# Disaster Funding in the U.S.

## Group 4 Presentation

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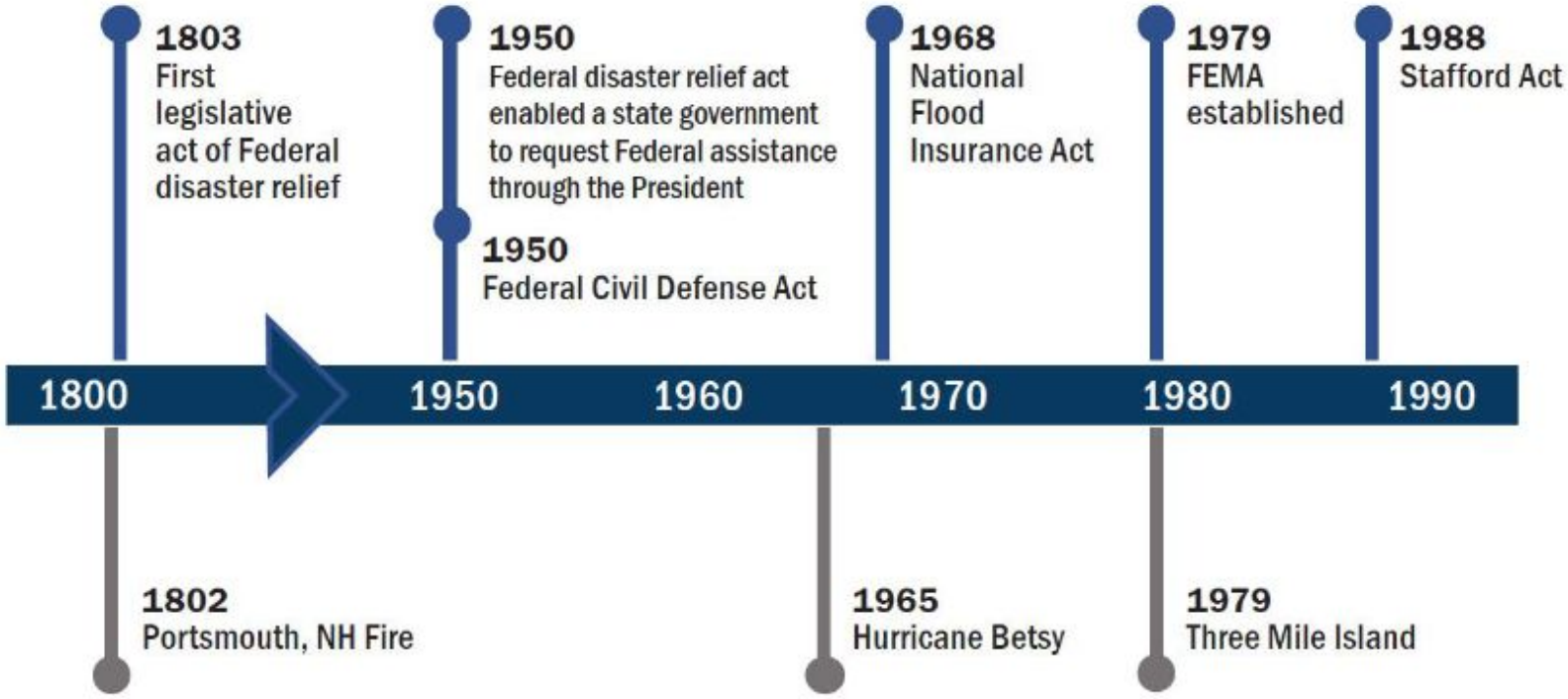
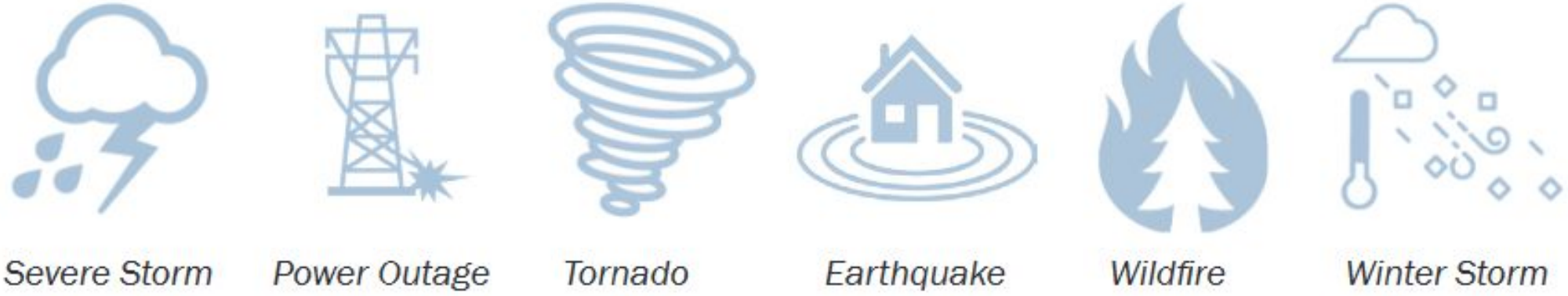
# Project Background

