

LAB SESSION 3 – DISTRIBUTIONS

Analytics Primer

CONTINUOUS PROBABILITY DISTRIBUTIONS

Standard Normal Distribution

Example

- Assuming a normal distribution with mean = 0 and s.d. = 1, find the following probabilities:

1. $P(z > 2) = 0.0228$

2. $P(z \leq 1.12) = 0.8686$

3. $P(-1.33 \leq z \leq 1.33) = 0.9082 - 0.0918 = 0.8164$

4. $P(z \geq 3.02) = 0.0013$

5. $P(z \leq 6.87) \approx 1$

6. $P(z \leq -6.87) \approx 0$

YEARS OF
PROFESSIONAL
EXPERIENCE

More Examples

- Assume new employees at a company have previous years of professional experience that follow a normal distribution with the mean is 5 and the s.d. is 2.5.

Example

1. What is the probability that a new employee has more than 5 years of previous experience?

$$z = \frac{x - \mu}{\sigma} = \frac{5 - 5}{2.5} = 0 \rightarrow 0.5$$

Example

2. What is the probability that a new employee has less than 2 years of previous experience?

$$z = \frac{x - \mu}{\sigma} = \frac{2 - 5}{2.5} = -1.2 \rightarrow 0.1151$$

Example

3. What is the probability that a new employee has between 1 and 7.5 years of previous experience?

$$z = \frac{7.5 - 5}{2.5} = 1 \rightarrow 0.8413 \quad z = \frac{1 - 5}{2.5} = -1.6 \rightarrow 0.0548$$

$$0.8413 - 0.0548 = 0.7865$$

Example

4. What is the 90th percentile of employee experience?
What is the 10th percentile?

$$1.28 = \frac{x - 5}{2.5} \rightarrow x = 8.2$$

$$-1.28 = \frac{x - 5}{2.5} \rightarrow x = 1.8$$

MILES DRIVEN PER DAY

More Examples

- Americans drive an average of 41 miles per day with a standard deviation of 9. Assume that these miles follow a Normal distribution. Use this information to answer the next three questions

Example

1. What is the probability a random driver drives more than 60 miles in a day?

$$z = \frac{x - \mu}{\sigma} = \frac{60 - 41}{9} = 2.11 \rightarrow 0.0174$$

Example

2. What is the probability that a random driver drives less than 10 miles in a day?

$$z = \frac{x - \mu}{\sigma} = \frac{10 - 41}{9} = -3.44 \rightarrow 0.0003$$

Example

3. What is the interquartile range (IQR) for this data?

$$0.67 = \frac{x - 41}{9} \rightarrow x = 47.07 \quad -0.67 = \frac{x - 41}{9} \rightarrow x = 34.93$$

$$47.07 - 34.93 = 12.14$$