

Net Meta Analysis

P&G/The Data Mine



Team Members: Alex Liu, Collin Novak, Guna Avula, Junhyeok Kil, Kyndahl Bishop, Sang Hyun Kim, & Saul Means

TAs: Sayitrisa Ramarathnam, Thomas Huss

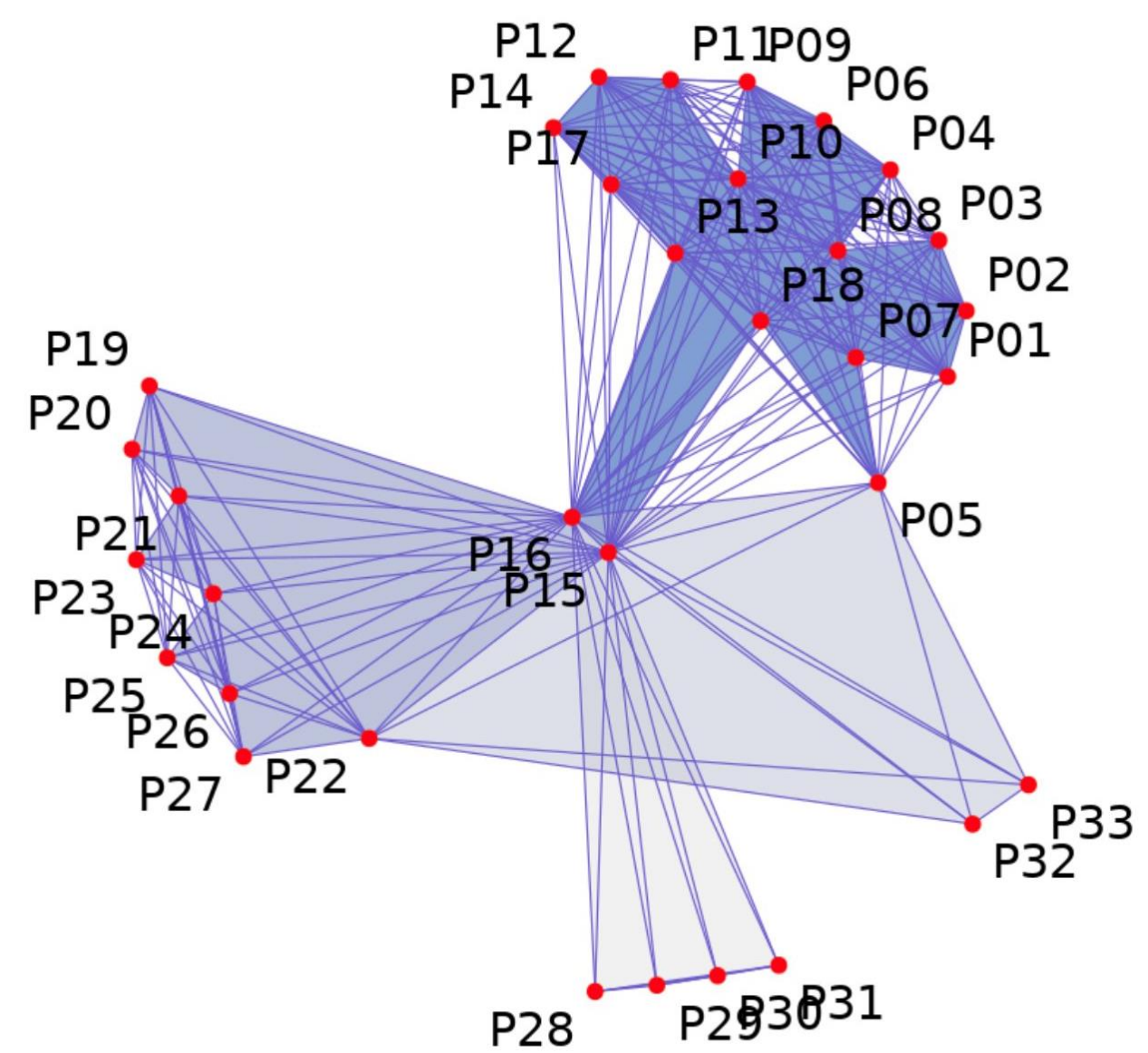
Acknowledgements: Alex Varbanov, Spiro Stilianoudakis, Qifan Song

OVERVIEW

To test different versions of a products (i.e. laundry detergent), a study comparing every pair of products needs to be conducted. This is both time, effort, and money intensive. To overcome this, network meta-analysis is utilized to compare any pair of product, given that they have been compared to a baseline product. Using this technique, we developed an app, for P&G internal use, to automate this analysis for users who are not familiar with statistical software, in addition to time, effort, and money.

