

Research Internship for Master 2 Students: Formal Methods for the Development of Distributed Algorithms

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The development of correct distributed algorithms is challenging, for different reasons. First, in the presence of failures in asynchronous systems, many problems (e.g., consensus) cannot be solved at all. Furthermore, proving a *given* distributed algorithm to be correct is an extremely difficult task due to the combinatorial explosion of its state space.

In the research project FREDDA (FoRmal methods for the Development of Distributed Algorithms), we develop formal methods to support the design of distributed algorithms. In particular, these methods shall allow us to prove, automatically, that a given algorithm behaves correctly, or to improve its efficiency or robustness. This project lies at the frontier of two research domains with different communities, namely formal verification and distributed algorithms.

In this internship, we will set the first formal basis for models and analysis techniques that facilitate the development of distributed algorithms. For a start, the focus will be on existing distributed algorithms for renaming problems [CRR11]. Some of the following issues will be addressed:

- Classification of existing distributed algorithms for renaming problems.
- Characterization of properties that these algorithms should verify.
- Decidability status of verification problems for new models.
- Development of algorithms to solve or approximate verification problems.
- Improvement of existing algorithms.

References

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