### Application of machine learning in predictions of the minimum number of sensors and the optimal locations of sensors for structural health monitoring

As repairing and enhancing existing reinforced concrete structures have taken place in the field of structural engineering, monitoring the performance and structural integrity of structures has been recognized as a high priority. With this manner, structural health monitoring (SHM) with sensors has become an essential part of the field of structural engineering.

Thus, reinforced concrete structures usually require as many sensors as possible to monitor their health condition to assure the safety of structures.

However, it is not easy to estimate how many arrays of connected sensors are required and where to install the sensors due to the complexity of structures' design and maintenance cost of the SHM system.

Therefore, in my research, I will implement a neural network to make predictions of the minimum number of sensors and the optimal locations of sensors in a cost-effective manner.

[ 01 Creating a Dataset ]

At first, I will focus on non-destructive and destructive tests from extracted beams to figure out the most severe possible damages based on locations of test points. Then I will build a classification system that can help flag serious cases of failures.

[ 02 Building a Model ]

And I will build a neural network to carry out predictions on the structural dataset from destructive and non-destructive tests and evaluate the results of a model using automated machine learning. Then, I will implement the model with different variants of the structural data to evaluate how the data affects performance of structures. In this step, sensors location and the number of sensors will be discussed as a result of the model.

[ 03 Measuring Impact and Updating Models ]

For the integrity of the model, post-deployment impact of sensors location and the number of sensors will be evaluated. I will update the model to avoid unwanted bias, ensure security, and compliance to develop the business cases.

My research would take advantage of reducing maintenance costs and increasing the lifetime of structures.