

Numerical toolbox to compute a refined mean-field approximation

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Keywords – Stochastic system, mean-field approximation, caching policies.

1 Description

Stochastic models of interacting agents are used in many domains (caching systems, computer networks, social networks...). The analysis of the model of n stochastic entities interacting with each others can be particularly difficult. The mean field approximation is a very effective technique to study such a system when the number of entities n is very large. The idea of mean-field approximation is to replace a complex stochastic system by a simpler deterministic dynamical system. Our recent progress suggest that it is possible to extend these methods to study systems with a relatively small entities ($n \approx 10$). The objective of the internship will be to contribute to the development of theoretical and analytical tools on this subject, for example to focus on heavy-traffic regime and heterogeneous systems.

Depending on the candidate, this project can have a more theoretical flavor or a more algorithmic one. Different applications are envisioned (e.g. evaluation of caching policies, optimal scheduling for server farms,...).

- See N. Gast Expected Values Estimated via Mean-Field Approximation are $1/N$ -Accurate (ACM SIGMETRICS 2017) https://github.com/ngast/meanFieldAccuracy/blob/master/mf_rate_convergence.pdf

2 Contact

For more information, please contact nicolas.gast@inria.fr

3 Gratification

The intern will have a grant of about 540 euros / month.

4 Location

The intern will be hosted in the POLARIS team. The POLARIS team is a joint team between Inria and LIG (Grenoble Computer Science Laboratory) and is located on Grenoble University main campus (<https://batiment.imag.fr/>).