

# Postdoc Position: Principled Approaches to Handling Imperfect Data

## Context

Accessing the relevant information in real-world data to support informed decision making is difficult, time-consuming, and error-prone due to the need to integrate data across multiple heterogeneous sources. Moreover, even if this first hurdle is overcome, a perhaps even more daunting challenge arises: how to obtain reliable insights from imperfect data? It is widely acknowledged that real-world data is plagued with quality issues, such as incompleteness (missing information) and errors (false or outdated information).

The ontology-mediated query answering (OMQA) paradigm [1,2,3] addresses the first challenge by facilitating access to (potentially heterogeneous) data sources through the use of ontologies that specify a convenient user-friendly vocabulary for query formulation (which abstracts from the way the data is stored) and capture domain knowledge that can be exploited at query time, via automated reasoning, to obtain more complete query results. While OMQA systems are growing in maturity [4], they too often fail to address the data quality issue, aside from issuing warnings when inconsistencies are discovered.

To widen the applicability of the OMQA approach, it is essential to equip OMQA systems with appropriate mechanisms for handling imperfect data: how to obtain meaningful answers to queries posed over imperfect data, and how best to generate a high-quality version of the data? While these questions have begun to be explored [5,6], we are still far from having robust and widely applicable techniques for handling data quality in OMQA.

This postdoc position is part of the INTENDED Chair on Artificial Intelligence, whose aim is to develop intelligent, knowledge-based methods for handling imperfect data. The chair is funded by the French National Research Agency (ANR) and the University of Bordeaux.

## Research Topic

The postdoctoral researcher will engage in research related to the INTENDED Chair's overall theme of developing intelligent, knowledge-based methods for handling imperfect data, which may target either classical or ontology-enriched databases. Generally speaking, this will involve the definition of formal frameworks for repairing and querying imperfect data, the study of the computational complexity of reasoning, and the development of reasoning algorithms. Examples of ongoing research directions include the integration of qualitative and quantitative preferences into repair-based semantics [7,8], the development of logic-based approaches to entity resolution [9,10], and the definition of holistic frameworks for jointly tackling various data quality issues [11]. We are also interested in implementing our approaches, using SAT solvers [12] and ASP systems [13].

The precise research topic will take into account the background and interests of the postdoctoral researcher, so brilliant candidates with an interest for the overall project topic should not hesitate to apply. In particular, while this position is primarily concerned with foundational aspects of data quality, we also welcome applications from researchers who have solid experience with reasoning and/or database systems and who are interested in developing and implementing efficient algorithms and optimizations for data quality.

# Position & Environment

This is a **full-time postdoctoral researcher position**. The position is for **13 months, starting from September 1st, 2025**, with a monthly net salary of around 2400€ (but a higher salary can apply in cases of prior postdoctoral experience). The position does not include any mandatory teaching or supervisory activities, but there will be opportunities to engage in teaching and/or student supervision if desired.

The position will be based at LaBRI (Laboratoire Bordelais de Recherche en Informatique), a computer science research lab located on the University of Bordeaux's Talence campus. The lab can be easily reached from the city center of Bordeaux by tram or bike. Located in southwestern France, Bordeaux offers easy access to both the Atlantic coast and the Pyrenees mountains, while being only a two-hour train ride from Paris. Famed for its vineyards, local gastronomy, and well-preserved historic center (a UNESCO World Heritage Site), Bordeaux offers a high quality of life.

The postdoctoral researcher will participate in the research team RATIO (Reasoning with data, knowledge and constraints), which is part of a much larger Formal Methods department that brings together dozens of researchers interested in applying logical and automata-theoretic methods to a wide range of problems within computer science.

The postdoctoral researcher will collaborate with Meghyn Bienvenu (leader of the chair) and will have many opportunities to interact with the other INTENDED participants and external collaborators. The chair provides significant resources to finance trips to conferences and to host visiting researchers.

## Candidate Profile

Applicants should hold a PhD degree (or complete their degree by the end of June 2025) and should have a strong research record in knowledge representation and reasoning, databases, or logic in computer science, as demonstrated by publications in top venues.

The applicant's research background should allow them to quickly start collaborating on topics within the scope of the project. For this, candidates should be comfortable working with logical formalisms (in particular, ontology languages and/or database query / constraint languages) and studying their (formal or computational) properties. Aside from this general requirement, experience and interest in one or more of the following areas would be relevant and welcome: ontology languages (description logics / existential rules), reasoning with inconsistent / uncertain / incomplete information, non-monotonic reasoning (e.g. argumentation), data quality, Semantic Web, automated reasoning (ASP, SAT,...), theoretical computer science (computational complexity).

Strong English language skills (reading, writing, & speaking) and an ability to take active part in writing up research papers are expected. Knowledge of French is not required, and the working language can be either French or English.

## How to Apply

Interested candidates should contact Meghyn Bienvenu and provide:

- a detailed CV, containing the applicant's full publication list

- university transcripts for Master's / engineering degree,
- names of 2-3 references,
- a brief description of how the project topics relate to their prior experience and interests.

Applications should be submitted by email to both of the following email addresses: [meghyn.bienvenu@u-bordeaux.fr](mailto:meghyn.bienvenu@u-bordeaux.fr) and [meghyn.bienvenu@cnrs.fr](mailto:meghyn.bienvenu@cnrs.fr)

The deadline for applications is: **April 20, 2025**. Applicants will receive an email to confirm receipt of their application within a few working days. Online interviews with selected candidates will be scheduled between mid-April and mid-May.

## Bibliography

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