

List 1 Exercise 1 PDF for UMSI

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1 Task Description

Recall the definition of the following distributions, providing their expected values and variances:

- Bernoulli distribution $B(p)$
- Binomial distribution $B(n; p)$
- Uniform distribution $Unif(a; b)$
- Normal distribution $N(\mu; \sigma^2)$

2 Solution

Bernoulli distribution

A Bernoulli distribution is a discrete probability distribution for a random variable which takes value 1 with probability p and value 0 with probability $1 - p$.

- **Expected value:** $E(X) = p$
- **Variance:** $Var(X) = p(1 - p)$

Binomial distribution

A Binomial distribution is a discrete probability distribution that describes the number of successes in a fixed number of independent Bernoulli trials, each with the same probability of success p .

- **Expected value:** $E(X) = np$
- **Variance:** $Var(X) = np(1 - p)$

Uniform distribution

A Uniform distribution (continuous) is a probability distribution where all outcomes are equally likely within a certain range $[a, b]$.

- **Expected value:** $E(X) = \frac{a+b}{2}$
- **Variance:** $Var(X) = \frac{(b-a)^2}{12}$

Normal distribution

A Normal distribution is a continuous probability distribution characterized by a symmetric, bell-shaped curve, described by its mean μ and variance σ^2 .

- **Expected value:** $E(X) = \mu$
- **Variance:** $Var(X) = \sigma^2$