

ANAVO ANALYSIS

Dataset – preprocessed placement details.

Code:

```
import statsmodels.api as sm

from statsmodels.formula.api import ols

data_melted = pd.melt(
    dataset,
    id_vars=['gender'],
    value_vars=['ssc_p', 'hsc_p', 'degree_p'],
    var_name='Score_Type',
    value_name='Score'
)

# 2. Define the Model Formula for Two-Way ANOVA
formula = f'Score ~ C(Score_Type) * C({"gender"})'

# 3. Fit the OLS Model
model = ols(formula, data=data_melted).fit()

# 4. Generate the ANOVA Table
two_way_anova_result = sm.stats.anova_lm(model, typ=2)

print(two_way_anova_result)
```

Result:

	sum_sq	df	F	PR(>F)
C (Score_Type)	129.9748	2	0.674026	0.510015
C (gender)	362.3717	1	3.758387	0.052983
C (Score_Type) : C (gender)	116.2214	2	0.602703	0.547641
Residual	61610.34	639	NaN	NaN

ANOVA Analysis and Conclusion

1. The Decision Rule

For each effect (row), we test the null hypothesis (H_0):

- If $\mathbf{P} \leq 0.05$: **Reject H_0** (The effect is statistically significant).
- If $\mathbf{P} > 0.05$: **Fail to Reject H_0** (The effect is not statistically significant).

2. Analysis of Each Effect

Effect	P-value (PR(>F))	Conclusion ($\alpha=0.05$)	Interpretation
C(Score_Type)	0.510015	$\mathbf{0.51 > 0.05}$. Fail to Reject H_0 .	Score Type (SSC, HSC, Degree) has no statistically significant main effect on the scores. The average scores across the three types are not significantly different.
C(gender)	0.052983	$\mathbf{0.0529 > 0.05}$. Fail to Reject H_0 .	Gender has no statistically significant main effect on the scores. The average scores for different genders are not significantly different.
C(Score_Type):C(gender)	0.547641	$\mathbf{0.54 > 0.05}$. Fail to Reject H_0 .	There is no statistically significant interaction effect. The effect of score type does not significantly depend on gender, and vice versa.

3. Overall Conclusion

Based on a significance level of $\alpha = 0.05$, you **fail to reject the null hypothesis for all three effects**:

1. **Main Effect of Score Type:** Not significant ($P \approx 0.51$).
2. **Main Effect of Gender:** Not significant ($P \approx 0.053$).
3. **Interaction Effect (Score Type \times Gender):** Not significant ($P \approx 0.55$).

Final Conclusion:

There is **insufficient statistical evidence** to conclude that there are significant differences in average scores due to the type of score (SSC, HSC, Degree), due to gender, or due to any combination of the two factors (interaction).

Note on the Gender P-value

The P-value for C(gender) is **\$0.052983\$**, which is **extremely close** to the standard cutoff of **\$0.05\$**.

- If you strictly stick to **$\alpha=0.05$** , you **fail to reject H_0** .
- In some fields, researchers might discuss this as a **"marginally significant"** or **"borderline"** result. If you had chosen a slightly more liberal α (e.g., **\$0.10\$**), this effect would be significant.

However, based on the **standard $\alpha = 0.05$** , the formal conclusion is that the gender difference is **not statistically significant**.