Proposition de stage: Learning Sliced Wasserstein flows for generative models

Generative models allow to sample a distribution only known by a discrete set of (possibly many) samples. A typical example is the synthesis of a new realistic image given a large database of other images. The main issue to address is to produce a sample that is not too similar to the input dataset so that the model generalizes well, while respecting that distribution.
One way to produce such a sample is to start with a sample of a known distribution (e.g., a Gaussian or uniform distribution), and to advect it to progressively move it towards the target distribution, for example via some gradient flow. The goal of this project is twofolds. First, the intern will study a gradient flow for a regularized Sliced Wasserstein* optimal transport problem. Second, the student will propose a neural network model that learns this Sliced Wasserstein gradient flow, i.e., a time-conditioned model that maps points from the known Gaussian/uniform distribution to any time-step of that gradient flow. Contrary to performing an actual Sliced Wasserstein gradient flow, this has the advantage of not requiring the storage of the entire training dataset, would be cheaper to compute at inference time, and would allow for additional control.

*The Sliced Wasserstein flow is obtained by advecting each sample with a velocity computed as the average velocity of 1-d optimal transport problems between random 1-dimensional projections of these samples and of the target distribution samples.

References:

- Optimal transport mapping via input convex neural networks [Makkuva et al. 2020] https://proceedings.mlr.press/v119/makkuva20a.html
- Sliced-Wasserstein Flows: Nonparametric Generative Modeling via Optimal Transport and Diffusions [Liutkus et al. 2019] https://proceedings.mlr.press/v97/liutkus19a/liutkus19a.pdf

Durée du stage: 4 à 6 mois

Possibilité de thèse financée après le stage.

Rémunération: indemnités de stage

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