SPU 26 Assignment 7: Weather forecasting – Due Wed April 23rd.

This assignment should be uploaded individually, but you can work collaboratively.

Purpose:

The purpose of this assignment is to consolidate knowledge of the weather from class. By making observations and committing to a prediction, it should help you see how weather systems evolve over time. It will also give you a first pass at video making, which will help with the final projects.

We ask that you refrain from looking up weather conditions and predictions for the period when you are making observations and predictions. Often local observations will be more accurate than the ones found on website.

Evaluation

There are four components on which you will be evaluated:

1.) Observational – How accurately can you report the weather conditions and trends on a given day?
2.) Predictive – How accurately can you predict the weather 24 hours in advance? How well do the observations on the following day match up with the predictions from the previous day?
3.) Quantitative - How much have you improved on the forecast based on persistence? You will use a statistical measure of your ability to forecast the weather.
4.) Presentation - You will make a video presenting the above elements.

Observations: We expect a minimum of one observation per day (two is preferable). We expect a minimum of 6 days of observations. It does not have to be 6 contiguous days, but chosen at convenient times during the period the assignment is out until the due date. Ideally, it should be 6 consecutive days to reduce a selection bias, but this may not be possible. Here is what you should report:

a) Outside temperature based on sensation – ideally in a location sheltered from wind. Obviously this is subjective, but we can usually estimate temperatures to within about 5 degrees Fahrenheit.
b) Sense of humidity – percentage humidity. Fog and rain is 100%. Again, this is subjective and imperfect, but I'd like you to try.
c) Surface wind velocity – both direction and magnitude - use the Beaufort scale to estimate wind speed.
d) Winds aloft – direction of winds aloft. Use observation of clouds going by.
e) Cloud formation – both at the time of observation and the trend. Use the names of clouds discussed in lecture. What fraction of the sky is covered?
f) Precipitation – has it rained or snowed during the day? If so, approximately how much? Express this as a fraction of precipitation during the 24 hour period. That is to say – what fraction of the 24 hour period did it rain or snow?

g) Rapid changes – if you notice any rapid changes, say the sudden appearance of lingering jet contrails, note the time.

Predictions: At or near the time of observation make a prediction for the weather 24 hours in advance, using your knowledge of the dynamics of weather. Try to predict the following:

a) Outside temperature at the times of the next day's observation.
b) Humidity at the times of the next day's observation.
c) Precipitation – will it rain or snow the next day? Roughly when do you expect that to happen? What percentage of the 24 hour period will see precipitation? 0% = no precipitation, 100% = precipitation for the entire 24 hour period.
d) Compare your predictions to the prediction from persistence. Persistence is the hypothesis that tomorrow's weather is the same as today.

Since you'll be observing the weather for six days minimum, you should have a minimum of five days of predictions.

Quantifying:

We as you to use something called a "figure of merit" to quantify the predictions. A figure of merit is measure one can devise which we think will roughly track our ability to observe and make predictions. It could be anything that seems to give a way of putting numbers to our ability to predict the weather. The figure of merit in this case is based on the percentage of precipitation in the 24 hour observation/prediction period for each day. You'll have a prediction you make from your observations and a prediction based on persistence.

The accuracy of forecasts can be compared to persistence. For each day you'll have (FOM = Figure of Merit):

FOM = Absolute value of (% precipitation observed - % of precipitation predicted)

You will also form a figure of merit based on persistence, that is to say

FOMP = Absolute value of (% precipitation observed - % from persistence)

At the end of the exercise, get the mean value of the figures of merit for the observation and prediction period and compare the average values based on your predictions with those based on persistence.

Who did better, your group or persistence? What is the standard deviation over the course of observations for the figure of merit for your group and persistence?

Video: The video should be relatively short, no longer than five minutes, but should address the above elements. In particular, we want to see evidence that you made the observations and predictions at the actual time of observations. This could be in the form of photographs or short clips edited in for each day of observation. If you want to make a time lapse of clouds passing by, use a tripod and set the camera on interval mode.

If you have a Mac, you can use iMovie for editing. There are equivalent packages for PC's. There are many possibilities. Kevin Guiney at Lamont Library can help people get started. iMovie in particular is very easy to use and there are many online tutorials to help get started.

Instructions for uploading the video will be given later.