# **Hypothesis Testing**

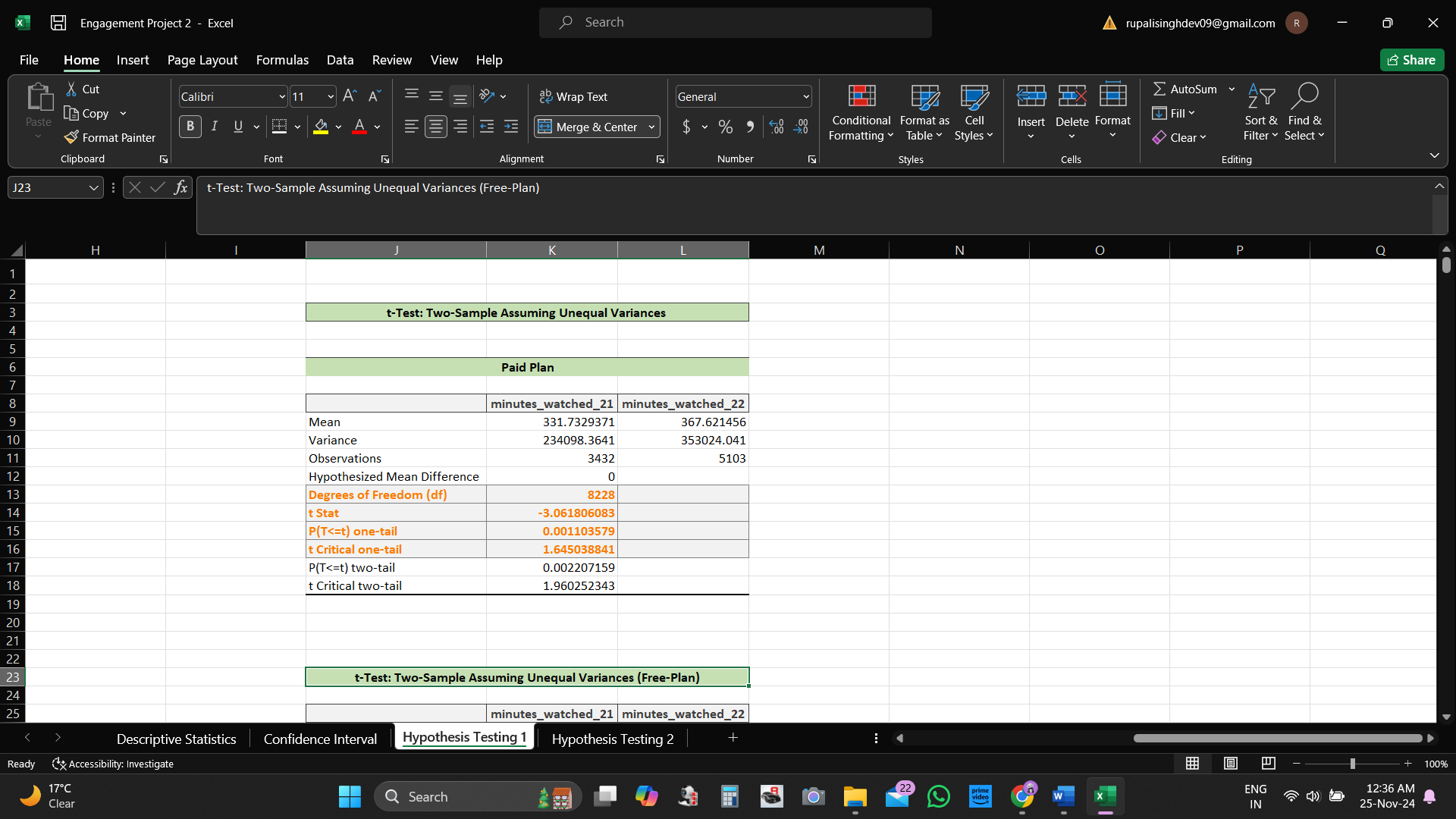
**Hypothesis Testing 1**

You can find the solution to this problem in the Hypothesis Testing 1.xlsx file.

**Null Hypothesis:** The average minutes watched by students in Q4 2021 is significantly smaller than the average minutes watched in Q4 2022.

**Alternative Hypothesis:** The average minutes watched by students in Q4 2022 is significantly smaller than the average minutes watched in Q4 2021.

