MNXB11-Project

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1 Introduction

In this project, a program in C++ was written that takes data from the Swedish Meteorological and Hydrological Institute (SMHI) and produces three plots for analysis. Each plot uses data from different cities in Sweden. The cities chosen were Umeå, Uppsala, and Lund. The data includes information about the recorded temperature at a specific time (UTC), day, month, and year. The goal of this project is to produce 3 functional plots and analyze them.

2 Method

Policy A was decided in the group on how we should work within the repository. Policy A is that one person is the release manager and the rest of the group members are developers. To write the program, the C++ programming language was used along with ROOT to interpret the code. Within each of the source files Uppsala.cxx, UMEA.cxx, and Lund.cxx, found in the src/ directory of the repository, there are functions 'void Uppsala()', 'void Umea()' and 'void Lund()' respectively. Each of these functions produces plots for their respective data.

2.1 Reading .csv files and saving the data

At the start of the Uppsala.cxx, UMEA.cxx, Lund.cxx source files, the functions read the .csv of the data. It does it as follows:

```cpp
// Defining our variables, and vectors
string line;
vector<string> DataStore;
vector<string> Date;
vector<string> Time;
vector<double> Air_Temp;
vector<string> Quality;

// Opening data file
ifstream file{"DataFile.csv"};

// While loop going through a line, stops at '\n' or in other words at the
// end of the line. This is done for each line
while( getline(file, line, '\n') ) {

  istringstream sline(line);
  string word;

// While loop doing a similar thing, but stopping at ',' then appending the sequence of
// characters to the vector DataStore
  while( getline(sline, word, ',') ) {
    DataStore.push_back(word);
```

```
 }
}
```

3   Results/Discussion

Figure 1 gives us an insight into how the temperature varies in Uppsala through the years. It is noticeable that there is a large peak around 0 degrees Celsius, which makes sense since Uppsala is a city with on average cold winters.
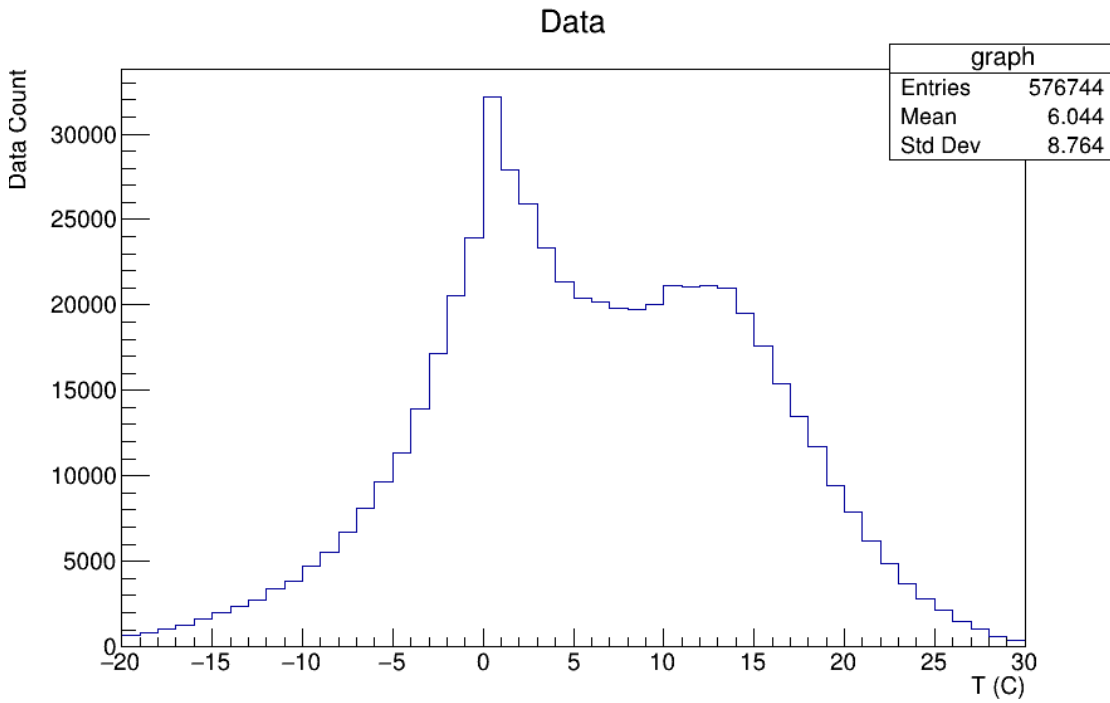

Figure 1: Figure showing a histogram for the Temperature in Celsius between the years 1944-2023 for the city of Uppsala.

