

HOWDY!

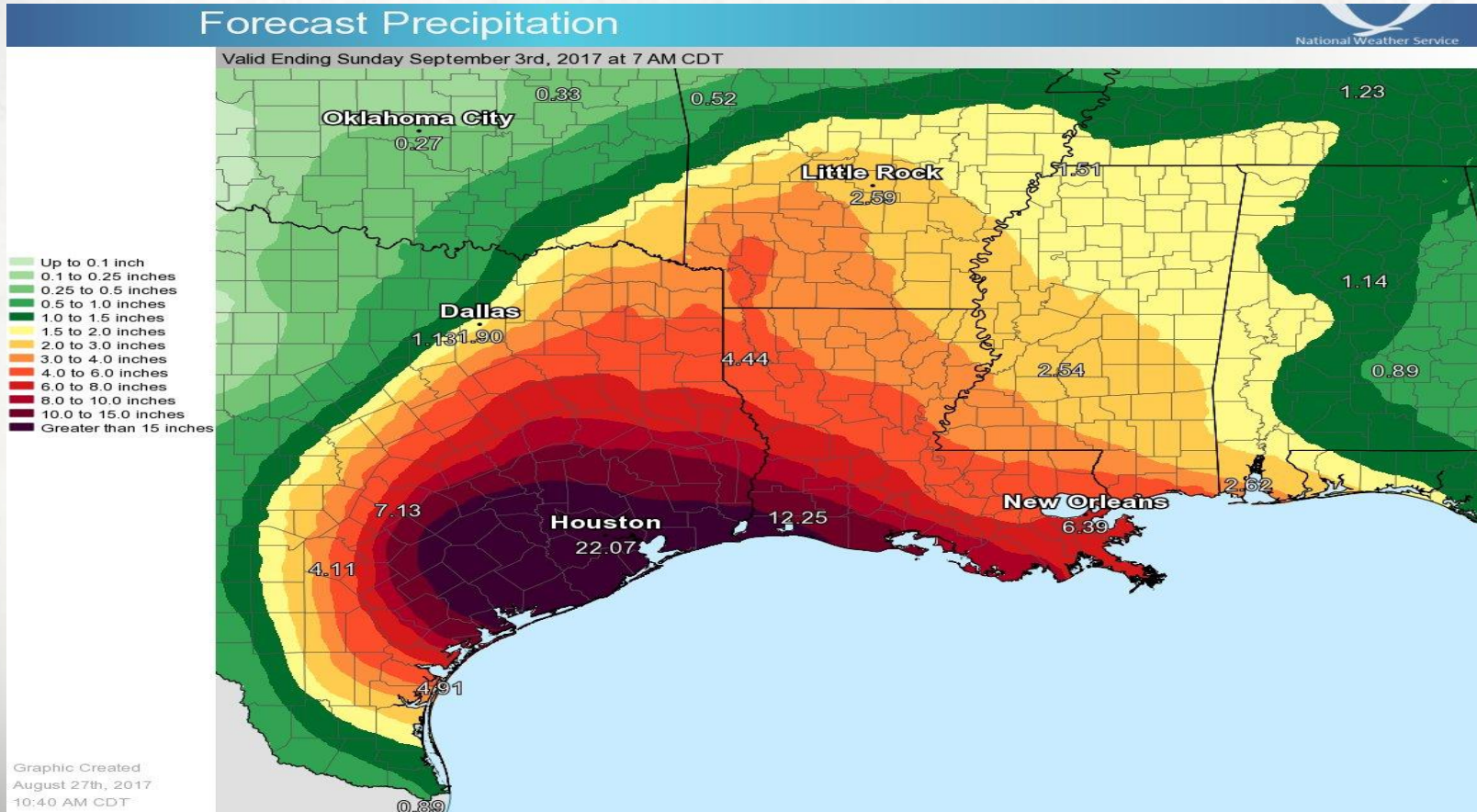
Application of Machine Learning Tools to Predict the Vulnerability of Roads to Natural Disasters

