression analysis*, this week, we looked at data on various health metrics. One of the metrics was adult mortality, measured as the number of deaths per 1000 adults. Which of the following would be an example of a seasonal pattern in the values for adult mortality? **1 / 1 point**

- Continual improvements in medicine leading to declining number of deaths over time.
- Periodic spikes in mortality connected to El Niño (occurring roughly every 4 years).
- Increased spending on healthcare during a particular president's term, leading to reduced mortality rates.
- None of the above.

Correct
Correct. Spikes in mortality resulting from periodic ocean current (and hence weather) behaviour would be an example of seasonality.

8. In the context of smoothing, what is the main difference between the moving average method and the exponential smoothing method? **1 / 1 point**

- The moving average method gives equal weight to all observations within the chosen window, whereas the exponential smoothing method gives a greater weight to more recent observations.

  Review the video: Demand forecasting and smoothing methods

- The moving average method gives a greater weight to more recent observations, whereas the exponential smoothing method equal weight to all observations within the chosen window.

- The moving average method is typically used for dollar amounts, whereas the exponential smoothing method is typically used for all other types of numerical values.
- The moving average method looks further back in time than the exponential smoothing method.

Correct
Correct.

9. Suppose you wanted to forecast the number of customers entering BigShop, a large department store, each day for the next week, and you have data on the number of customers entering the BigShop each day for the last 2 years. Which of the following would you expect to have the largest effect as far as producing an accurate forecast? **1 / 1 point**

- (•) Analysing the data specifically for seasonality patterns with a period of one week.
- Analysing the trend of customer numbers over the past 2 years to see if they are increasing or decreasing over time.
- Obtaining even older records, so that you have data on customer numbers for the past 3 years.
- Obtaining the same data for a different BigShop location.

Correct
Correct. Because we want to predict the number of customers on each day of the following week, we will need to look for any patterns within each week of the past data.

10. In Practice task 2, we looked at the Microsoft share price from 2016-2018 inclusive and calculated some moving averages. Suppose we wanted to also plot a trailing averages with 5-day and 15-day windows. Which of these two trailing averages would we expect to more closely follow the observed share prices? **0 / 1 point**

- We would not expect either of these trailing averages to follow the observed share prices more closely than the other.
- (•) We would expect the 15-day trailing average to more closely follow the observed share prices.
- We would expect the 5-day trailing average to more closely follow the observed share prices.
- There is no way to determine which trailing average would more closely follow the observed share prices without more information.

Incorrect
Incorrect. The 15-day window would contain older information, so we would expect more of a delay in this trailing average than that of the 5-day window.