Gabriel Rosario - 01/30/2024 – Rev1

capstone two – project PROPOSAL

# Project idea overview

## Selected project idea – 2022 national bridge inventory data

This dataset was generated through <https://infobridge.fhwa.dot.gov/>, and contains a collection of various measurements, ratings, and other information regarding bridges. It could potentially be used for understanding and managing bridge infrastructure, assessing conditions, planning maintenance, and evaluating the impact of climate factors on bridges.

The shape of this dataset is 143 columns and 15,034 observations (many missing values).

The goal is to clean and prepare the dataset to create a model that predicts how many bridges in total are going to need repair in 2025 and what would be the total amount to repair them.

Link to dataset: <https://www.kaggle.com/datasets/cynthiamengyuanli/2022-national-bridge-inventory-data?resource=download>

# project proposal – National bridge analysis

## Problem Identification

### Overview and Context

The Federal Highway Administration (FHWA) is an agency within the U.S. Department of Transportation that supports State and local governments in the design, construction, and maintenance of the Nation’s highway system (Federal Aid Highway Program) and various federally and tribal owned lands (Federal Lands Highway Program). Through financial and technical assistance to State and local governments, the Federal Highway Administration is responsible for ensuring that America’s roads and highways continue to be among the safest and most technologically sound in the world.

Over the past few years, the Federal Highway Administration (FHWA) has observed a significant rise in the number of bridges that have transitioned from good to fair condition. This increase in fair-condition bridges is expected to result in a future increase in funding for bridge repair, as these bridges will eventually transition to poor condition. As a result, the agency is currently working on predicting the number of bridges that will require repair in 2025, rank them based on traffic volume to prioritize the busiest bridges, and determine the amount of funding needed to repair those bridges.

### Criteria for success

The goals of this data analysis are the following:

* Identify the number of bridges that transitioned from good to fair condition,
* Identify what parameters are affecting in the acceleration of the condition degradation of the bridges,
* Forecast the number of bridges that will transition from good to fair conditions in 2025,
* Forecast the number of bridges that will transition from fair to poor conditions in 2025,
* Rank the bridges that will transition to poor conditions by the importance taking in consideration the following parameters:
  + Busiest bridges (higher amount of transit),
  + Cost to repair,
  + Bridges which are more isolated (longest detour length).
* Forecast the budget to repair the bridges with poor conditions in 2025.

### Scope of solution space

Analysis of bridges conditions across the continental United States that are under the jurisdiction of the State and County Owner Agency.

The method that will be apply for the data analysis will consist on the Linear Regression model using the Random Forest

The scope of our solution is to predict our dependent feature with a r-squared of more than 0.9.

### Constraints within the solution space

The following points are constraints that can affect the bridge condition analysis:

* Out of normal weather patterns,
* Unexpected increase of traffic patterns due to region growth,
* Unexpected decrease of traffic patterns due to region shrink,
* Accidents that could accelerate the bridge condition degradation.

### Stakeholders to provide key insight

* Cynthia Mengyuan Li – Dataset owner in Kaggle

### Key Data Sources

* CSV file downloaded from Kaggle (Link: <https://www.kaggle.com/datasets/cynthiamengyuanli/2022-national-bridge-inventory-data?resource=download> )
* For more information and references:
  + <https://infobridge.fhwa.dot.gov/>
  + <https://highways.dot.gov/about/about-fhwa>