

# Project of Bachelor Thesis: Simulation of Private Distributed Estimation

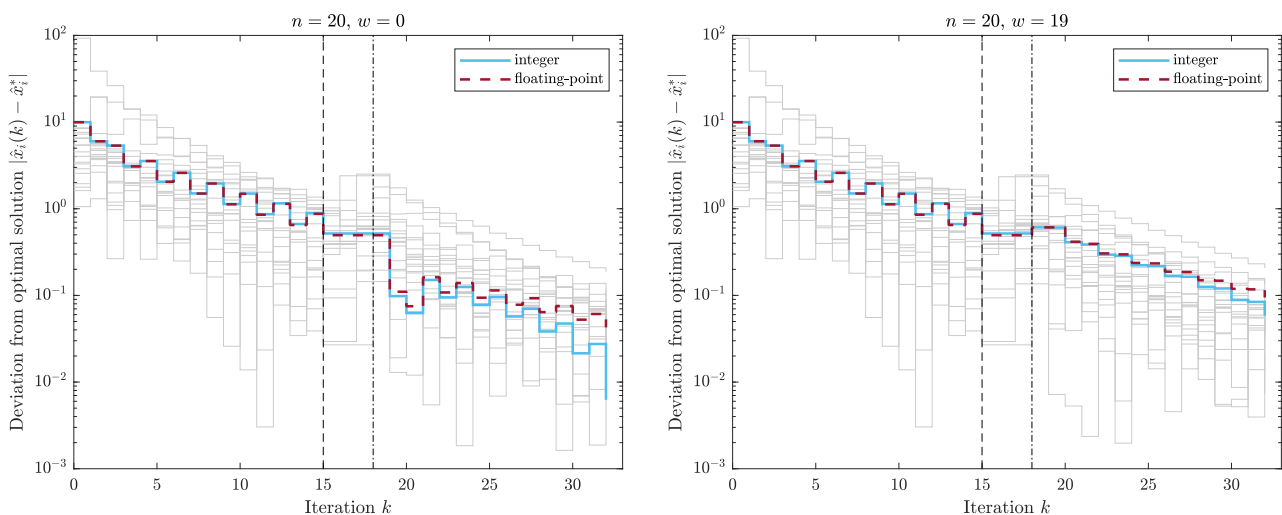
*Encrypted implementation and study of an affine averaging algorithm for distributed state estimation*

## Task description

Many applications in the context of multi-agent systems necessitate some form of *distributed state estimation*, a task where a (potentially large) number of individual agents cooperate in order to jointly compute estimates of their individual states. Problems of this kind arise, for example, in clock synchronization of processor networks or in position estimation in robot swarms. However, solving the estimation problem in a distributed fashion inherently requires communication and sharing of private data between the agents which, in turn, infringes on the individuals' privacy.

To counter this, we recently proposed a distributed state estimation scheme based on the affine averaging algorithm that allows to preserve the privacy of the agents' personal information. The proposed scheme supports any type of additively homomorphic cryptosystem.

This project aims at a complete implementation of the encrypted system dynamics in the Python programming language. This implementation will then be employed to study the behavior of practically relevant systems in medium-scale simulations.



**Figure 1:** Convergence of the algorithm with different parameters.

## Your Profile

Ideally, your profile should match the items listed below:

- Solid programming skills and experience in Python 3; Matlab skills are beneficial
- Linear algebra fundamentals
- Interest in a simulation-driven, largely empirical work

Of course, you will receive appropriate support from a supervisor. You can choose to do the task in German or in English.

## Interested?

If you are interested in this project, please contact us at [philipp.binfet@tu-dortmund.de](mailto:philipp.binfet@tu-dortmund.de). Make sure to include relevant information about yourself and your course of studies as detailed [here](#).