

ECE 341 - Homework #10

Testing with Normal Distributions. Summer 2023

Testing with Normal Distributions

Assume the monthly temperatures in Fargo, ND are normal distributions with the following mean and standard deviation:

Monthly High (Degrees F: Fargo, ND)												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
mean	38.5363	41.0038	56.0625	78.1	87.8625	92.0138	94.625	94.6262	89.575	79.5	59.425	41.7875
st dev	6.4057	7.1528	10.7118	7.7909	4.5472	4.5281	4.0043	4.5967	5.6294	6.7842	7.4728	6.5327

Monthly Low (Degrees F: Fargo, ND)												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
mean	-23.8725	-20.6238	-8.1475	15.1775	27.3413	40.425	46.4875	43.3387	30.6763	19.15	-1.0875	-17.025
st dev	8.2179	7.8559	10.0237	7.0423	4.3864	4.1576	4.0938	4.1522	4.8861	5.5212	9.0417	9.1069

1) How cold will this November get

- With a confidence level of 80%?
- With a confidence level of 99%?
- With a confidence level of 100%?

If you take a random year, what range will the temperature lie X% of the time?

$$\text{NovLow} = \text{randn} * 9.0317 - 1.0875$$

2) What is the probability that it will break -40F this coming January?

3) What is the probability that it will break +100F in June?

Testing with Two Populations

4) What is the probability that June will be warmer than July in a given year?

The low for 20 months are as follows:

```
{ -19.8, -19.0 -15.0 -11.0 -5.0 -5.0 -3.0 -2.0 0.0 3.0 4.0 8.0 9.0 11.0 14.0 15.0  
15.0 16.0 21.2 23.0 }
```

5) Which months are March and which ones are April? What threshold do you use for separating the data?

6) With your threshold, what is the probability of

- A false positive ? (the temperature was assigned to March but actually came from April)
- A false negative? (the temperature was assigned to April but actually came from March)

Regression Analysis

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Regression Analysis

The average temperature in August in Fargo, ND is available at

http://www.bisonacademy.com/ECE111/Code/Fargo_Weather_Monthly_Avg.txt

7) Find the least-squares curve fit for this data as

$$T = ay + b$$

where T is the temperature in degrees F and y is the year.

From this curve fit, how much has August in Fargo warmed up since 1942?

8) Determine the correlation coefficient between

- The average temperature in May and June
if May is hot, is June going to be hot?
- The average temperature in May and December
if May is hot, is December going to be hot?