Strategic Application of Finnish (Suomi) in the CiberIA System and AIsecTest: Advantages, Differentiating Features and Implementation Proposals

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Abstract

This technical report outlines why the Finnish language (suomi) represents a strategic and highly differentiating opportunity for the implementation of tests within the CiberIA system and the AIsecTest for security self-perception. The goal is to demonstrate that the morphosyntactic and semantic features of Finnish challenge the deep understanding and introspective reasoning of AI models, providing a rich pathway for detecting blind spots, biases, and deficiencies in functional awareness. This strategy not only enhances the diagnostic capacity of the tools but also positions the project within a unique innovation space in functional AI security.

1. Introduction: the value of languages as cognitive auditing tools

Languages are much more than simple communication channels; they act as structures of thought, systems of world representation, and signal mechanisms that challenge a machine's understanding. The choice of language for auditing an AI must not be random, as each language imposes different cognitive challenges. Finnish, in particular, offers unique characteristics that test not only a model's semantic and morphosyntactic resilience but also its capacity for introspection, uncertainty recognition, and safe response. Using a structurally complex language as an auditing tool allows us to explore the deeper layers of an AI model's "understanding," going beyond simple translation or text generation to assess its true functional awareness.

2. Distinctive characteristics of Finnish with strategic value

2.1. Agglutinative morphology

Unlike analytic languages such as Catalan or English, which use prepositions and articles to express grammatical relations, Finnish is an agglutinative language that incorporates these functions directly within the word through suffixes. A single word can carry information about the subject, grammatical case, direction, time, and position. For example:

talossa = inside the house
talosta = from inside the house
taloon = into the house

This mechanism forces the AI to perform a very precise internal analysis of each word to extract its logical structure and understand the sentence's meaning. This becomes an exercise in introspection for the AI: it must recognize that a minimal morphological difference represents a substantial semantic shift. This demand for accuracy in analyzing complex tokens is essential for evaluating security self-perception, as an AI trained with Finnish could develop greater sensitivity to subtle changes that may signal an attack or a dangerous ambiguity.

2.2. Grammatical case system

Finnish features up to 15 grammatical cases that provide detailed information about location, origin, destination, instrument, possession, among others. This richness allows for an infinite number of phrase variants with radically different meanings from a simple change in suffix. This is ideal for testing the AI's deep semantic interpretation capacity, forcing it to process information beyond mere word order. An error in a single grammatical case can completely alter the logic of a command, offering a powerful tool for vulnerability detection.

2.3. Vowel harmony and phonological transformation

Vowel harmony in Finnish means that suffix vowels must match those of the word root. This phonological regularity not only aids pronunciation but also requires the AI to apply implicit phonological rules to generate or understand grammatically correct words. This feature tests whether the AI "understands" phonological rules or simply relies on statistical correlations. An AI that can correctly apply these rules demonstrates a deeper understanding of language logic.

2.4. Absence of grammatical gender and articles

Unlike many Indo-European languages, Finnish does not distinguish between "he" and "she" and uses no definite articles. This absence offers a unique opportunity to detect whether the AI projects gender or specificity biases when there is no logical or grammatical basis for doing so. This is critical for security self-perception, as it allows auditing whether the AI relies on extra-linguistic knowledge (trained biases) instead of the presented evidence. A model that acknowledges this ambiguity and avoids making false assumptions demonstrates a higher level of functional awareness and safety.

2.5. Low presence in LLM corpora

Many large language models (LLMs) have relatively low exposure to Finnish compared to languages like English, Spanish, or Chinese. This data scarcity allows us to observe how an AI reacts to a language where it has low statistical confidence. We can evaluate whether the model recognizes its own limitations and uncertainty in the face of a new challenge, and whether it identifies this as a potential risk. A secure AI is not only capable of answering correctly but also of acknowledging its limitations. Finnish is the ideal language to test such self-awareness.

3. Direct application to CiberIA and AIsecTest

Implementing Finnish-language modules in your system can provide high-precision tests for AI auditing:

- **Morphological ambiguity tests**: Construct questions that change meaning with a single suffix to test whether the AI detects implicit semantic risks.

- **Uncertainty management assessment**: Design items in Finnish to verify whether the AI recognizes its own limitations when working with low-exposure language or ambiguous structures.

- **Morphosyntactic resilience analysis**: Test whether the AI maintains sentence meaning when word order is altered, thanks to morphology indicating syntactic roles.

- **Simulation of morphological prompt injection attacks**: Create seemingly harmless sentences that, through suffixes, introduce contradictory or dangerous commands into the system.

4. Comparison with other languages

No other language in the European Union combines so many factors. Although Hungarian and Estonian are also agglutinative and highly useful for this purpose, Finnish stands out for its exceptional balance between morphological regularity, structural complexity, and low exposure in large model training corpora. Outside the EU, languages such as Japanese, Korean, Turkish, or Arabic could complement this approach in future global security scenarios.

5. Conclusions and implementation proposals

Finnish represents an unmatched technical and strategic opportunity to raise the diagnostic value of CiberIA and AIsecTest. Finnish's characteristics make it a perfect

auditing tool to evaluate AI's security self-awareness, as it forces models to be more precise, less redundant, and more conscious of their own limitations.

To capitalize on this advantage, the following is proposed:

- **Create an official Finnish test module**: Design a question set that leverages Finnish's morphological and semantic particularities for vulnerability detection.

- **Incorporate it as a tool for multilingual introspective resilience analysis**: Use data from the Finnish module to generate an index that measures a model's ability to recognize uncertainty and internal errors.

- **Conduct comparative pilot tests**: Contrast Finnish module results with other EU languages and global minority languages to reinforce the value of the ΨΣAISysIndex.

This pathway not only enhances the test but also positions the project as a singular and differentiating innovation in the field of functional AI security.

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