Forecasting System

**Introduction**

There is often a great need for this type ofsystem, particularly during the brutal, bitterly cold winters we experience here in Chicago. Often, students need a way to predict harsh weather conditions and anticipate large amounts of snowfall that may substantially delay their commutes to campus. Additionally, our system will serve as a reliable and effective tool for gauging everyday temperatures in Chicago as well as other weather conditions that students will want to know ahead of time before going to class.

The system will function primarily through the use of certain formulas that will work together and attempt to predict the weather for up to 3 days as accurately as possible. Tentatively, the system may allow students to make predictions for up to a week, however the system will provide more accurate weather predictions for 3 days or less.

Ideally, the system will be a perfect addition to the software available to students at Northeastern Illinois University because as a strictly commuter school, NEIU students come from different parts of the city and have vested interests in any adverse weather conditions that may delay or otherwise affect their commutes to school. Our system will provide this service to students and strive to do so as accurately and reliably as possible.

**Glossary**

|  |  |
| --- | --- |
| TERMS | DEFINITIONS |
| Air Pressure | Cumulative force exerted on any surface by the molecules composing of air. |
| CAPE | Convective available potential energy. Amount of energy a parcel of air would have if lifted a certain distance vertically through the atmosphere. Larger the value over 0, the more potential energy there is available and storms will build vertically quickly. This is also used to assess the potential for large hail, amount of lightning in a storm, and potential for pockets of very heavy rain. |
| CIN | Convective Inhibition. Region where a parcel of air if raised will sink back down again. This is also known as the capping layer and inhibits storms from forming. In order for storms to form, this layer must be broken. Daytime heating usually erodes this cap. Larger the value, larger the cap on the atmosphere. |
| Dew Point | Temperature to which air must be cooled at constant pressure to achieve saturation. Has to be above 32 °F. |
| Dew Point Depression | Difference between the temperature and dewpoint of a sample of air. Lower values means the relative humidity is going to be higher. |
| Freezing Level | Level in the atmosphere that represents the freezing point of water at 0 °C. |
| Instability | A condition in which air will rise freely on its own due to positive buoyancy. Air in the lower atmosphere will lift until it’s less dense than the surrounding air. Once it’s less dense, it will rise on its own. The condition of the atmosphere when thunderstorms and severe weather can occur. |
| K Index | Index to assess convective potential. Values above 15 equates to a better convective potential. Higher the values, better chance of seeing storms if they do form. |
| Lifted Index | Index used to assess instability in the lower part of the atmosphere. Values above 0 indicate a stable atmosphere. A stable atmosphere is not conductive for producing storms. Values below 0 equates to larger amounts of instability. |
| MB | Stands for millibars. Used to represent atmospheric air pressure. Sea level pressure is defined as 1000 mb. Going up in the atmosphere, the pressure levels decreases. The main levels Meteorologist look at for forecasting are 850, 700, 500, and 300 for various parameters such as wind, moisture and temperature to aid in forecasting the weather at the surface. |
| Relative Humidity | Is how close an air sample is to saturation at a specific temperature. |
| Saturation | The atmosphere is considered saturated when the humidity is 100%. This means the air cannot hold anymore water. |
| Saturation Vapor | Point where vapor pressure is saturated. |
| Showalter Index | Index used to assess 850 mb air parcel instability. A negative value indicates an environment where convection can occur. More negative the value, more unstable the environment is. |
| Sweat Index | Determines the likeliness of severe weather and tornadoes. Variables over 150 equates to a better chance of seeing severe weather if storms do form. |
| Total Totals | A parameter used to assess storm strength. Values above 44 equates to thunderstorms. The larger the value, the stronger the storms if they do form. |
| Vapor Pressure | Portion of the total air pressure exerted by the water vapor in a sample of air. |
| Water Vapor | Is the gas phase of water. Produced from the evaporation of liquid water and aids in the formation of clouds. |

**User Requirements Definition**

Our application is a system that will strive to accurately and reliably predict the weather conditions in Chicago and the surrounding suburbs for up to 3 days. It will also let students specify a period of up to a week, although accuracy declines if more than 3 days are specified.

**Functional Requirements**

o The system will allow users to enter a period of up to 1 week and will deliver

weather predictions for the specified amount of time. (3 days would be a good start.)

o The system shall display the following weather parameters:

o Temperature in Celsius and Fahrenheit

o Real feel in Celsius and Fahrenheit

o Humidity

o Precipitation

o Wind

o The system shall default with current location weather information upon start up

o The system shall provide the user with an option to enter any desired location for

weather prediction

o The system shall support severe weather alerts and advisories

o The system shall support historical weather information up to xxx days with

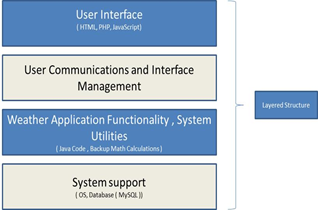
actual, average and record min and max temperatures This is for if there is time. May be tough to download data for another city.

**Non-functional Requirements**

- The system should be made available at all times, be platform independent, and functional on most connection speeds.

- The system is coded in such a way that optimizes maintainability and safety

**System Architecture**



**System evolution**

• Continuation of requirements on existing products and forecasts

• Development of downstream services and implementation of new services and products, based on current forecast system

• Evolution of modelling systems

• Combine the forecast with storm warnings and other hazardous weather warnings

Submitted by:

Dilusha Harischandra

Efren Ulloa

Emmanuel Raguay

Lalitha Vedula

Rob Niesen