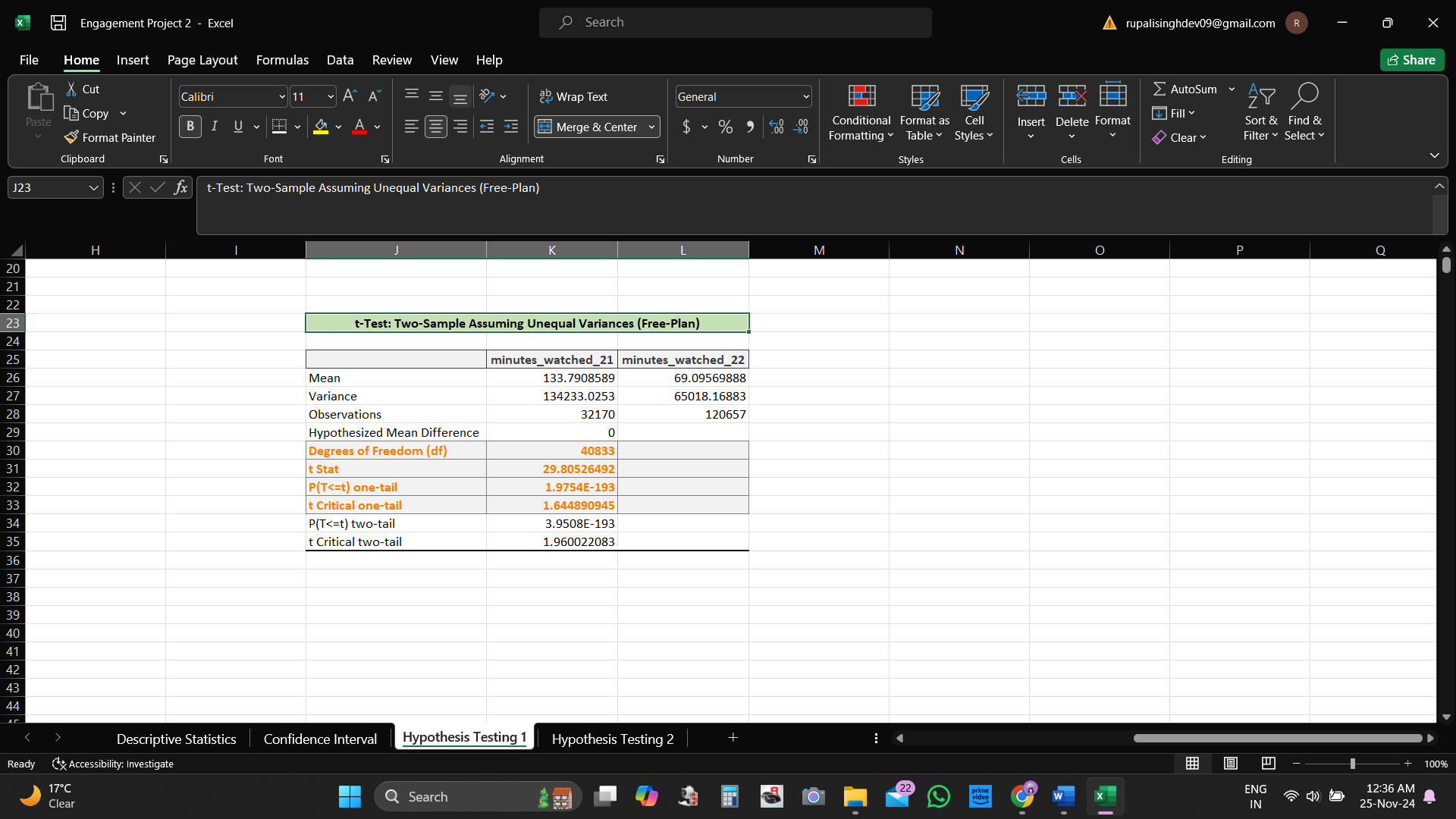
* **Paid-Plan Students**

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**Conclusion:** **Reject**because the p-value is lower than the specified significance level α (0.05).

**Summary:** With a t-statistic of -3.05 you would reject the null hypothesis because the negative t-statistic indicates that (the mean minutes watched by students in Q4 2021) is significantly smaller than (the mean minutes watched by students in Q4 2022). This is contrary to the null, so we reject it. Of course, rejecting the null hypothesis does not confirm the alternative hypothesis; it suggests that the data provide enough evidence against the null hypothesis.

* **Free-Plan Students**

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**Conclusion:** **Fail to Reject**because the calculated **p-value** is higher than the t-critical value.

**Summary:** With a t-statistic of 29.78 (greater than the critical value of -1.645), you would fail to reject the null hypothesis. This means there’s not enough evidence to conclude that μ1μ1 is smaller than μ2μ2. So, the data supports the null hypothesis that μ1μ1 is larger than or equal to μ2μ2.

**Conclusion**

Regarding the second part of the question, a Type I error (false positive) occurs when you reject the null hypothesis, which is true. In our case, this would mean concluding that engagement in 2022 is higher when it's not. The probability of making this error is the level of significance, α. Since you (the researcher) choose the significance level of the hypothesis test, the responsibility for making this error lies solely on you.

Note that the significance level is closely related to the confidence level, representing our degree of certainty in the estimated results. It’s equal to (1 − α). For example, a significance level of 5% for a hypothesis test means a 5% probability of rejecting a true null hypothesis, corresponding to a 95% confidence level.

