

# 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