

Optimisation on measures spaces

Optimisation on measures spaces provide a framework for very diverse problems.

Simple examples involving only point measures include K-means, which are the most used clustering algorithm, or the century-old Thomson's problem, which consists in finding the configuration of electrons on a sphere, without any known solution to this day. We may also write in that way some inverse problems in infinite dimension, such as tomography or superresolution. This allows to work in finite dimension.

More complex, structured measures, may be supported by lines, or have a density. They may model acquisition trajectories in MRI, or fissures in, say, plane wings. Finally the figure below illustrates the use of these techniques in artistic rendering. Here, a target picture is approximated by a measure supported on a curve with geometrical constraints. We show it at different zooms to make the effect clearer.

This understudied framework opens numerous challenges in theory, numerics, algorithms, and applications. The intern will address one or several of these aspects depending on his tastes.

The intern will work at the Institut de Mathématiques de Toulouse. After the internship, a PhD grant is available through the ANR OMS project. The supervisory team includes Jérôme Bolte, Frédéric de Gournay, Jonas Kahn et Pierre Weiss. The supervisor will be chosen according to the student's profile.

More information on the project on the website :

<https://perso.math.univ-toulouse.fr/oms/> .

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