Advanced probability and statistical methods for engineering

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Probability vs. Statistics

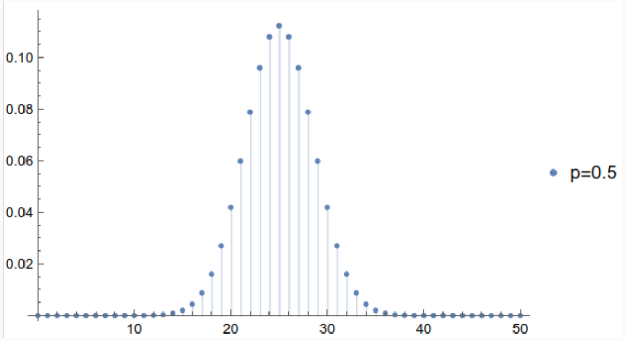
The problems considered by probability and statistics are inverse to each other. In probability theory we consider some underlying process which has some randomness or uncertainty modeled by random variables, and we figure out what happens. In statistics we observe something that has happened, and try to figure out what underlying process would explain those observations. —*Persi Diaconis*

Example: Coin flip

Probability: Given parameters, find the probability of observing a particular set of data.

Probability

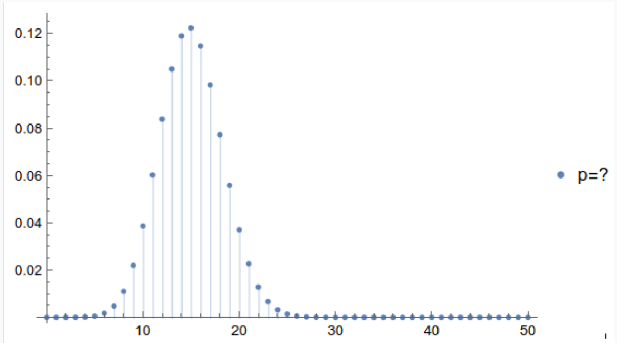
Given model, predict data



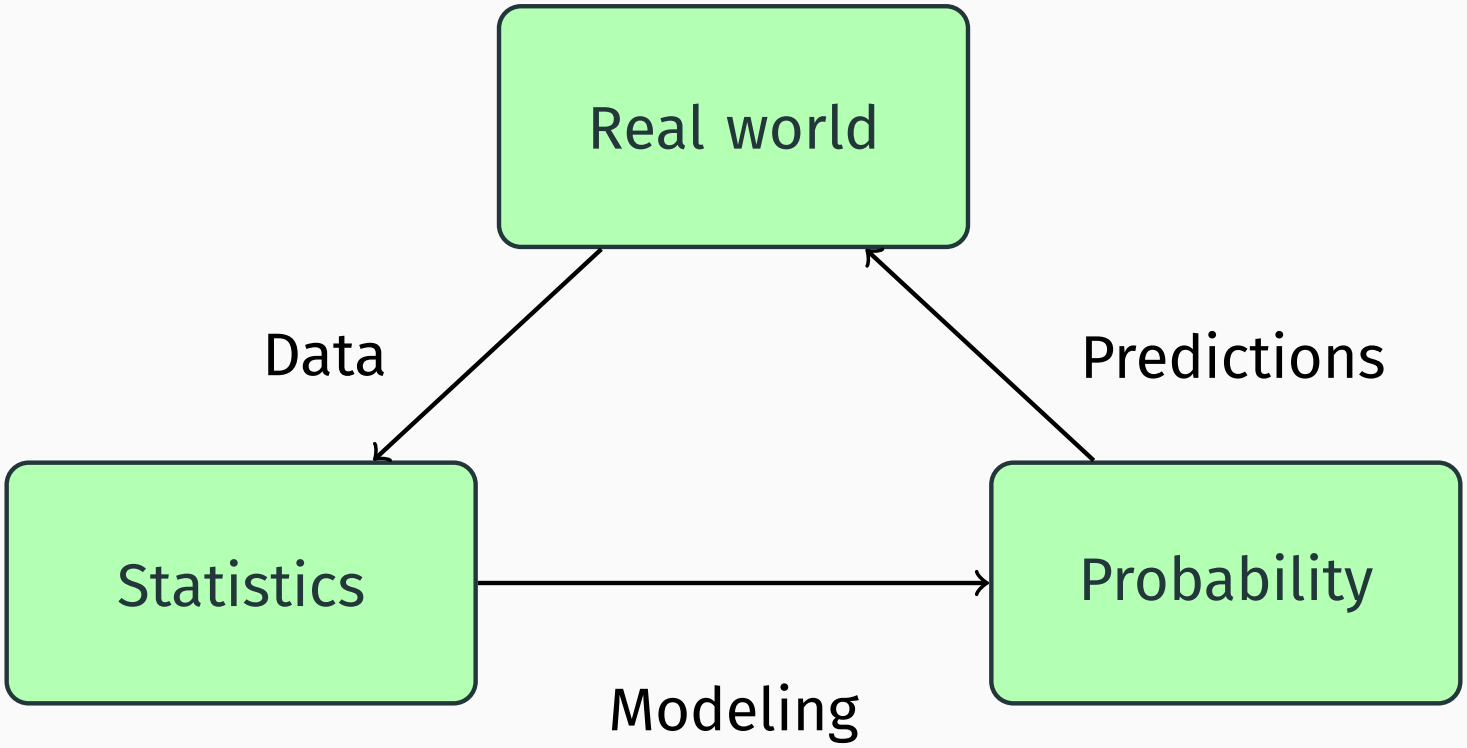
Statistics: Given a particular set of observed data, make an inference about what the parameters might be.

Statistics

Given data, predict model



Data, modeling and predictions



- The real world generates data analysed using statistics
- Using statistics we can construct probability models
- Probability models make predictions about the real world

Course organisation

Structure of the course:

6 ETCS (54 hours) on probability and statistics.

Prerequisites:

Differential and integral calculus for univariate and multivariate functions. Basic notions of probability.

Final assessment:

Oral exam.