1 Overview

This library implements a number of functions for mathematical operations, it has dependencies upon the scala-nlp-breeze matrix library, and it's purpose is to explore the implementation of various mathematical functions.

This document is structured with the headings corresponding to the major package names in the project.

2 Methods of Counting

2.1 package au.id.cxd.math.count

The count package contains a series of modules dedicated to methods of counting.

2.1.1 Factorial

The factorial operation is provided as $n!$ implementing:

$$\prod_{i=1}^{n-1}(n-i)$$

2.1.2 Choose

The choose module implements $\binom{n}{m}$, how many ways can m items be selected with replacement from a set of n items.
Determined as:

$$\frac{n!}{m!n!}$$

2.1.3 Permutation

The method of selecting m ordered items from a set of n ordered items $P\binom{n}{m}$.

$$\frac{n!}{(n-m)!}$$

3 Probability

3.1 package au.id.cxd.math.probability

This package provides a series of modules that support operations for inference via probability, and for estimation of distributions.

3.1.1 Inequalities

The class TchebysheffInequality implements a simple estimation of a pdf using the inequality rule:

$$P(\mu - k\sigma < Y < \mu + k\sigma) \geq 1 - \frac{1}{k^2}$$

Which can be restated as:

$$P(lower < Y < upper) \geq 1 - \frac{1}{k^2}$$

The value of k is derived from either upper and lower bounds since:

$$k = \frac{upper - \mu}{\sigma}$$

After determining the value of k the probability can be estimated by substituting

$$p = 1 - \frac{1}{k^2}$$

3.1.2 Discrete Distributions

The discrete distributions packages contains the following.

3.1.3 Binomial

The binomial module has the parameters p for the prior proportion of successes and n for the total number of trials and calculates the probability of y successes

$$P(y;n;p) = \sum_{i=1}^{n} \binom{n}{y_i} p_i^y (1-p)^{n-y_i}$$

3.1.4 Continuous Distributions

3.1.5 Inference

3.1.6 Regression