Baiherula Abula, David Cross, Aaron Kingery

Dec 5, 2017

Introduction & Motivation

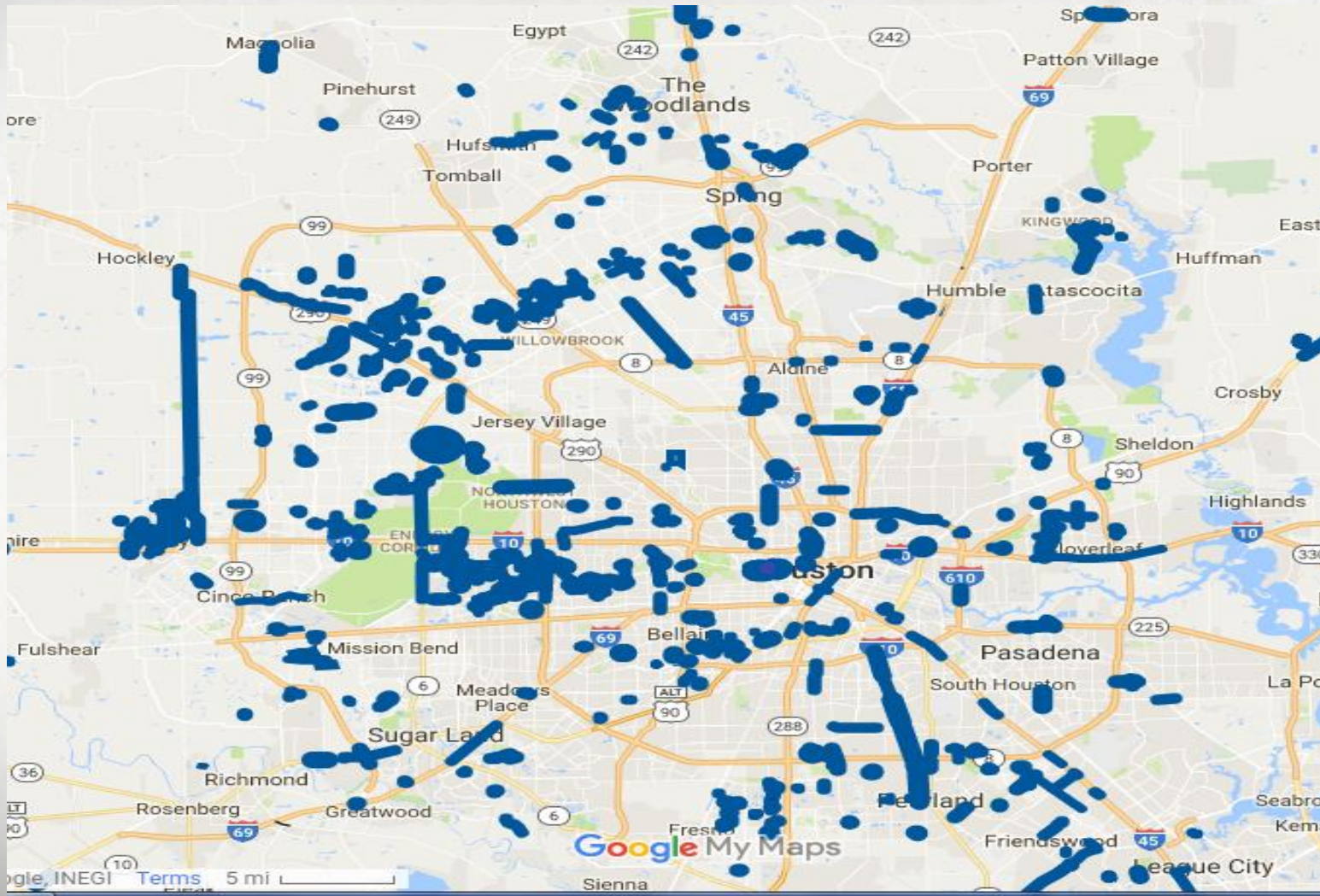
Hurricane/Typhoon → Heavy Precipitation → Heavy Flooding



Source: <http://www.weatherboy.com/tag/texas-floods/>



Flooded Streets due to Harvey



Problem Formulation & Literature Review

How do we predict which roads get flooded before the actual rain?

Examples of existing works on the topic:

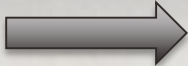
- Qualitative analysis
- Quantitative analysis



Proposed Solution

Identify features of roads which got flooded and not flooded, based on the historical data (from the Hurricane Harvey) for Houston, based on the identified features, run various classification algorithms.



