Hypothesis Testing

Terms, Terminologies, & Testing Methods

What is a **statistical hypothesis**?

It is a statement, report , or claim regarding a characteristic of one or more population parameters.

What is a **hypothesis testing**?

It is a process that uses sample statistics, based on sample evidence and probability, to test a claim about the value of a population parameters.

What is a **null hypothesis** H_0?

It is a statistical hypothesis that contains a statement of equality, such as $\leq$, $\geq$, or $=$.

What is an **alternative hypothesis** H_1?

It is the complement of the null hypothesis and must contain a statement of inequality, such as $<$, $>$, or $\neq$.

What is a **type I error**?

It takes place when a true null hypothesis is rejected.

What is a **type II error**?

It takes place when a false null hypothesis is supported.

What are the **Hypothesis Testing Four Outcomes**?

Conclusion vs. Reality $\rightarrow$ $\downarrow$	H_0 is true.	H_0 is false.
Support H_0	Correct Decision	Type II Error
Reject H_0	Type I Error	Correct Decision

What is a **significance level**?

It is the probability of making **Type I Error** and it is denoted by the Greek letter alpha α where $0 < \alpha < 1$.

What are the **probabilities of making errors**?

$$P(\textbf{Type I Error}) = \alpha$$
$$P(\textbf{Type II Error}) = 1 - \alpha$$

What are the **Hypothesis Testing Methods**?

1) Traditional Method

When Computed Test Statistic Is In	Then	And	We Should
Non-Critical Region	H_0 **is valid**	H_1 **is invalid**	**Support** H_0 **and Reject** H_1
Critical Region	H_0 **is invalid**	H_1 **is valid**	**Reject** H_0 **and Support** H_1

2) P-Value Method

When P-Value Is	Then	And	We Should
Greater Than α	H_0 **is valid**	H_1 **is invalid**	**Support** H_0 **and Reject** H_1
Less Than Or Equal To α	H_0 **is invalid**	H_1 **is valid**	**Reject** H_0 **and Support** H_1

3) Confidence-Interval Method

Use $(1-2\alpha)100\%$ **Confidence Level Whenever Performing Only One Tail Test.**

When the parameter is	Then	And	We Should
within the confidence interval	H_0 **is valid**	H_1 **is invalid**	**Support** H_0 **and Reject** H_1
not within the confidence interval	H_0 **is invalid**	H_1 **is valid**	**Reject** H_0 **and Support** H_1

What are the main **Keywords**?

The parameter is $\cdots$		
Verbal Statement for H_0	Mathematical Statement for H_0 & H_1	Verbal Statement for H_1
equal to k k exactly k	$H_0: \cdots = k$ $H_1: \cdots \neq k$	not equal to k different from k not k
greater than or equal to k at least k not less than k	$H_0: \cdots \geq k$ $H_1: \cdots < k$	less than k below k fewer than k
less than or equal to k at most k not more than k	$H_0: \cdots \leq k$ $H_1: \cdots > k$	greater than k above k more than k