Predicting Dengue Fever

Non-Technical Presentation

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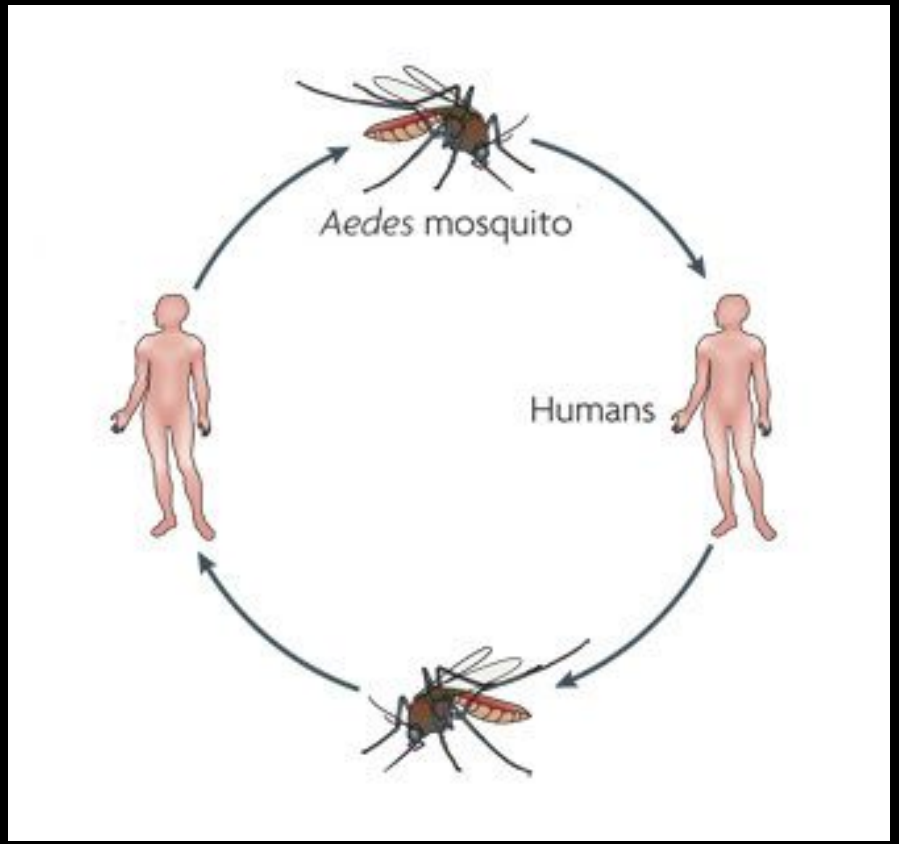
Can weather predict the weekly number of dengue fever cases?