**Federal Emergency Management Agency (FEMA) is a government agency with the purpose of helping people before, during and after disasters.**




- The Stafford Act of 1988 provides clear direction for FEMA's role in emergency management.

Source: www.fema.org




**A disaster is defined as an adverse condition or occurrence that requires coordinated action across multiple entities to resolve. Disasters include all types of emergencies and includes both natural and man-made incidents.**

Source: www.fema.org

# Overview of Disaster Declaration

**Preliminary Disaster Assessment**

- Governor submits request through Regional FEMA Office
- Preliminary Disaster Assessment completed to determine extent of impact and that effective response beyond local resources – supplemental federal assistance is needed

**Disaster Declaration**

- President declares either an Emergency Disaster or Major Disaster
  - Assistance available for Emergency Disasters (up to 5 million) and Major Disasters: Public, Individual, Hazard Mitigation funding

**FEMA Response**

- Application reviewed and accepted or not accepted
- Appropriations from Disaster Relief Funds used to direct, coordinate, manage, and fund eligible response and recovery efforts associated with domestic major disasters and emergencies that overwhelm state, local, tribal, or territorial resources.

Source: https://www.fema.gov/pdf/media/factsheets/dad_disaster_declaration.pdf

# Overview of Major Disaster Funding

## Funding Types

### Individual & Housing Programs

- Housing (Ha) Assistance
- Other Needs Assistance (ONA)
  - Funeral
  - Medical
  - Dental
  - Childcare

### Public Assistance

- **CatAb** Debris Removal and Emergency Protective Measures
- **CatC2g Infrastructure**
  - roads and bridges
  - water facilities
  - public bldgs.
  - public utilities
  -

