

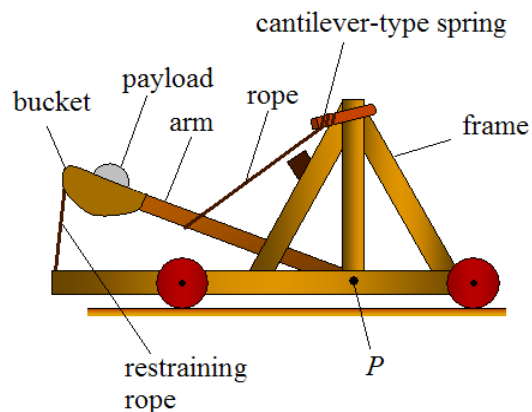
# Machine Learning Engineer Nanodegree

## Capstone Proposal

### Catapult prediction

#### Domain Background

A catapult is a ballistic device used to launch a projectile a great distance without the aid of gunpowder or other propellants – particularly various types of ancient and medieval siege engines. A catapult uses the sudden release of stored potential energy to propel its payload. Most convert tension or torsion energy that was more slowly and manually built up within the device before release, via springs, bows, twisted rope, elastic, or any of numerous other materials and mechanisms. The counterweight trebuchet is a type of catapult that uses gravity. Machine Learning could be a good solution to predict the distance of a projectile so you don't have to run the experiment every time when you change one of the inputs. Using a Machine Learning you will save the money and the time that require to run the experiment.



## Problem statement

The goal of the project is to predict the distance between the projectile when it will hit the ground and the catapult depending on several inputs which are release angle, firing angle, cup elevation, pin elevation, and bungee position. The output is the distance

## Datasets and Inputs

For this project, the input data is collected from an online simulation of a catapult by changing the inputs which are release angle, firing angle, cup elevation, pin elevation, and bungee position. Using 459 experiments to collect the data to be the input for this project.

Here is an example of the data set.

Release angle	Firing angle	Cup elevation	Pin elevation	Bungee pos	distance
185	90	300	200	100	202.44
185	95	300	200	100	247.16
185	100	300	200	100	296.5
185	105	300	200	100	338.37

## Solution Statement

Trying different models is always a good solution to see and decide which model is fit better for the data. Using Linear regression, Random Forest, and Multilayer Perceptron and compare between them to find the best algorithm.

## Evaluation Metrics

The goal here is to compare the performance of my model. On of the important steps to define the features that you will use in the model and then evaluate the most important features that can be affect your model.

## Project Design

1. Collect the data
2. Import the necessary dataset and libraries, pre-process the data.
3. Fit regression model with selected polynomial coefficient
4. Import Random Forest model and fit the data
5. Import Multilayer Perceptron model and fit the data
6. Predict the output and compare between different models

## References

- 1.Catapult Background: <https://en.wikipedia.org/wiki/Catapult>
- 2.Catapult simulation for data collection: <https://sigmazone.com/catapult>