



Subject: Internship Proposal

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Project Supervisor

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Project details

<i>Title</i>	Semantic Caching Policies for IoT Contents at the Network Edge
<i>Detailed description:</i> The internship will focus on Internet of Things (IoT) content caching in network edge environments. As a reference network paradigm, the Named Data Networking (NDN) framework will be considered, which natively supports in-network caching at every router. However, NDN cache lookups are based on exact-name matching, which can fail when semantically equivalent content is published by heterogeneous IoT producers under different naming conventions. Introducing semantic similarity into cache admission and lookup decisions addresses this limitation, but raises open questions, regarding caching policies (what to cache and what to replace), embedding model selection, and validation methodology, that remain largely unexplored. In this context, the internship will focus on the following measurable targets: - reviewing the state of the art on semantic caching and on related embedding-based similarity retrieval techniques; - studying and extending existing semantic caching admission policies, with a focus on replacement strategies that jointly account for semantic diversity and access patterns (recency/frequency); - evaluating sentence/text embedding models for name-based semantic similarity, comparing accuracy and computational cost for deployment on resource-constrained edge nodes; - investigating the availability of realistic content-naming datasets (e.g., smart-city or IoT taxonomies) to validate the proposed policies beyond synthetic traffic models, and constructing a representative dataset if none are found suitable; - implementing the proposed extensions within an existing Python-based simulation framework, and evaluating them against legacy and existing semantic caching baselines through simulation; - documenting the results through a technical report.	

The tools to be used include Python, sentence-embedding libraries (e.g., Sentence Transformers), and an existing discrete-event simulation codebase developed within the LINKING-LAB.

<i>Duration (month – max 12)</i>	6
<i>Duration (hours)</i>	150
<i>Open positions</i>	1

Internship Skills

Technical requirements: Interest in computer networks, IoT/sensor networks and Python programming; basic knowledge of data structures and algorithms. Familiarity with machine learning or embedding concepts is welcome but not required, as it will be introduced during the internship.

<i>Other skills</i>	curiosity, willingness to learn, ability to read scientific literature, problem-solving attitude, reliability
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