### Hazard Mitigation

Source: www.fema.org

# Project Overview

**Project Question(s):**

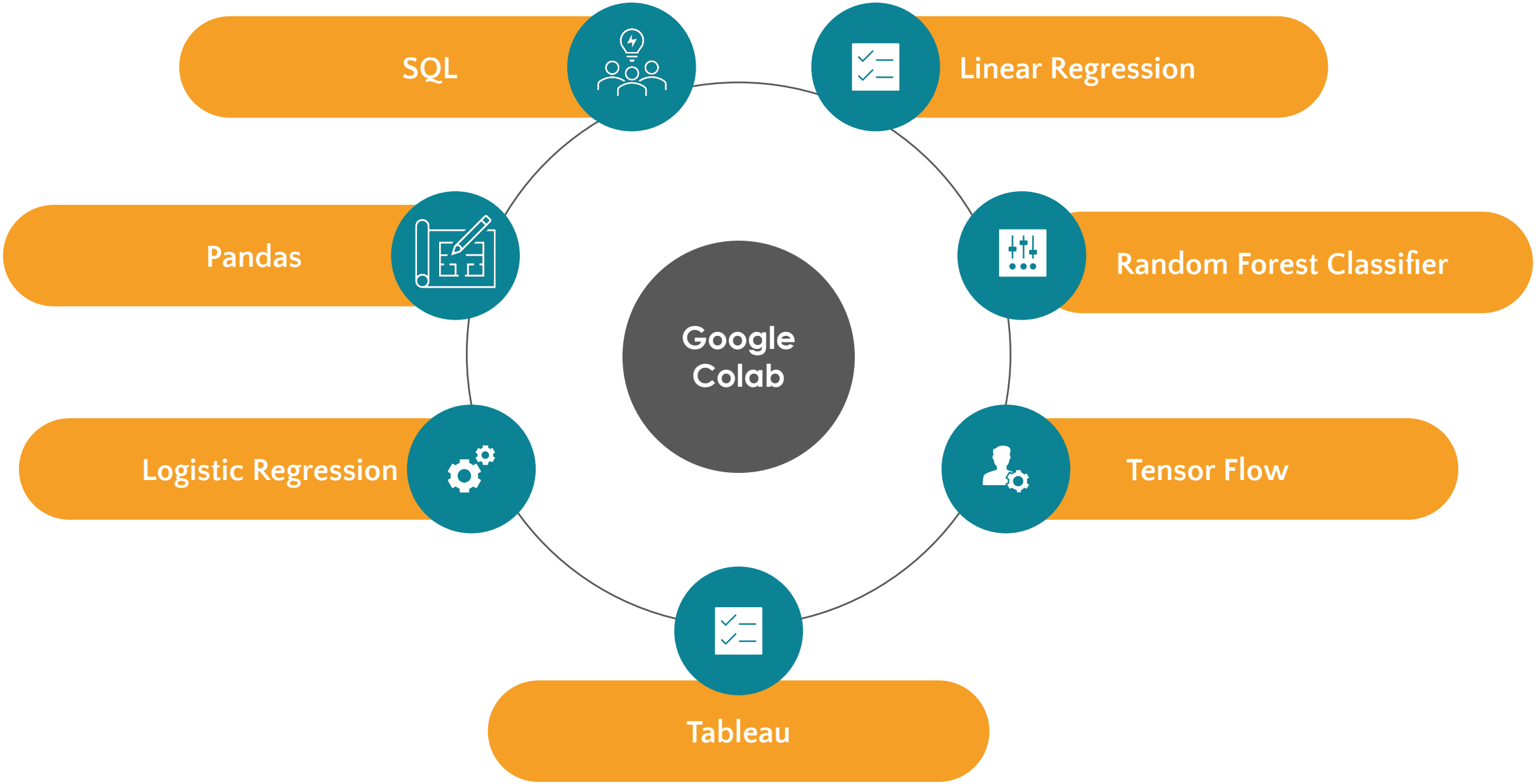
What predicts how much infrastructure funding is given?

What predicts whether a disaster requires infrastructure funding?

**Why This Is Important:**

Allocation of public funding is key to re-building community infrastructure and recovery.

# Tools Used

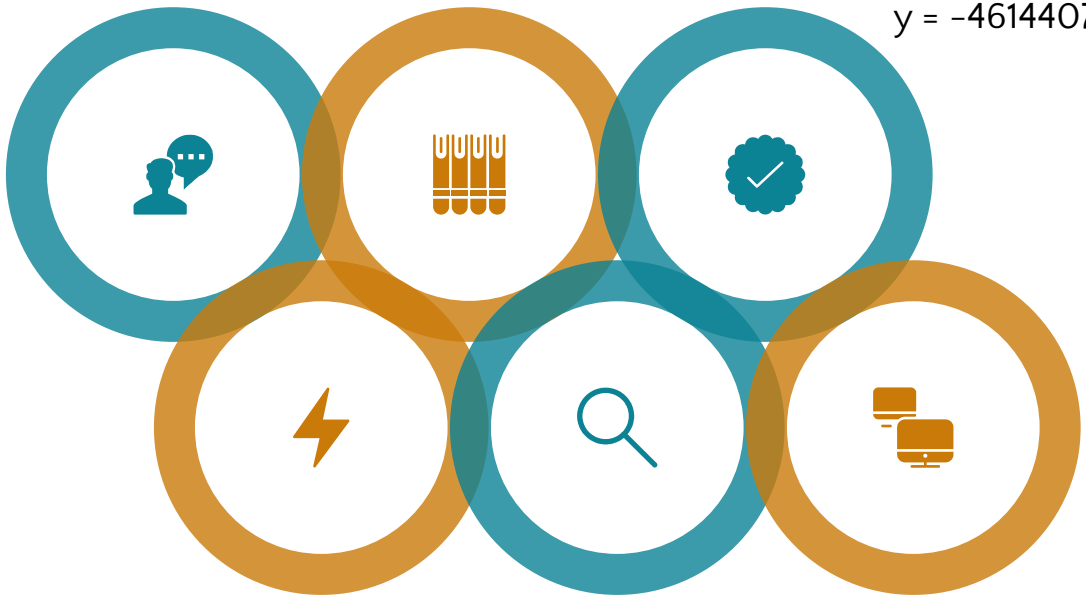

SQL
Linear Regression
Pandas
Random Forest Classifier
Google Colab
Logistic Regression
Tensor Flow
Tableau