Heavy Flooding  Road Closures

Characteristics of flooded roads:

- Tend to lie in flood plains
- Tend to be close to dams/floodgates
- Tend to be close to floodgates
- Tend to have no open side spaces
- Tend to be in the vicinity of bayous/channels



Data Description

- Data type:
 - Five feature variables with discrete values
 - One output variable with binary values
 - In total, 75 unique observations
- Source of data:
 - Houston Transtar (road closure data)
 - FEMA Flood Plain map
 - Google Earth/Map Data

Models

- K-NN
- Multilayer Perceptron
- Random Forest
- Logistics Regression
- Bayes Rule

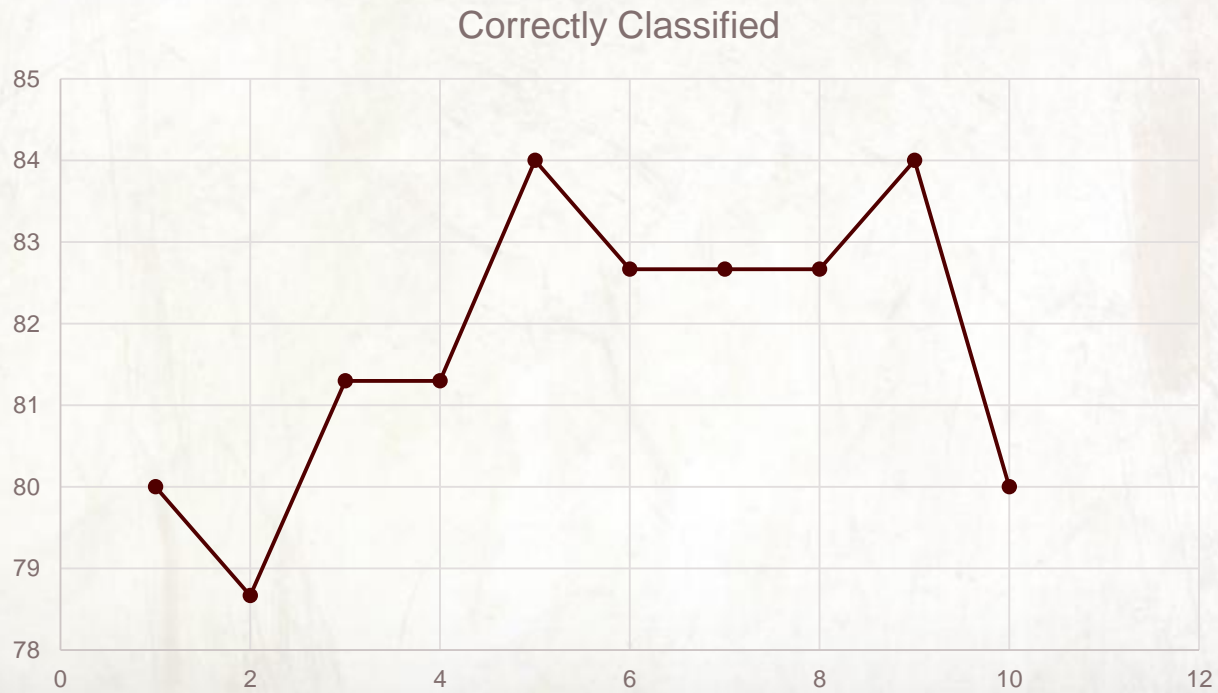
Models

- K-NN
- Multilayer Perceptron
- Random Forest
- Logistics Regression
- Bayes Rule

Algorithms	Prediction Accuracy
k-NN	84
Multi_layer	85.6
Random_Forest	87.6
Logistics_Regression	77.3
Bayes Based	81.3

