Postdoctoral Associate

Summary

Titile :	Ontology-driven Knowledge Base Development for Ethical Factor Identification
Field :	Ontology engineering, Ethical risks, Ethical factors
Period :	One year from 1 November 2025 with potential one-year extension
Salary :	According to experience
Laboratory :	CRAN
Employer :	University of Lorrain
Funding :	ANR JCJC DET project

Context

The ANR JCJC DET project seeks to propose innovative methodologies to bridge the gap between ethics and automation in smart manufacturing. The project will contribute to modeling, developing, and engineering digital ethical twins (DETs) – digital twins capable of conducting ethical reasoning. Ethical factors are a prerequisite for ethical reasoning. This work will primarily focus on ethical factor identification within the context of smart manufacturing.

Problem Statement

Existing approaches to ethical factor identification are frequently ad hoc, relying on manual interpretation of guidelines or fragmented domain expertise [1]. Such methods hinder scalability, interoperability, and traceability, making it difficult to ensure that ethical considerations are systematically embedded across the full lifecycle of a system. The ethics-related information covered in standards such as Responsabilité Sociétale de l'Entreprise (RSE) [2], Règlement Général sur la Protection des Données (RGPD) [3] remains vague and incomplete. For example, RSE addresses only economical, social and environmental aspects. RGPD pertains exclusively to the European Union and focuses solely on data protection matters. The standards also often evolve less rapidly than technologies [4]. Without a structured, machine-interpretable representation of ethical knowledge, practitioners and researchers face significant barriers in automating ethical assessment, aligning interdisciplinary perspectives, and adapting to evolving regulatory landscapes.

Tasks

T1 : Literature review on ethical factors in smart manufacturing
- Conducting a systematic literature review ;
- Describing the identified ethical factors and their relationships ;
- Performing the classification of ethical factors.

T2 : Identifying ethical factors in real scenarios
- Visiting relevant smart manufacturing factories to build ethical risk scenarios ; For each scenario,
    - describing operational activities ;

- o describing planification activities ;
- o identifying and structuring the constraints ;
- o evaluating the ethical factors with experts.

T3 : Developing an ontology-based ethical risk scenario knowledge base

- Proposing a methodology based on the ontology development guide to provide a step-by-step approach ;
- Designing a meta-model explaining the major classes and the relationships among them ;
- Building the class taxonomies of different facts of ethical risk knowledge for risk identification ;
- Defining properties and relations for classes ;
- Defining Semantic Web Rule Language (SWRL) rules to enable ontology reasoning
- Conducting criteria-based (e.g., completeness, correctness, etc.) and application-based evaluations

References

[1] Dindler, C., Krogh, P. G., Tikær, K., & Nørregård, P. S. (2022). Engagements and articulations of ethics in design practice. *International Journal of Design*, *16*(2), 47-56.
[2] Igalens, J., & Gond, J. P. (2020). *La responsabilité sociale de l'entreprise*. QUE SAIS-JE.
[3] Desgens-Pasanau, G. (2019). Le cadre législatif et réglementaire du Règlement général sur la protection des données (RGPD). *I2D-Information, données & documents*, *1*(1), 12-20.
[4] Guenduez, A. A., Walker, N., & Demircioglu, M. A. (2025). Digital ethics: Global trends and divergent paths. *Government Information Quarterly*, *42*(3), 102050.

Candidate Profile

- Ph.D. in Industrial Engineering, Computer Science, Information Systems, Knowledge Engineering, Artificial Intelligence, or a related field
- Proven expertise in ontology design and development (e.g., OWL, SPARQL, etc.).
- Prior research experience in ethics of technology, responsible AI, human–computer interaction, or socio-technical systems is highly desirable.
- Strong written & oral communication skills including evidence of publishing peer reviewed research articles.

How to apply

Applicants are invited to send one .zip file including : CV, Cover letter, PhD summary, and related papers to yinling.liu@univ-lorraine.fr and hind.el-haouzi@univ-lorraine.fr.