# Project Analysis Process

1. Two FEMA CSVs were read and merged through SQL tables.

2. Cleaning and filtering was completed to ensure precise and accurate data is analyzed.

3. Utilized Dummy coding to view various disaster types. Ran Linear regressions to predict how much money went into infrastructure support, resulting in: y = -4614407 + 7.95X and R-squared value of 0.32.



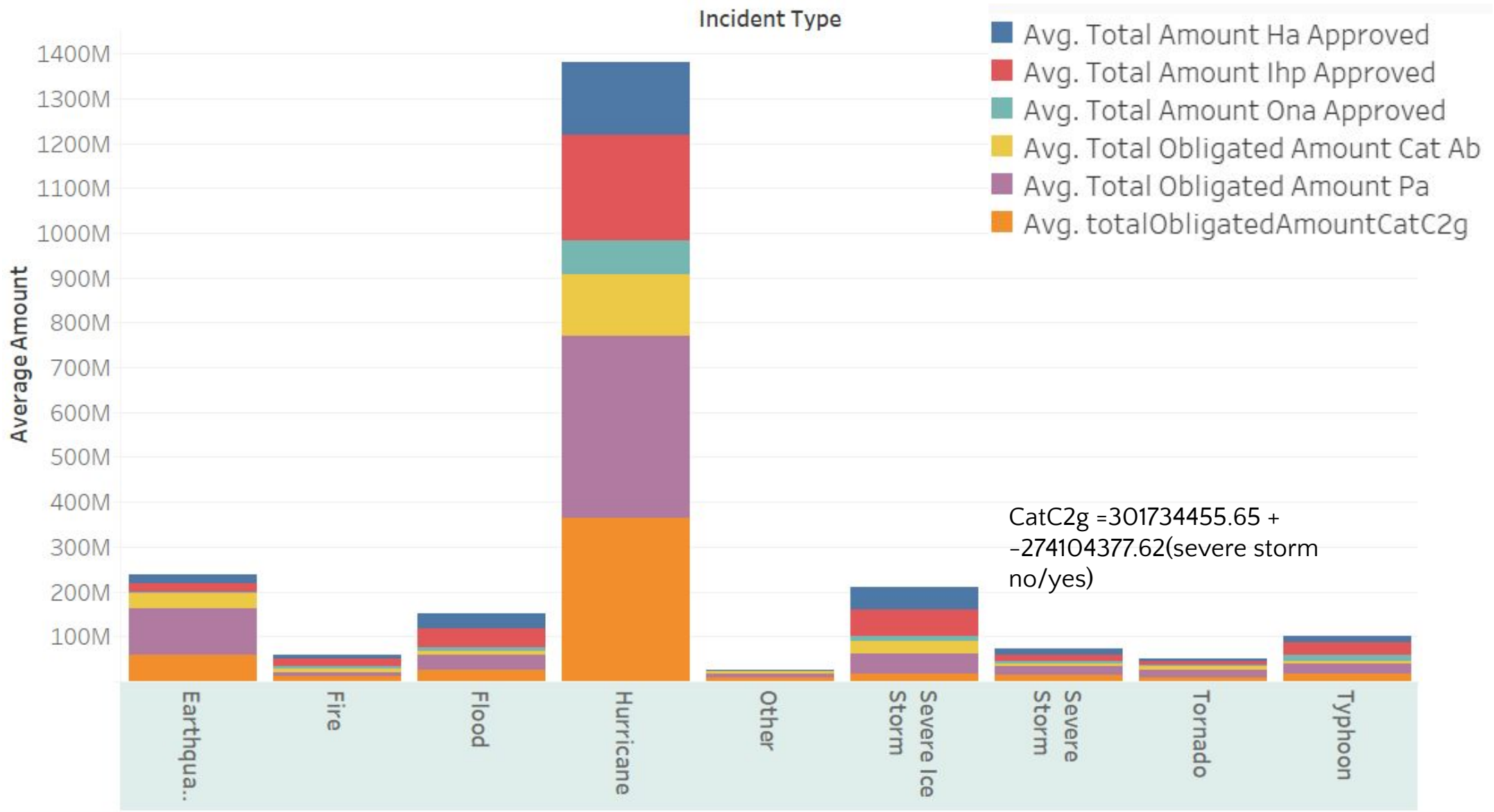
4. Explored infrastructure support based on disaster types and created new columns representing our findings. Variables for X and Y were chosen.

