

ESCI 1010 – Weather and Climate Honors Term Paper

Total Points Possible: 100

Due: 2 April 2021

In order to receive honors credit for this course, you will need to perform an analysis of weather or climate data and write up the results. Keep in mind you are enrolled in an honors section, so failure to complete the term paper will negatively impact your grade. The project topic for this semester involves an analysis of the 7-day weather forecasts produced by the four local network stations. Instructions are listed in three separate groups below. Please don't hesitate to contact me if you need guidance.

Recording Instructions:

Note: Since weather forecasts for the individual stations occur about the same time in the newscast, you may need to go to their individual websites to obtain their 7-day forecasts:

- ABC (WPTY) www.localmemphis.com
- CBS (WREG) www.wreg.com
- FOX (WHBQ) www.fox13memphis.com
- NBC (WMC) www.wmcactionnews5.com

1. Pick a day sometime during the semester and record the 7-day weather forecasts for each TV station. Record the forecasts to the left of the "/" in Tables 1-3 (located on page 3). High temperature forecasts go in Table 1, low temperature forecasts in Table 2, and probability of precipitation forecasts in Table 3. Enter the probability of precipitation as a decimal percent (e.g., 20% is entered as 0.20).
2. Follow the weather for the next 7 days and record the actual values to the right of the "/" in Tables 1-3. For precipitation, just record whether or not precipitation fell (i.e., record a zero (0) for no precipitation or a trace (T) of precipitation and a one (1) for the day if 0.01" or more precipitation fell). These data can be found at either one of the two links below. If you use the second link, make certain to select Memphis International Airport, since we will use that station to verify the forecasts.
 - kamala.cod.edu/tn/latest.cdus44.MEM.KMEG.html
 - w2.weather.gov/climate/index.php?wfo=meg

Analysis Instructions:

1. Once Tables 1-3 are completed, you are ready to analyze the data. First, calculate the absolute error in each station's high and low temperature forecast by using the equation below (note: the || means to take the absolute value of the difference). The lower the value, the more accurate the forecast.

$$\text{Absolute Error} = | \text{Forecast Temperature} - \text{Observed Temperature} |$$

2. We will use the brier score to assess the probability of precipitation, where a lower brier score means a more accurate forecast. This score is defined as:

$$\text{Brier score} = (\text{Forecast Value} - \text{Observed Value})^2,$$

where Forecast Value is the probability of precipitation as a decimal percent, the observed value is 0 for no precipitation or a trace of precipitation and 1 if 0.01 inches or more precipitation was recorded that day.

Example: If the Forecast Value was 0.20 (for 20% chance) and precipitation DID occur (Observed Value = 1) then

$$\text{Brier score} = (0.20-1.0)^2 = 0.64$$

precipitation DID NOT occur (Observed Value = 0) then

$$\text{Brier score} = (0.20-0)^2 = 0.04$$

3. Record the values you computed in Steps 1 and 2 for each station in one or more tables of your design. You are free to design the tables however you like. Just make sure you report the errors for both high and low temperatures and the brier scores for each TV station.

The Term Paper:

Now using the table(s) you created, you can put together your term paper. This term paper should be typed, double-spaced and be at least 4 pages long. Make sure to have a good introduction to the project, include and refer to the table(s) you created, and discuss the results. Which TV station performed the best according to your data? Did they perform better with temperature or precipitation forecasts? How did their forecasts for Days 1 and 2 compare with Day 7? Do you think you would get different results if you performed this experiment at different times of the year? Why or why not?

Upload your term paper to Dropbox on the course website by 2 April 2021.

Table 1. High Temperatures (forecast left of the “/”, verification right)

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
WPTY	/	/	/	/	/	/	/
WREG	/	/	/	/	/	/	/
WHBQ	/	/	/	/	/	/	/
WMC	/	/	/	/	/	/	/

Table 2. Low Temperatures (forecast left of the “/”, verification right)

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
WPTY	/	/	/	/	/	/	/
WREG	/	/	/	/	/	/	/
WHBQ	/	/	/	/	/	/	/
WMC	/	/	/	/	/	/	/

Table 3. Probability of Precipitation (in decimal percent; forecast left of the “/”, verification right)

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
WPTY	/	/	/	/	/	/	/
WREG	/	/	/	/	/	/	/
WHBQ	/	/	/	/	/	/	/
WMC	/	/	/	/	/	/	/