A Type II error (false negative) occurs when you fail to reject the null hypothesis, but it’s false. In our case, this would mean that the engagement in 2022 is not higher than it is.

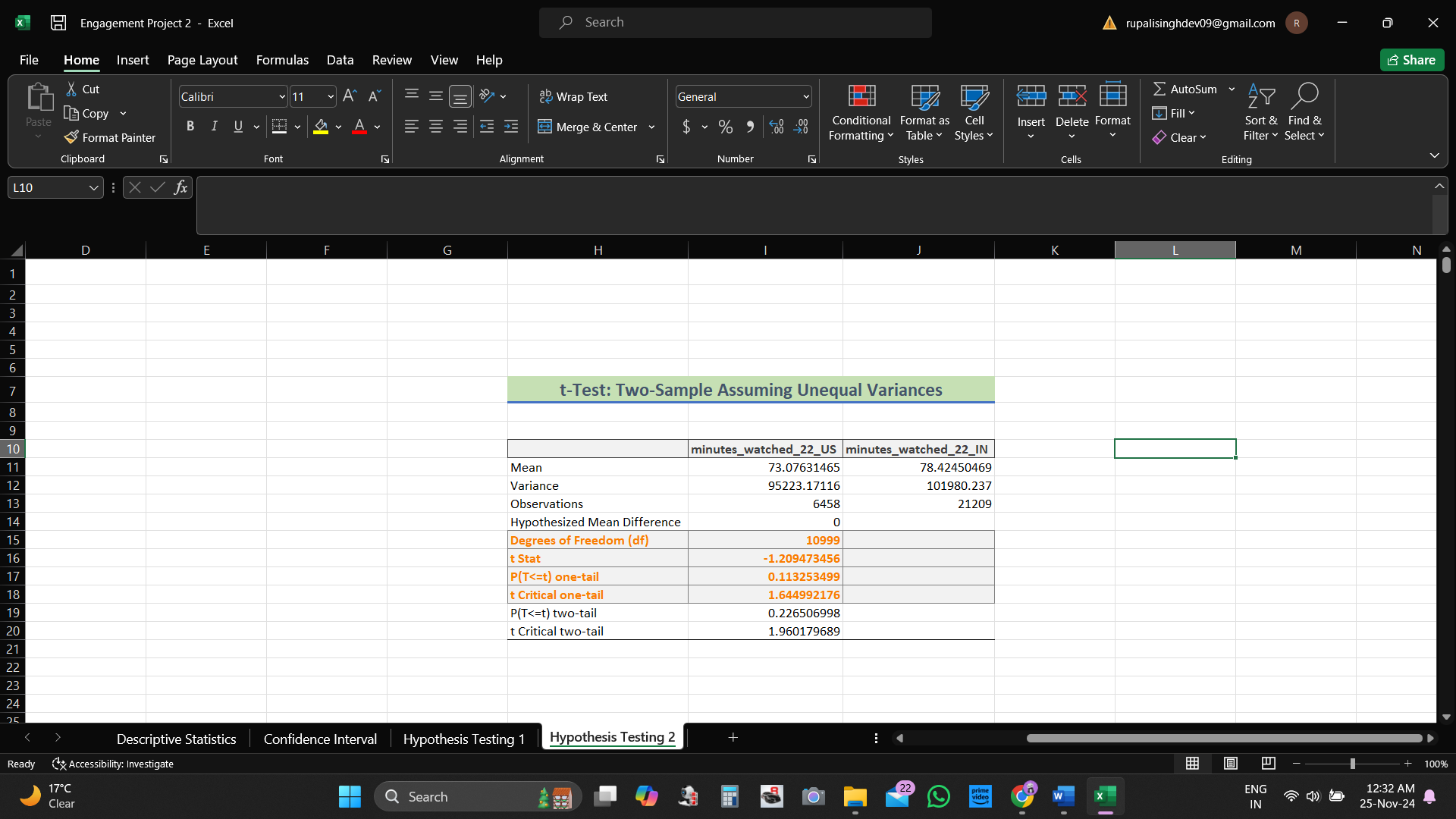
The cost to the company of each type of error would depend on the implications of incorrectly concluding that engagement has increased—potentially leading to over-investment in certain features or complacency about needing to improve features—versus incorrectly concluding that engagement has not increased—potentially missing out on recognizing successful features or identifying areas that need improvement.

**Hypothesis Testing 2**

You can find the solution to this problem in the Hypothesis Testing 2.xlxs file.

**Null Hypothesis:** US students watch less amount of content as Indian students

**Alternative Hypothesis:** US students watch more or an equal content on average than students in India.

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**Conclusion:** **Fail to Reject**because the p-value is higher than the specified significance level α (0.05). If the hypothesis that US students watch more or an equal amount of content as Indian students is rejected, this suggests that US students watch less content on average than students in India.