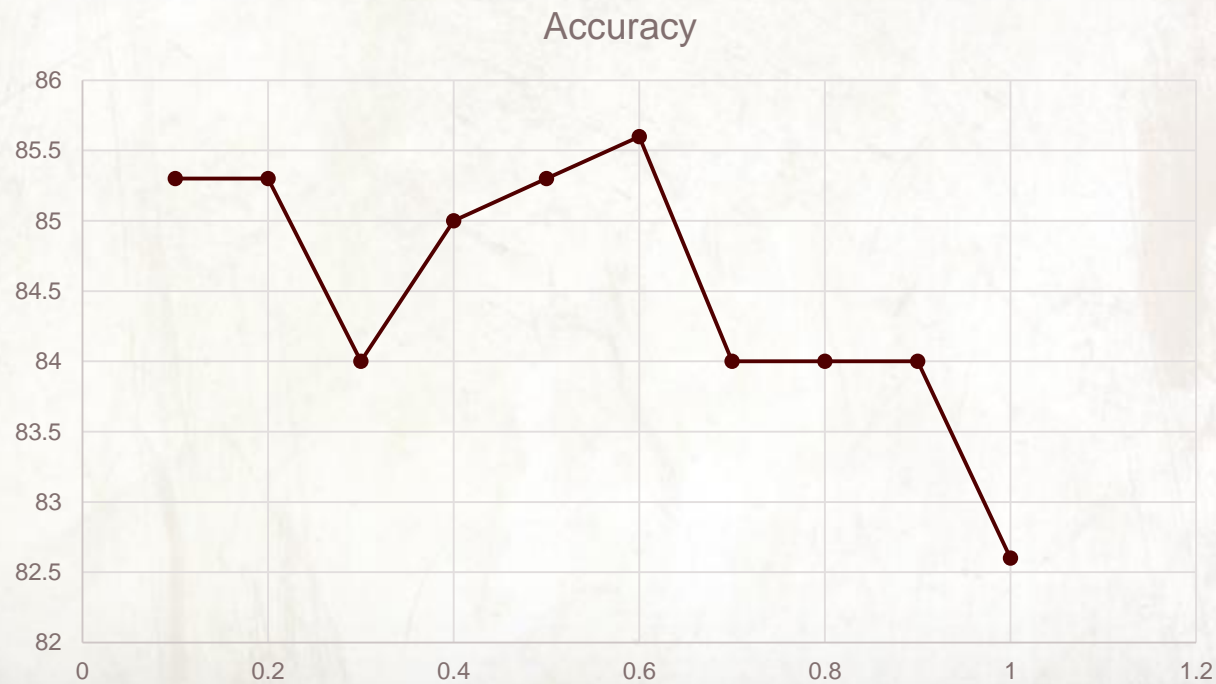
Models

- K-NN



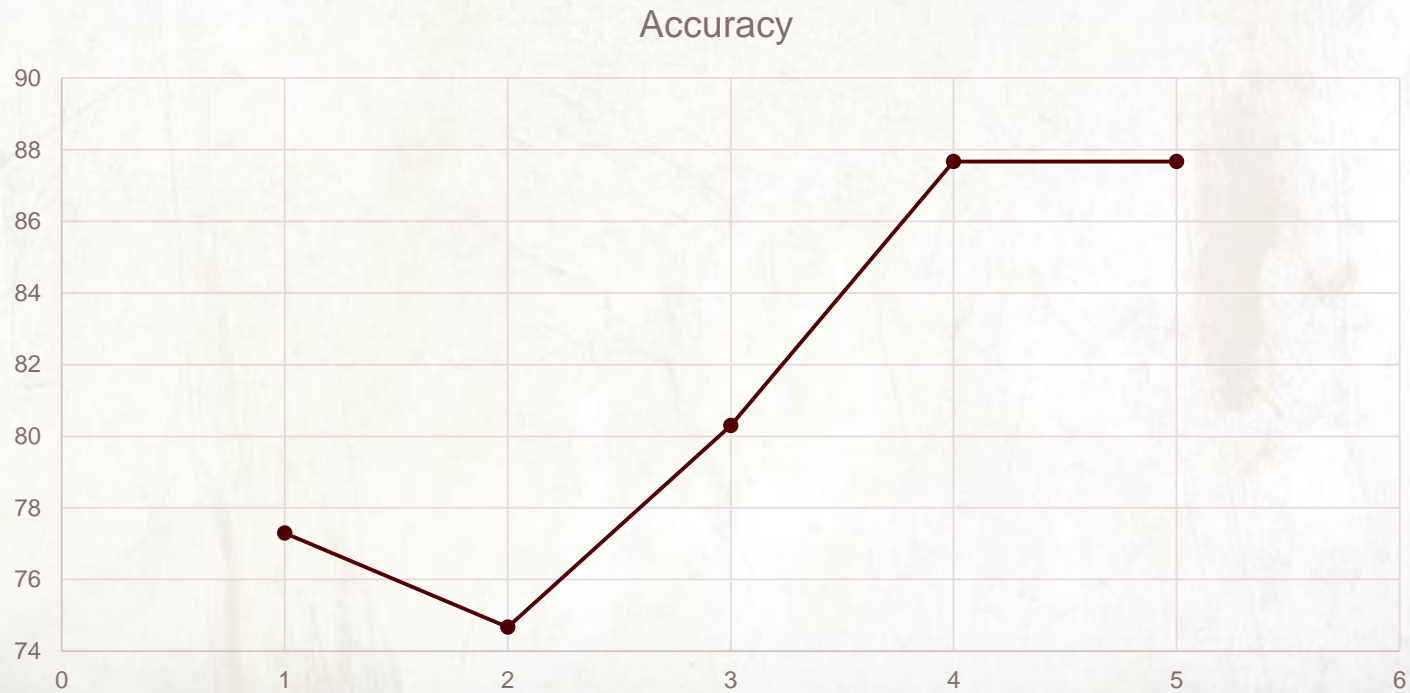
Models

- Neural Network



Models

- Random Forest



Results and Discussions

- Model works best:
 - Random Forest

- Rooms for Improvement:
 - More Features
 - More data with higher accuracy

Thank You!

