**Lab 13: CVG Airport Weather Statistics**

You will be working with a dataset of daily weather statistics taken over the last forty six years at the CVG (Cincinnati/Northern Kentucky) Airport. The source of the weather data is the National Oceanic and Atmospheric Administration:

<http://www.ncdc.noaa.gov/cdo-web/search>

**Part A: Introduction to the CVG Weather Dataset**

1. Go to the metacourse site on Blackboard under Lab 13, download the Weather.mat file, and save it in your current MATLAB folder.
2. At the MATLAB command prompt, type the following:

>> load Weather

You should now see a dataset called W (16740x9) in your workspace window. If not,

make sure Weather.mat really is in your current MATLAB folder and/or ask for assistance.

1. Double click on the W dataset array to open it up in the Variable Editor Window. This dataset has nine columns defined as follows:

* W.YEAR is the year
* W. MONTH is the month (numerical)
* W.DAY is the day
* W.PRCP is the daily precipitation (in inches)
* W.SNWD is the daily snow depth (in inches)
* W.SNOW is the daily snow fall (in inches)
* W.TMAX is the maximum daily temperature (in oF)
* W.TMIN is the minimum daily temperature (in oF)
* W.WIND is the average wind speed for the day (in mph)

This dataset begins on January 1st, 1970 and ends on October 31, 2015.

1. If you look in the variable editor window at the W dataset, you will notice some odd entries of 9999 in W.AWND. A value of 9999 indicates an invalid reading. Invalid readings typically occur in large databases like this. An invalid reading indicates that a measurement wasn’t entered in for that date or time possibly because somebody forgot to enter it in, or a sensor wasn’t working that day, or the communication between the sensor and the database broke down. At CVG, average wind speed measurements were not taken until January 1st, 1984 so all entries prior to this date were filled with -9999.

Note: There are a few invalid entries scattered throughout this database in the snow and snow depth columns as well.

**Part B: Simple Data Analysis on CVG Weather Dataset Array**

In this part of the lab, you will be answering a series of questions about the W dataset. Include both your answers to the questions and the MATLAB commands used to answer the questions. **Make sure you include units in all of your answers.**

1. **Enter your Birthday:** 12/12/1996

Use the find command to find the row in the dataset corresponding to your birthday as follows:

>> BD\_Row = find(W.YEAR == *YourYear* & W.MONTH == *YourMonth* & W.DAY == *YourDay*)

Now find the weather stats for your birthday as follows:

>> W(BD\_Row,:)

**PASTE RESULTS HERE:**

YEAR MONTH DAY PRCP SNWD SNOW TMAX TMIN WIND

1996 12 12 0.37in 0in 0in 57.9⁰F 39.9⁰F 9.2mph

2. What was the highest rainfall recorded in a single day at CVG in the dataset?

**Highest Rainfall in a Single Day:** 4.3in

**MATLAB Command(s):** PRCP\_MAX =max(W.PRCP)

3. On what date(s) did this maximum rainfall occur?

**Date(s) with Highest Rainfall:** 10/20/1985

**MATLAB Command(s):**

maxPRCP\_row = find(W.PRCP == 4.3)

W(maxPRCP\_row,1:3)

4. How many days in 2014 did the maximum temperature exceed 90o?

**Number of Days in 2014 with Temps above 90:** 4

**MATLAB Command(s):**

DaysAbove90 = sum(W.YEAR == 2014 & W.TMAX > 90)

5. How many days has it snowed in May in the last 46 years?

**Number of Snowy Days in May:** Who Cares

**MATLAB Command(s):** clear

6. Find the date(s) that it snowed in May and how much snow fell on the date(s)?

**Date(s) of Snow in May and Snowfall Amount:**

**MATLAB Command(s):**

7. Fill in the following table. Paste MATLAB commands below.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Month** | **Month**  **Number** | **Year** | **Mean of Daily Rainfall (in)** | **Standard Deviation of Daily Rainfall (in)** | **Total Precipitation for Month (in)** |
| **April** | **4** | **2011** | **0.45** | **0.63** | **13.5** |
| **April** | **4** | **2013** | **0.11** | **0.25** | **3.15** |
| **April** | **4** | **2015** | **0.17** | **0.32** | **5.13** |

**MATLAB Commands (JUST FOR ONE OF THE MONTHS):**

count = 0;

for year = 2011:2:2015

count = count + 1;

Rows = find(W.YEAR == year & W.MONTH == 4);

PRCP\_MEAN(count) = mean(W.PRCP(Rows));

PRCP\_STD(count) = std(W.PRCP(Rows));

PRCP\_Total(count) = sum(W.PRCP(Rows));

end

PRCP\_MEAN

PRCP\_STD

PRCP\_Total

**Part C: Generating and Plotting Data from the CVG Weather Dataset Array**

1. For each year from 1970 through 2015, determine how many days had temperatures above 90, then plot the number of hot days (above 90) versus the year. (Hint: for loop). Be sure to add a title and labels to your plot.

**PASTE CODE AND PLOT HERE:**

%Models Lab 13 Part C

clear; clc;

load Weather

count = 0;

YearVector = 1970:1:2015;

for year = YearVector

count = count + 1;

DaysAbove90(count) = sum(W.YEAR == year & W.TMAX > 90);

end

plot(YearVector,DaysAbove90,'ro-'); hold on;

xlabel('\bfYear','FontSize',14);

ylabel('\bfAbove 90 (days)','FontSize',14);

title('\bfDays Above 90 from 1970-2015','FontSize',20);

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1. Determine the total amount of precipitation (PRCP) for each year from 1970 to 2014 then plot the total yearly precipitation versus year. Be sure to add a title and labels to your plot.

**PASTE CODE AND PLOT HERE:**

%Models Lab 13 Part C2

clear; clc; clf;

load Weather

count = 0;

YearVector = 1970:1:2014;

for year = YearVector

count = count + 1;

Rows = find(W.YEAR == year);

TotalPRCP(count) = sum(W.PRCP(Rows));

clear Rows;

end

plot(YearVector,TotalPRCP,'ro-'); hold on;

xlabel('\bfYear','FontSize',14);

ylabel('\bfTotal Precipitation (in)','FontSize',14);

title('\bfYearly Total Precipitation','FontSize',20);



1. Using your results from the previous step, what is the average yearly precipitation measured at the CVG airport over the last forty five years?

**Average yearly precipitation:** 43.4

**Code:** MEAN = mean(TotalPRCP)

1. From your precipitation graph in step 2, which year had the least precipitation and which year had the most?

**Year with Least Precipitation:** 1976

**Year with Most Precipitation:** 2011