Time Series Anomalies

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The following are proposed application of Time Series Anomalies analysis that are being considered for the scope of our project. As we learn more about the methodology and tools available for Time Series Anomaly detection, we will select an application that can be accomplished with the available tools we researched and that can be accomplished before the end of the semester.

**Drought Detection**

Utilize NOAA weather sensor data and detect the anomaly of a drought based on doing a time series analysis on select features associated with drought, such as rain fall, stream flow, temperature, etc. Since drought is a cumulative response over a time span, the anomaly would have to be detected not at a specific time but most likely over a range of time or moving average of select features. Additionally the a specific region or area would be selected, ideally with predictive weather patterns, as it is anticipated the anomaly detection could only be calibrated for a specific area and may not be universally applied to any region. More research would need to be done on what is considered as a drought.

<http://drought.unl.edu/ranchplan/DroughtBasics/WeatherDrought/MeasuringDrought.aspx>

<http://drought.unl.edu/DroughtBasics/PredictingDrought.aspx>

**Flood Currents**

Utilize NOAA tidal measurements and time series anomaly detection methods to determine where High Tide coincides with Flood Current and Low Tide coincides with Ebb Currents. We would have to evaluate further if this is actually a time series anomaly. Data may also be limited.

<https://tidesandcurrents.noaa.gov/faq4.html#15>

<https://ocefpaf.github.io/python4oceanographers/blog/2014/07/07/pytides/>

<http://www.co-ops.nos.noaa.gov/publications/Understanding_Tides_by_Steacy_finalFINAL11_30.pdf>

<http://www.whydomath.org/node/hearing/fourierHarmonicAnalysis.html>

**Buoy Vandalism**

Use time series anomaly detection on buoy sensor data to detect anomalies that indicate vandalism of the buoy. The report below has a table listing select station IDs and failed dates that could be used as part of the training set, if corresponding buoy data set is available from the NOAA.

<http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA527205>

**Tsunami Detection**

Use Deep-ocean Assessment and Reporting of Tsunamis (DART) data from NOAA to detect anomalies for Tsunamis. This system has sensor at the bottom of the ocean that measure pressure to determine depth of water column. When an “event” measurement is achieved, it will signal an event warning. Since this system is relative new, it is unknown if a tsunami has been detected

[**http://www.ndbc.noaa.gov/dart/dart.shtml**](http://www.ndbc.noaa.gov/dart/dart.shtml)

[**http://www.ndbc.noaa.gov/measdes.shtml**](http://www.ndbc.noaa.gov/measdes.shtml)

**Sea Surface Temperature Anomaly Detection (El Nina and El Nino)**

Use time series anomaly detection to determine when El Nina and El Nino is occurring. Based on the description of how this patterns are detected, the satellites are used to measure what height and surface water temperature. The buoys wind speed and direction are also collected, and with the satellite data, the anomaly is detected. It is uncertain at this point if we are able to obtain Satellite data and what form it will be in. In addition, we may need to use some GIS/Spatial software to spatial correlate buoy and satellite data to properly make the evaluation, since it is not a point location anomaly but a regional anomoly.

[**http://earthobservatory.nasa.gov/GlobalMaps/view.php?d1=AMSRE\_SSTAn\_M**](http://earthobservatory.nasa.gov/GlobalMaps/view.php?d1=AMSRE_SSTAn_M)

[**http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml**](http://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml)

[**http://www.gma.org/surfing/weather/elnino.html**](http://www.gma.org/surfing/weather/elnino.html)