5. Final Logistic Regressions were run and data was scaled. Logistic regressions improved from 43% to 71% to 83%.

6. Exploratory Analysis of predicting types of disasters based on assistance given. Returned with a 99% classification accuracy, surprisingly.

# FEMA Funding

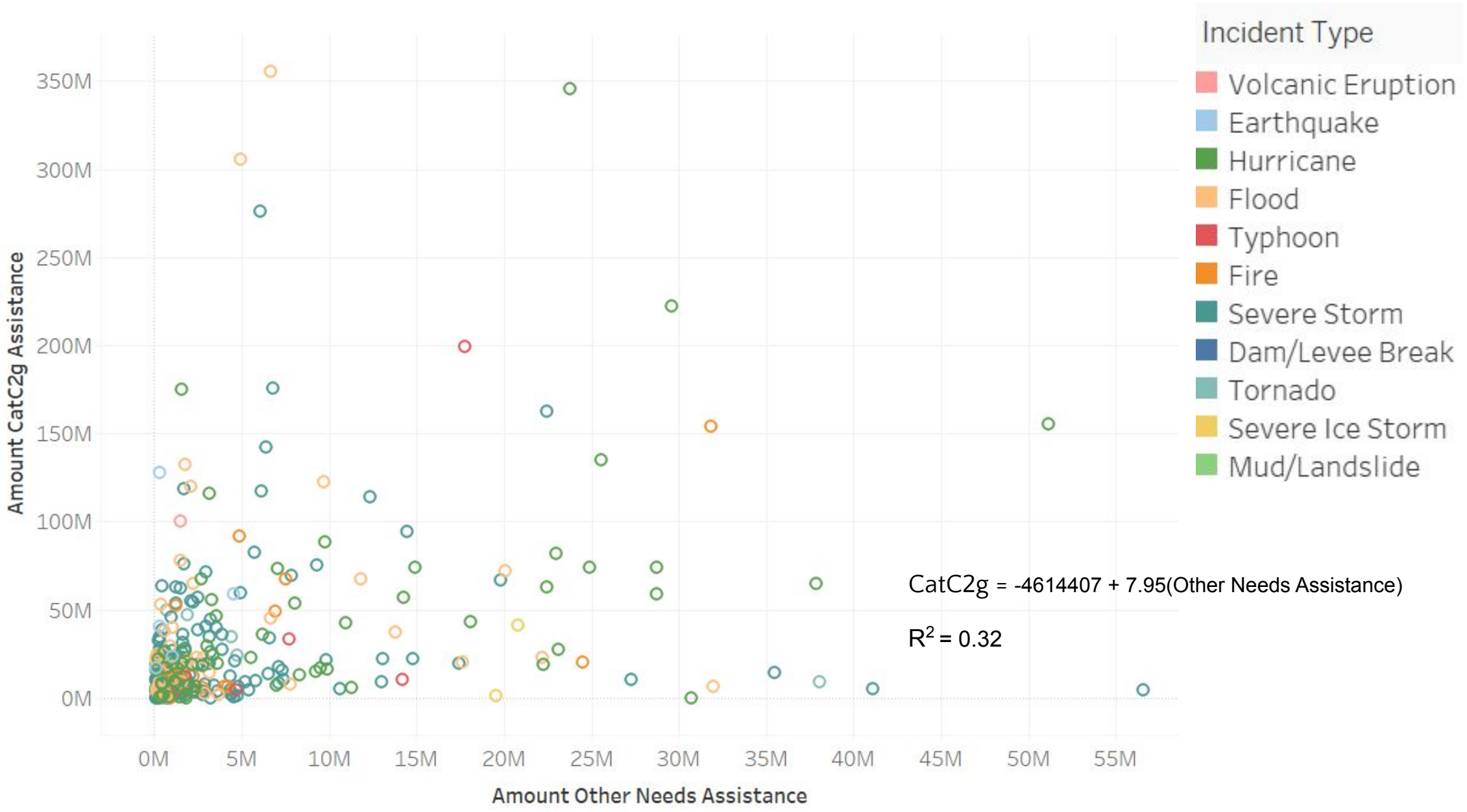
CatC2g = 30790375.83 + 701224478.44(hurricane no/yes)




