Estimation and Inference

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Learning Module 7: Estimation and Inference

Standard Error of the Sample Mean (Known Population Variance)

$$\sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}} \tag{1}$$

Where:

- $\sigma_{\bar{X}}$: standard error of the sample mean
- σ: population standard deviation
- n: sample size

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```
## Standard Error of the Sample Mean (Known Population Variance)

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\sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}} \tag{1}
$$

Where:

* $\sigma_{\bar{X}}$: standard error of the sample mean
* $\sigma$: population standard deviation
* $n$: sample size
```

Standard Error of the Sample Mean (Unknown Population Variance)

$$s_{\bar{X}} = \frac{s}{\sqrt{n}} \tag{2}$$

Where:

- $s_{\bar{X}}$: estimated standard error of the sample mean
- s: sample standard deviation
- n: sample size

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```
## Standard Error of the Sample Mean (Unknown Population Variance)

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s_{\bar{X}} = \frac{s}{\sqrt{n}} \tag{2}
$$

Where:

* $s_{\bar{X}}$: estimated standard error of the sample mean
* $s$: sample standard deviation
* $n$: sample size
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Sample Variance

$$s^2 = \frac{\sum_{i=1}^{n}(X_i - \bar{X})^2}{n-1} \tag{3}$$

Where:

- s^2: sample variance
- X_i: ith observation in the sample
- $\bar{X}$: sample mean
- n: sample size

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## Sample Variance

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$$

Where:

* $s^2$: sample variance
* $X_i$: $i$th observation in the sample
* $\bar{X}$: sample mean
* $n$: sample size
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Model-free resampling or non-parametric resampling

$$s_{\bar{X}} = \sqrt{\frac{1}{B-1}\sum_{b=1}^{B}\left(\hat{\theta}_b - \bar{\theta}\right)^2} \tag{4}$$

Where:

- $s_{\bar{X}}$: the estimate of the standard error of the sample mean
- B: the number of resamples drawn from the original sample
- $\hat{\theta}_b$: the mean of a resample, and
- $\bar{\theta}$: the mean across all the resample means

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```
## Model-free resampling or non-parametric resampling

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