

Technical Appendix: Mathematical and Algorithmic Details

This appendix collects the formal mathematical definitions, derivations, and algorithmic specifications referenced from the main methodology section.

A.1 Citation-Weighted Hypothesis Scoring Formula

For each hypothesis H , we compute a citation-weighted evidence score aggregating all assertions relevant to H :

$$\text{score}(H) = \frac{\sum_{a \in S(H)} w(a) - \sum_{a \in C(H)} w(a)}{\sum_{a \in A(H)} w(a)}$$

where $S(H)$ is the set of supporting assertions, $C(H)$ is the set of contradicting assertions, $A(H)$ is all assertions for H (including neutral), and the weight function is:

$$w(a) = \log(1 + \text{citations}(a)) \cdot \text{confidence}(a)$$

The logarithmic citation weighting ensures that highly cited papers