Dengue: A Primer

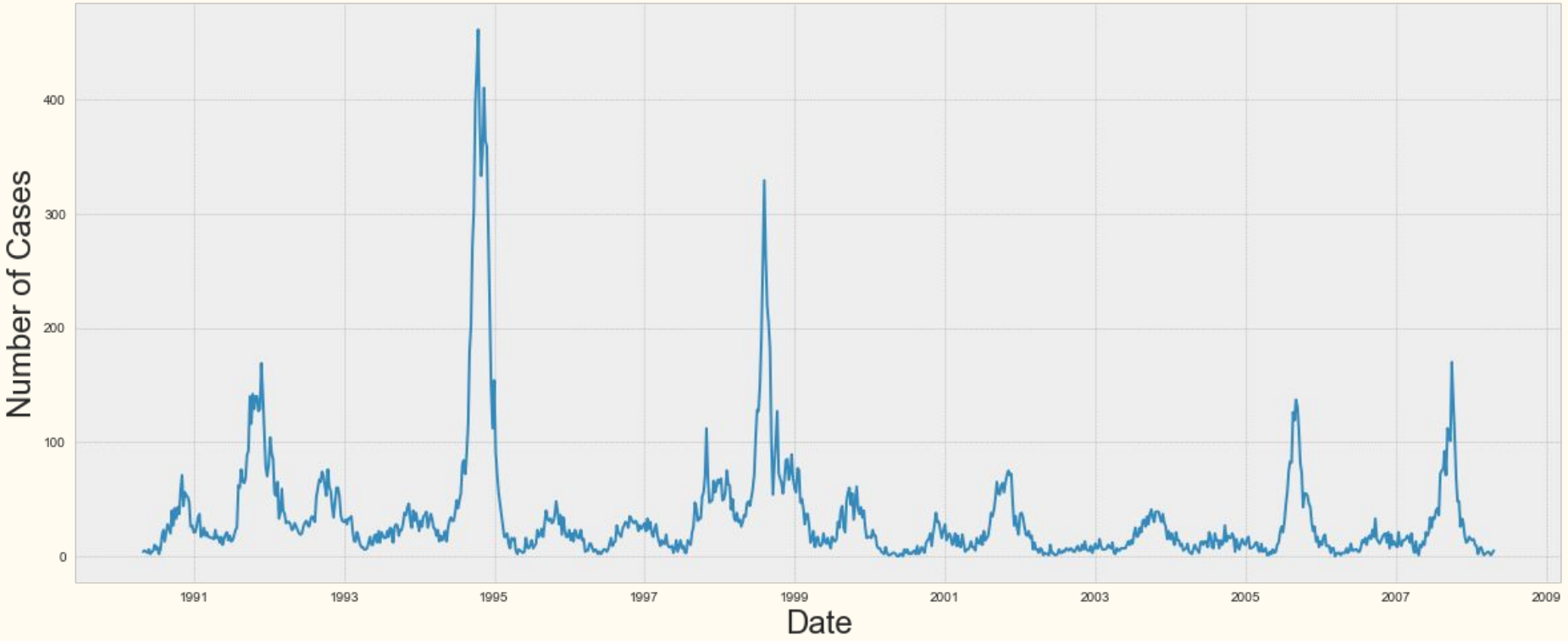


The Competition:
Hosted by Driven Data

- Goal:
  - Predict number of cases in San Juan, Puerto Rico and Iquitos, Peru using the weather
- Duration:
  - Ends Dec. 31, 2017
- Prize:
  - Glory!

DRIVENDATA

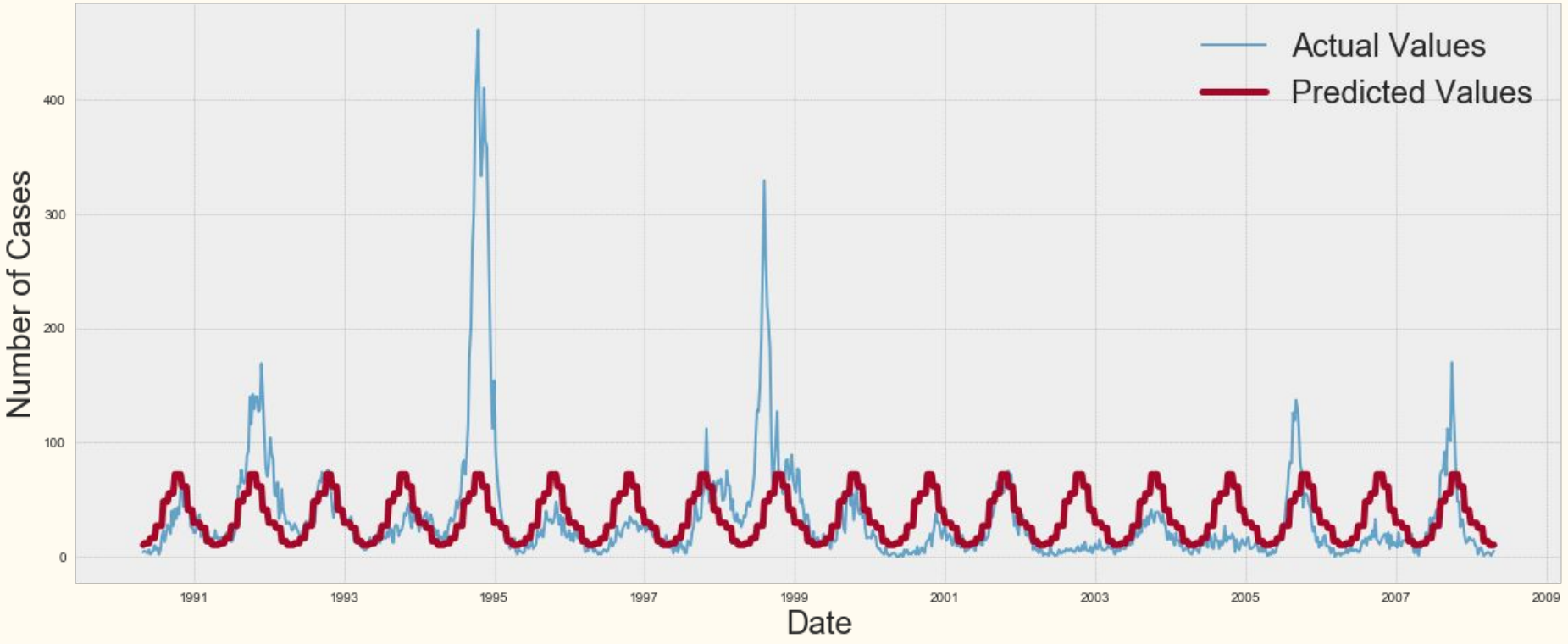
Number of Cases per week in San Juan, Puerto Rico



Methods

1. Find monthly trend
2. Use weather variables to predict higher or lower than trend
3. Combine weather predictions and monthly predictions

