■ Electrostatic Analysis of Fabrics

This project presents a statistical data analysis based on a physics experiment investigating the electrostatic behavior of different fabrics.

Research Question

How do different fabrics (Cotton, Wool, Polyester, and Polyurethane) differ in their ability to accumulate static charge through friction?

Hypothesis

Polyurethane is expected to accumulate the most negative charge, followed by Polyester. Cotton should be the least charged.

Descriptive Statistics

Fabric	Mean (°)	Std. Deviation (°)
Cotton	6.0	1.25
Wool	12.7	1.34
Polyester	32.4	2.22
Polyurethane	47.3	2.98

ANOVA Test

A one-way ANOVA showed significant differences ($p < 0.0001$) between the means of the fabric groups.

Post-hoc Tukey Test

All pairwise comparisons revealed statistically significant differences.

Conclusion

Polyurethane > Polyester > Wool > Cotton in terms of static charge accumulation. Matches triboelectric theory.

Practical Implications

Material	Risk Level	Recommendation
Polyurethane	High	Avoid in ESD-sensitive environments
Polyester	Moderate	Use with caution
Wool	Medium	Good for reference tests
Cotton	Low	Ideal base fabric

Learning Journey

This was part of my beginner-level exploration in Python and scientific research. Feedback is welcome!