Statistical Background

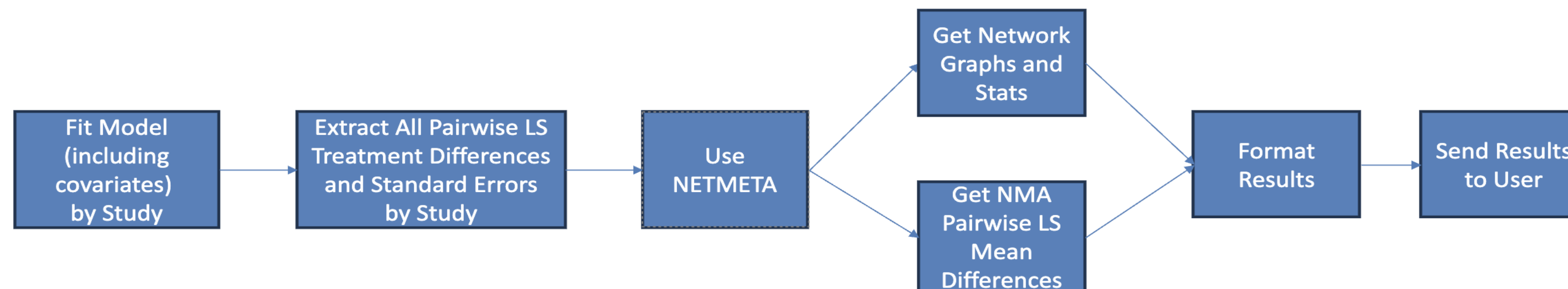
Often, we have data from experiments directly comparing treatments to each other, but we want to estimate comparisons that don't exist experimentally. Network meta-analysis combines information from studies to provide these estimations.



The above graph represents the pairwise comparisons that have been conducted between two products. Each vertex represents a product, and each edge represents a study.

R-Shiny Application

The purpose of this application is meant to allow everyone, even people without a statistical expertise, to be able to compare different studies, each with its own variability. The app takes in the data in the standard format – with studies and treatments. Then, it will run the entire net-meta analysis process by itself and generate the results and visualizations.



P&G Automated Network Meta-Analysis

3.31.24

- + What does the tool do?
- + Instructions
- + Output

Example of a file upload input

Upload file label
Browse... No file selected

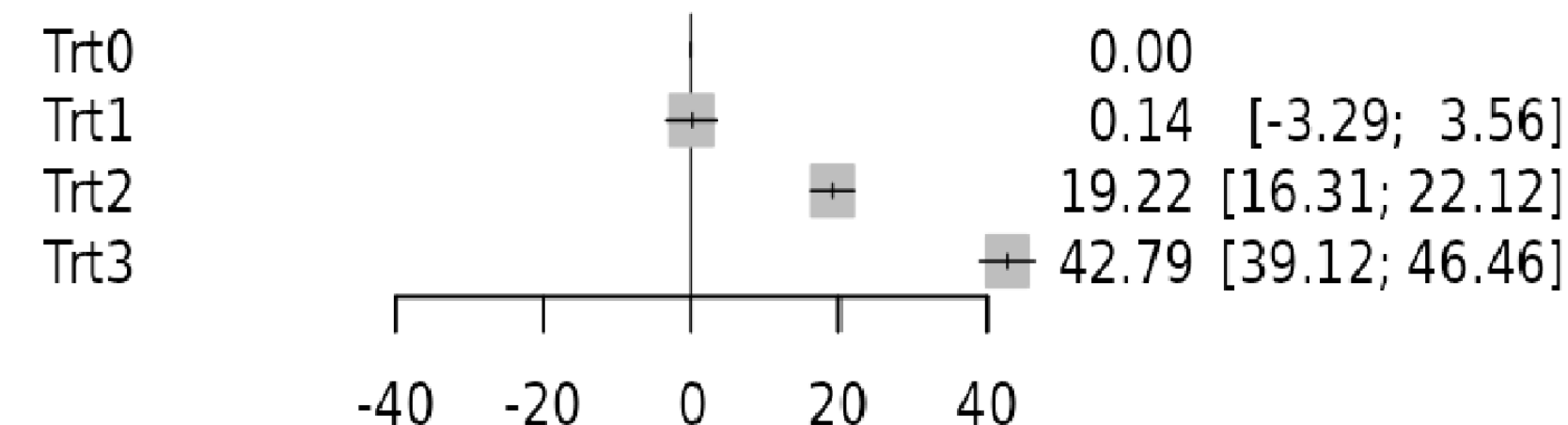
Treatment column
Select Treatment
Option 1

Response column
Select Response
Option 1

Run Analysis

Excel Output Net Graph Net Rank Forest Plot

Comparison: other vs 'Trt0'
Treatment (Random Effects Model) 95%-CI



Results

Data Simulation

For testing purposes, a data simulation pipeline was developed in R, generating data as a 4d matrix. Since the data from P&G is sensitive, this acts as a placeholder to view, analyze, and run the net-meta-analysis on.

Future Plans

- **Exploring Jones et al. Methodology:** This is a more advanced method which accounts for covariates across studies. Currently, it's operational in SAS, but we're facing challenges with its application in R.
- **Commitment to Solutions:** We're dedicated to resolving these challenges. Our team will investigate further to ensure Jones Method can be effectively utilized in the future.

Conclusion

From the entire process, we learned much about the statistical processes of comparing two treatments without a direct connection. Furthermore, we learned about the Agile development cycle and collaboration on a team.

References

Balduzzi S, Rücker G, Nikolakopoulou A, Papakonstantinou T, Salanti G, Efthimiou O, Schwarzer G (2023). "netmeta: An R Package for Network Meta-Analysis Using Frequentist Methods." *Journal of Statistical Software*, 106(2), 1–40. [doi:10.18637/jss.v106.i02](https://doi.org/10.18637/jss.v106.i02).