Monthly Trend of Dengue Fever in San Juan



Using the Weather

- Temperature
  - Max, min, average, diurnal range, dew point
- Precipitation
  - Total rainfall
- Humidity
  - Mean relative and mean specific
- Vegetation
  - Level of vegetation in NW, NE, SW and SE quadrants of city as measured by satellite image

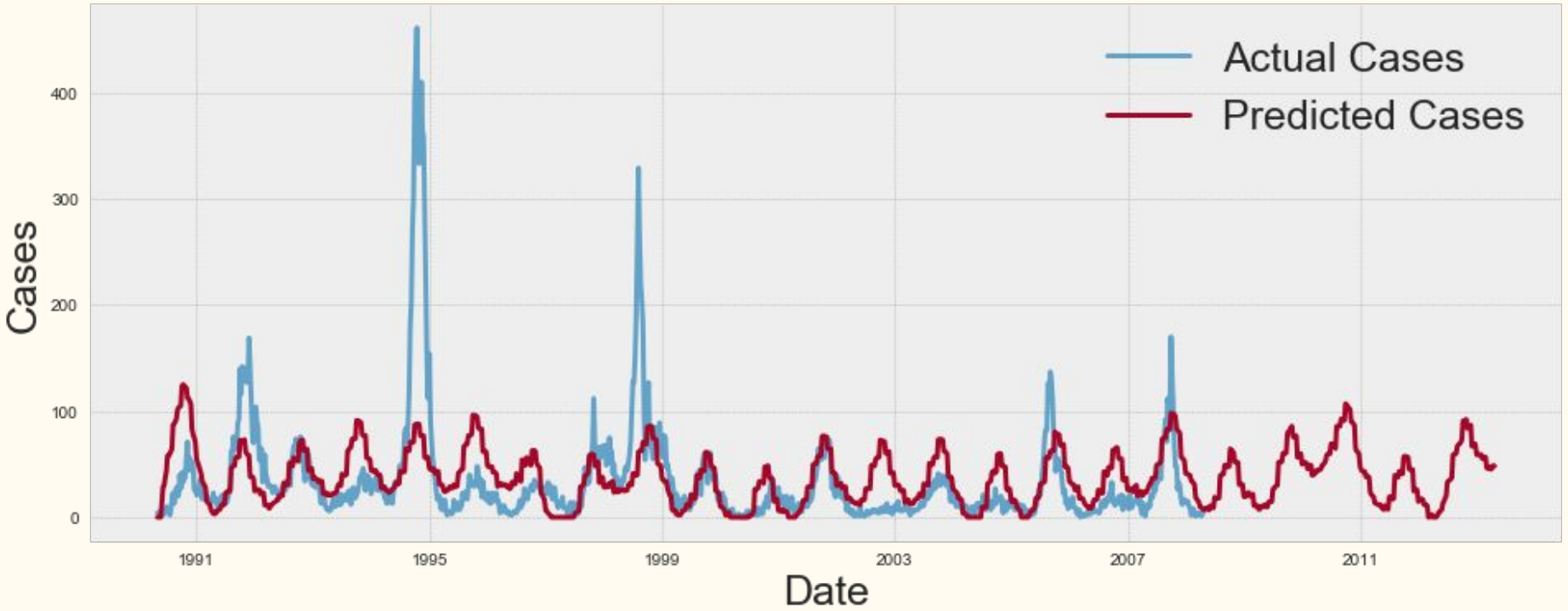
This week's weather doesn't matter...
... it's the weeks and months before

Mosquitos need hot and wet weather for multiple weeks to reproduce. Abundant vegetation can provide pools of stillwater for spawn points.

Over what time period should we study the weather to predict a single week's worth of cases?

- A month (4 weeks)?
- A quarter (16 weeks)?
- A year (52 weeks)?

Best Predictions of Dengue Fever in San Juan



RESULTS

Model Description	Improvement
Monthly Trend	Baseline
Monthly Trend + Custom weather features for both San Juan and Iquitos	13.5% better
Monthly Trend + Custom weather for San Juan and only Temp for Iquitos	17.3% better
BEST: Monthly Trend + Rolling Mean of Temperature for both	21.1% better

As of Sept 26, 2017, my best submission is 61st out of 1922 entrants, or in the top 4% of all competitors.

Problems

- Overfitting the data. Received better validation scores, but worse test scores after Submitting to DrivenData.
- Model cannot not predict outbreaks, just increased caseloads.
- San Juan and Iquitos need unique models to reflect unique weather predictors.

Further Information

Code and analysis can be found in my GitHub repo here:

- https://github.com/AlexJF12/predicting-dengue

Technical Presentation can be found here:

- https://github.com/AlexJF12/predicting-dengue/blob/master/Predicting%20Dengue%20-%20Technical%20Presentation.pdf

Competition

- https://www.drivendata.org/competitions/44/dengai-predicting-disease-spread