CatC2g =301734455.65 + -274104377.62(severe storm no/yes)

Source: www.fema.org

# FEMA Funding




CatC2g = -4614407 + 7.95(Other Needs Assistance)

$R^2 = 0.32$

Source:
www.fema.org

# Was CatC2g support given?
(logistic regression)

| | precision | recall | f1-score | support |
|---|---|---|---|---|
| 0 | 0.00 | 0.00 | 0.00 | 129 |
| 1 | 0.98 | 1.00 | 0.99 | 6103 |
| accuracy | | | 0.98 | 6232 |
| macro avg | 0.49 | 0.50 | 0.49 | 6232 |
| weighted avg | 0.96 | 0.98 | 0.97 | 6232 |

# Was CatC2g support given?
## (based on: year of disaster, type of disaster, amount of Other Needs Assistance given)

CatC2g=Infrastructure Funding

**Neural Network Model (TensorFlow)**

| | Model (relu, sigmoid) | Optimized model (tanh) |
|---|---|---|
| Accuracy | **.71** | **.84** |
| Loss | **.60** | **.42** |

# What type of disaster was it?
## (based on year, Cat2Cg assistance, Other needs Assistance)

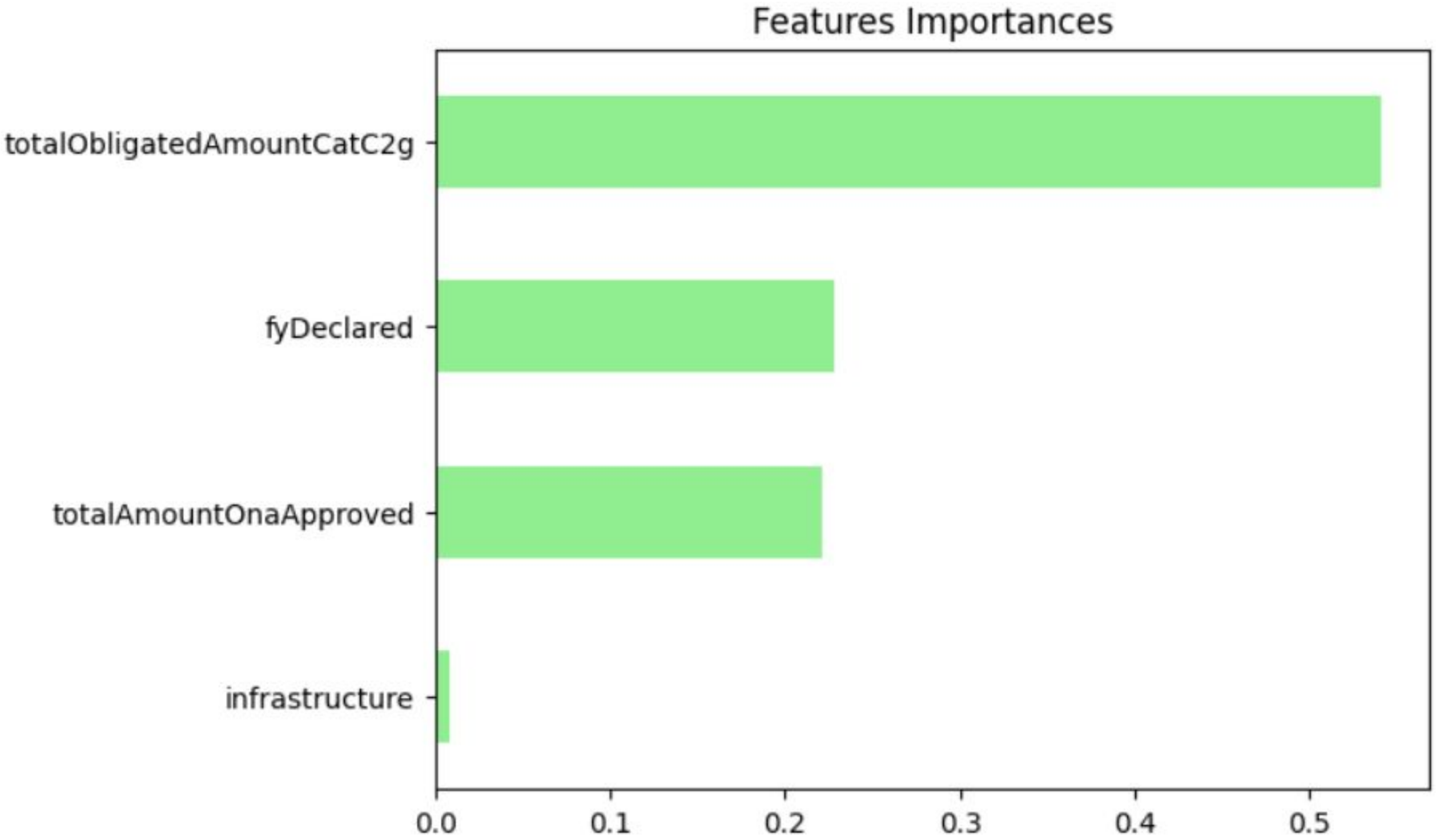
Confusion Matrix

| | Predicted 1 | Predicted 2 | Predicted 3 | Predicted 4 | Predicted 5 | Predicted 6 |
|---|---|---|---|---|---|---|
| **Actual 1** | 3137 | 3 | 2 | 0 | 1 | 0 |
| **Actual 2** | 4 | 1167 | 0 | 2 | 0 | 0 |
| **Actual 3** | 18 | 13 | 752 | 0 | 0 | 0 |
| **Actual 4** | 2 | 0 | 0 | 420 | 0 | 0 |
