

Product Backlog for WPEAR

Team 5

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Problem Statement

Forecast accuracy is an important topic in both operational forecasting and atmospheric research. In order to facilitate accuracy in forecasts we must measure the difference in what was forecasted and what happened. To meet this need we will be designing and implementing a pipeline which will take publicly available forecasts and data from weather instruments and create derivative products with statistical information about the accuracy of the forecasts. The products will consist of visualizations on a website as well as grib files that can be used to do further analysis of the data.

Definitions

- NEXRAD Radar - A US based network of radar stations that primarily detect reflectivity. (Map of NEXRAD Radar Stations: <https://www.roc.noaa.gov/wsr88d/maps.aspx>)
- Multi-Radar/Multi-Sensor System (MRMS) - MRMS is a system with automated algorithms that quickly and intelligently integrate data streams from multiple radars, surface and upper air observations, lightning detection systems, and satellite and forecast models. (Further information: <http://www.nssl.noaa.gov/projects/mrms/>)
- NWS - US National Weather Service (Further Information: <http://www.weather.gov/>)
- Grid Spacing - In weather models the grid spacing is the size of each “pixel” in a forecast or observation. A common grid spacing is a 4 sq. km or 2 sq. km square area. (Further information: <http://weather.mailasail.com/Franks-Weather/Grid-Length-Resolution>)

Background Information:

Most forecast evaluation systems are written exclusively for a specific weather forecast such as the Indianapolis NWS forecast. We are proposing a general solution with appropriate converters to be able to evaluate multiple forecasts based on multiple types of observations (such as data from the NEXRAD Radar System or the MRMS). This will allow us to evaluate many different variables such as Temperature or Reflectivity across multiple forecasts and generate visualizations that can help researchers determine what the strengths and deficiencies of specific forecasts are. This type of system will also allow for new forecasts and observation data to be calculated and visualized trivially.

Requirements

- **Functional Requirements**

Backlog ID	Functional Requirement
1	As a user, I would like to obtain latest observation data from the given sources.
2	As a user, I would like to have the data interpolated before evaluation for the visualizations.
3	As a user, I would like to be able to generate visualizations based on data specifically for a certain region.
4	As a user, I would like to choose between different variables (for instance reflectivity or temperature) for a particular visualization.
5	As a developer, I would like for observation data to be in a common format (grid spacing and variables)
6	As a developer, I would like for forecast data to be in a common format (grid spacing and variables).
7	As a developer, I would like to be able to calculate the mean of a particular variable over time or over a specific region.
8	As a developer, I would like to be able to calculate the root square mean difference of a particular variable over time or over a specific region.
9	As a user, I would like to view a static heatmap of the forecasted weather.
10	As a user, I would like to view a static heatmap of the observed weather.
11	As a user, I would like to view a static visualization of the comparison done using mean .
12	As a user, I would like to view a static visualization of the comparison done using root mean square difference.
13	As a user, I would like to view a moving heatmap of the forecasted weather.
14	As a user, I would like to view a moving heatmap of the observed weather.
15	As a user, I would like to view a moving visualization of the comparison done using mean. (if time permits)
16	As a user, I would like to view a moving visualization of the comparison done using root mean square difference. (if time permits)
17	As a user, I would like to view a graph showing the accuracy of a specific variable over a time period (if time permits).
18	As a user, I would like to view a graph showing the accuracy of a specific variable

	based on how far out have they been forecasted (if time permits).
19	As a developer, I would like to perform evaluation calculations on the observation and forecast and compare the models.
20	As a user, I would like to see historical trends and visualizations
21	As a user, I would like to see the difference between the results from top accurate weather forecast and the worst accurate weather forecast. (if time permits)
22	As a user, I would like to see which model is better at predicting extreme weather. (if time permits)
23	As a user, I would like to see if there exist visible trends in the data that help better predict weather disturbances. (if time permits)
24	As a user, I would like to be able to store the models for each observation and forecast in separate files.

- **Non-Functional Requirements**

1. **Web Enabled:** Visualizations must be available over the web. Webpages must be autogenerated based on the visualizations that are to be displayed using type of visualization, date/time, location and variable as parameters.
2. **Intermediate Data Archival:** Interpolated intermediate data must be available historically for reanalysis of visualizations. Archived data must be clearly marked with location, time/date and variable parameters. Archived data must be available via the web and linked to the visualizations that are created from it.
3. **Operational Weather:** Every hour this tool should retrieve the observations and forecasts, convert them to a common grid spacing and format and create visualizations based on an evaluation of the observation and forecast for specific points in time.
4. **Web access must be fast:** Webpages should be static HTML/CSS and not include any server side programming.
5. **Modular:** Code must be modularized in a way that adding new types of observations and forecasts is trivial.