PhD Thesis Proposal: GRAIL Project

Contact: Julien Romero - julien.romero@telecom-sudparis.eu

Thesis Description

The GRAIL (Grounded Recommendation with Auditable Inference Links) project addresses the structural challenges of two-sided cold start in job recommendation. The research focuses on algorithmic decision support within the highly dynamic labor market, where interactions are sparse and profiles are frequently new. The thesis centers on three primary scientific objectives:

- **Uncertainty-Aware Extraction**: Design a pipeline to extract missing skill tokens from unstructured resumes and job descriptions while maintaining strict document-level provenance and confidence scores.
- **Hybrid Generative Recommendation**: Develop a recommender component that infers missing candidate-job interaction edges to restore predictive power. Each generated edge must be accompanied by an auditable inference link, functioning as a compact evidence subgraph connecting job requirements directly to candidate profiles.
- **Trustworthiness and Fairness Auditing**: Implement rigorous equal-opportunity auditing focused on the candidate selection stage, utilizing sensitive attributes strictly for offline reporting to ensure transparent utility-fairness trade-offs.

Timeline

The PhD program is structured as a three-year project with defined research milestones:

- **Year 1**: Finalize the two-sided cold-start protocol, implement the uncertainty-aware skill extraction pipeline, and establish strong evaluation baselines to deliver the initial auditable evidence graph.
- **Year 2**: Develop the grounded generative module to propose candidate recommendations using auditable inference links and train the explicit predictive scorer.
- **Year 3**: Deploy equal-opportunity auditing mechanisms, quantify system robustness to extraction uncertainty, and consolidate the benchmark, pretrained models, and toolkit into a documented release.

Required Skills and Qualifications

- Strong academic background in computer science, specifically in machine learning, natural language processing (NLP), or recommender systems.
- Proficiency in programming, algorithm design, and large-scale experimentation.
- Familiarity with heterogeneous graph-based learning or foundation models.
- Prior research experience is strongly recommended.

Administrative Details

- **Host Institution**: Télécom SudParis, Institut Polytechnique de Paris (IPParis).

- **Laboratory**: SAMOVAR lab.
- **Funding**: Financed by Hi!Paris.
- **Supervisor**: Julien Romero.
- **Start Date**: September 2026 (flexible).
- **Contract**: Full-time.

How to Apply

To apply for this position, please submit the following materials:

- A comprehensive resume.
- A cover letter detailing your research interests and alignment with the GRAIL project.
- A complete transcript of your academic grades.
- Recommendation letters (highly appreciated).