| **Actual 5** | 11 | 1 | 1 | 1 | 445 | 0 |
| **Actual 6** | 1 | 0 | 0 | 0 | 1 | 250 |

1 = Severe Storm
2 = Hurricane
3 = Flood
4 = Severe Ice Storm
5 = Other
6 = Snowstorm

**Accuracy Score : 0.990211810012837**

# What helped predict disaster type?



# Project Analysis/Findings

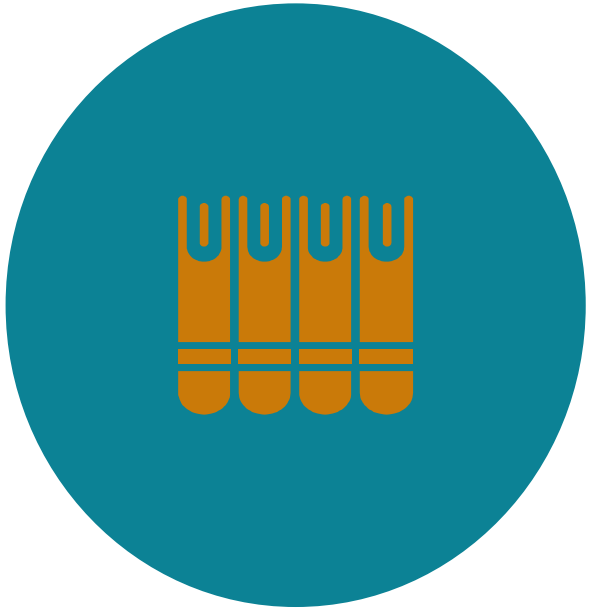
Circumstances that require other needs assistance (ONA) and infrastructure support are distinct

Low amounts of other needs assistance (ONA) may be required in the absence of a need for infrastructure support

When infrastructure support is needed, the cost is likely to be greater

Infrastructure support is more likely to be needed with some kinds of disasters (e.g., hurricanes versus biological disasters)

# Limitations



This is raw, unedited data from FEMA's National Emergency Management Information System (NEMIS) and as such is subject to a small percentage of human error.

Due to differences in reporting periods, status of obligations and how business rules are applied, this financial information may differ slightly from official publication on public websites such as usaspending.gov.

Our model is not 100% accurate. We did not incorporate other factors such as location, populations, environmental features.

# Questions?

# Thank You!

24Slides