# Data-Driven Problem Solving in Mechanical Engineering

## Model Development

Masoud Masoumi

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# Learning from Data

The basic premise of learning from data is the use of a set of observations to uncover an underlying process. That is a very broad premise and it is difficult to fit into a single framework.

(a) **Supervised Learning:** Training data contains explicit examples of what the correct output should be for given inputs, i.e. pairs of (input, correct output)

(b) **Unsupervised Learning:** Training data does not contain any output information. Can be viewed as the task of finding patterns and structure in input data.

(c) **Reinforcement Learning:** is concerned with the problem of finding suitable actions to take in a given situation in order to maximize a reward. Here the learning algorithm is not given examples of optimal outputs, but must instead discover them by a process of trial and error. See Gym platform.

# Modeling

The process of encapsulating information into a tool which can forecast and make predictions.

"*All models are wrong, but some models are useful*" -George Box

To develop a model, we split the data into *training data* and *test data*, typically 80/20.

- **Training Data:** data used to fit your models or the set used for learning
- **Test Data:** data used to evaluate how good your model is.

General procedure