3.2 Experimental design

We want to investigate how varying the prestige and threshold-val parameters affect the adoption of Grammar 1 overtime in the networked population.

Input Parameters:

- **prestige**:
  - *Meaning*: The relative prestige or social influence of grammar 1.
  - *Values*: 0.0 to 1.0 (lower values mean lower prestige of grammar 1).
- **threshold-val**:
  - *Meaning*: The threshold proportion of neighbors using Grammar 1 is required for an agent to adopt Grammar 1.
  - *Values*: 0.0 to 2.0 (higher values make it harder to adopt grammar 1).

Output Parameters:

- **final-grammar1-proportion**:
  - *Meaning*: The proportion of agents using grammar 1 at the end of the simulation.
  - *Calculation*: (count nodes with [state = 1]) / count nodes
- **ticks**:
  - *Meaning*: The number of time steps the simulation ran before stopping.

Parameters to Vary:

1. **Prestige (prestige)**:
   - *Definition*: Represents the relative prestige of grammar 1 compared to grammar 0.
   - *Range*: 0.0 to 1.0 (inclusive)
   - *Increments*: 0.2
   - *Values*: [0.0, 0.2, 0.4, 0.6, 0.8, 1.0]
2. **Threshold Value (threshold-val)**:
   - *Definition*: Determines the proportion of neighbors with grammar 1 required for an agent to adopt grammar 1.
   - *Range*: 0.0 to 2.0 (inclusive)
   - *Increments*: 0.5
   - *Values*: [0.0, 0.5, 1.0, 1.5, 2.0]

Fixed Parameters:

- Number of Nodes (num-nodes): 100
- Percentage of Grammar 1 (percent-grammar-1): 50%
- Alpha (alpha): 0.025
- Update Algorithm (update-algorithm): "threshold"
- Sink State 1? (sink-state-1?): False
- Logistic? (logistic?): False

Total Combinations:

- Number of prestige values: 6
- Number of threshold-val values: 5
- Total parameter combinations: 6 * 5 = 30

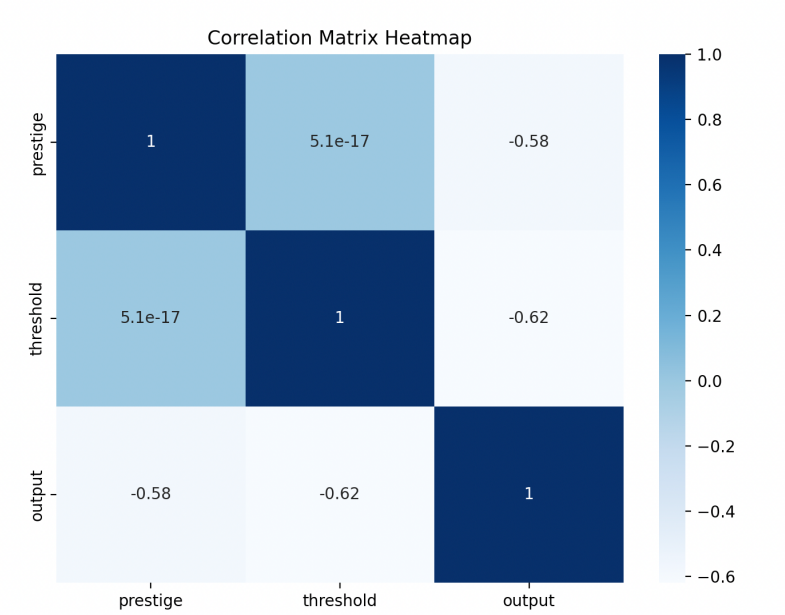
Repetitions:

- For each parameter combination, perform 30 independent simulation runs to account for stochastic variability.
- Total simulation runs: 30 parameter combinations * 30 runs = **900 runs**

For each simulation run, we recorded the following output parameters:

- Final Proportion of Grammar 1 Users:
  - Calculation: (count nodes with [state = 1]) / (count nodes)
- Number of Ticks:
  - Total time steps are taken in the simulation.

Results of the experimental design:



Analyzing the simulation results, we observed negative correlations between prestige and output (-0.58) and between threshold and output (-0.62). These negative correlations indicate an inverse relationship between the variables: as the prestige of Grammar 1 or the threshold value increases, the final proportion of agents adopting Grammar 1 decreases. This outcome is somewhat counterintuitive, as one might expect that higher prestige would lead to higher adoption rates of the prestigious grammar.