Properies of Discrete Random variables

### Expectation/Mean/Expected Value

* Weighted average of the values the random variable X can take
* Weighting by the probability of each value
* Measure of centrality

### Expectation of a constant multiple of a random variable

From definition 1

By multiplying out the brackets

From the properties of summation

From definition 1

From axioms of probability

### Expectation of a function of random variable

* The expectation of a function of a random variable is **not equal** to the function of the expectation 

### Variance

Let

 From definition

Multiplying out

From definition 3

Properties of summations

Axioms of probability

### Variance of a constant property

### Variance of a constant multiple

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From definition 2

Letting 

From definition

From definition 4

### Expectation of the sum of two finite countable variables

If X is a random variable with sample space and Y is an independent random variable with sample space then the sample space of the joint distribution will be given by a set of pairs

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The expectation of the sum of the two variables in then given by

Multiplying out we get

Noting that and

Therefore we can note that

### Expectation of the sum of n identically distributed random variables

We can calculate the expectation of the sum of n identically distributed random variables denoted by as which is equal to

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