Figure 2, shows the graph of average temperature per year over the course of the past 60 years. We added a linear fit to this graph which shows a clear increase with a slope value of 0.0364 in average temperature over the years, a sign of global warming.
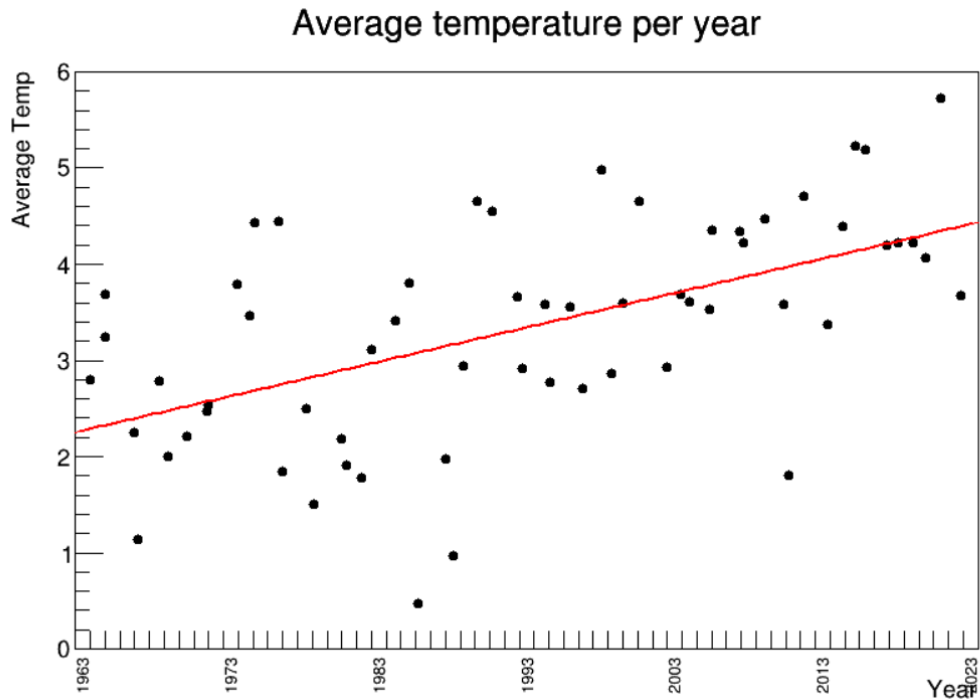
Figure 2: Graph showing the average temperature per year from 1962 until 2023, together with a linear fit to the data (red).

Figure 3, shows the graph of the daily temperatures for the year 1986. This is the year of the Chernobyl disaster, which took place on the 26th of April. This corresponds to day 113 on out plot and we can see a small but noticeable spike in temperature around this day. Apart from that the temperatures for the second half of the year also has a gradual decline in temperature compared to the first half. Thus, it got hotted on average after the Chernobyl disaster.
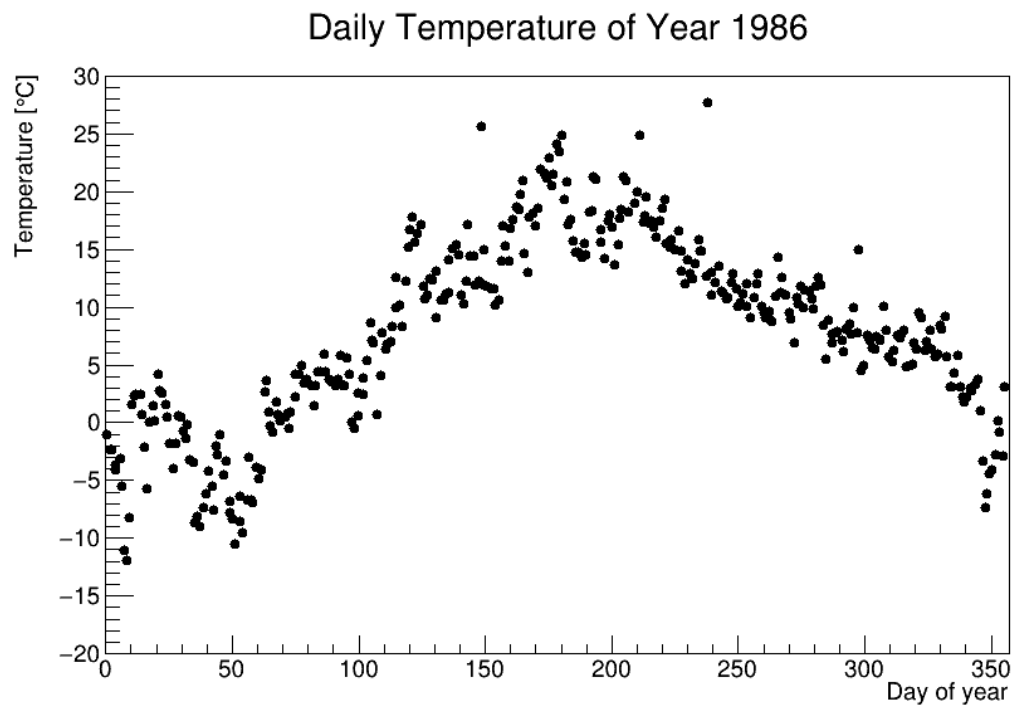
Figure 3: Graph showing the daily temperatures for year 1986. This is the year of the Chernobyl disaster.