PhD Position (M/F) – Thesis offer (M/F)
Reference: DS/PM/DIFF/022022

Research topics	Probabilistic Machine Learning, Generative Diffusion Models
Departement	Data Science Department
Publication date	01/02/2022
Start date	ASAP
Duration	PhD Thesis duration

Description

The goal of this Ph.D. Thesis is to deepen our understanding and develop new methodologies for probabilistic generative models. There are many types of generative models, including Generative Adversarial Networks, Variational Autoencoders and Flow-based models. Recently, new methods based on ideas borrowed from non-equilibrium thermodynamics, namely probabilistic diffusion-based models, have emerged: these methods can be studied under different angles, including discrete-time Markov diffusion processes, stochastic differential equations that use the score function, or more generally optimal transport methods and the solution of high dimensional partial differential equations.

In this Ph.D. Thesis, we aim at addressing outstanding difficulties of diffusion-based models, which include computational efficiency for training and sampling, as well as the quality and structure of generated samples, to name a few. An additional challenge we consider deals with the nature of the data we aim to model: we target at generalizing current models to generic non-euclidean spaces. If most of the research literature focuses on computer vision applications, we aim at addressing structured data, which develops in time, such as computer network traffic.

This Ph.D. Thesis is inscribed in a larger project funded by Huawei Technologies, Paris. As such, and in addition to theoretical and methodological contributions, we expect to apply the models studied in this work to application domains that include (unsupervised) anomaly detection tasks. The team includes a senior researcher, who is experienced in mathematical modeling, and who will support the Ph.D. advisor. Additionally, several experienced research staff members from Huawei Paris are involved in the project, contributing to an exciting working environment.

Requirements

- Education Level / Degree : M.Sc.(Eng.) in the area of Computer Science / Computer Engineering, Physics, Mathematics, Applied Mathematics or equivalent
- Field / specialty: Machine learning, and applications
- Technologies: PyTorch, JAX
- Languages / systems: Python
- Other skills / specialties: A natural appetite for theoretical and mathematical challenges
- Other important elements:
    - Experience with Machine Learning and/or Deep Learning projects
    - Experience with Statistical Physics
    - Experience with numerical simulation of Stochastic Differential Equations
    - Basic knowledge of Differential Geometry

Application

The application must include:

- Detailed curriculum,
- Motivation letter of two pages also presenting the perspectives of research and education,
- Name and address of three references.

Applications should be submitted by e-mail to Prof. Pietro Michiardi (Pietro.Michiardi@eurecom.fr) and copy to secretariat@eurecom.fr with the reference : DS/PM/DIFF/022022

Important Dates

Screening will start immediately.
Deadline to apply: ASAP
Interviews will be scheduled until the position is filled
The start date is ASAP

About EURECOM

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