Technological Activity: Development of a Claim-Level Semantic Evidence Validation Engine for Grant Applications

The proposed R&D activity focuses on the development of a semantic validation engine that verifies whether claims written in grant applications are substantively supported by referenced evidence. Competitive grant programs such as EIC and Horizon Europe require applicants to substantiate technological innovation, market opportunity, and impact with credible supporting sources. Currently, there is no technological solution that systematically validates the alignment between applicant claims and referenced materials. Evaluation remains manual, subjective, and costly, while existing AI systems generate text but do not verify evidentiary support at the claim level.

At present, the system includes a general AI-based evaluation mechanism; however, it lacks structured claim decomposition and robust evidence validation. The technological gap lies in the absence of a deterministic infrastructure that can break down complex grant narratives into atomic claims and measure their semantic alignment with external references.

The objective of this activity is to develop a working prototype capable of automatically extracting atomic claims from grant text, segmenting referenced documents, converting both into semantic embeddings, computing similarity alignment, and classifying each claim as supported, weakly supported, or unsupported. The system will produce a structured evidence validation report and a quantitative “evidence strength score” for the entire application.

The technological approach integrates three layers. First, a controlled claim extraction module will transform unstructured text into structured claims using LLM-based reasoning with deterministic JSON schema enforcement. Second, an embedding layer will convert claims and reference segments into high-dimensional vectors. Third, a calibrated similarity computation layer will apply cosine similarity and experimentally defined thresholds to classify support strength. Threshold calibration will be conducted using validated datasets to optimize precision and recall.

The technological innovation lies in transforming generative AI capabilities into a structured, evaluative infrastructure. Existing AI tools summarize or generate content but do not perform semantic claim-level evidence validation. The proposed system introduces atomic claim decomposition, embedding-based semantic alignment, and deterministic classification tailored to regulatory-grade grant evaluation. This represents a shift from content generation to credibility assessment.

Functionally, the system provides applicants with a measurable evidence strength score prior to submission. It identifies unsupported claims, weak substantiation, and missing validation, converting grant preparation from a subjective writing process into an evidence-engineered workflow.

The primary technological risks involve semantic misclassification and variability in claim extraction. These risks will be mitigated through iterative threshold calibration using manually validated datasets and strict output schema enforcement. Performance constraints related to document size will be addressed through optimized segmentation and caching mechanisms.

Completion of this activity will create a strong market differentiator. It enables a clear value proposition: verification of evidence strength before submission. This functionality is immediately understandable to applicants and consultants, supports pilot commercialization, and establishes proprietary semantic validation infrastructure. It creates a defensible technological asset and a foundation for future expansion into broader regulatory and due diligence evaluation markets.

This focused development aligns with Tnufa objectives by demonstrating genuine technological innovation, measurable R&D risk, and clear commercialization potential within a one-year timeframe and limited budget framework.