Machine Learning and Optimal Transport for shape parametrization

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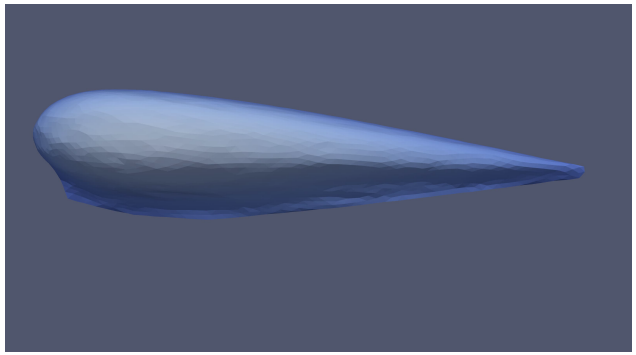
Line 1: Semi-discrete Optimal Transport

Optimal transport map definition:

$$\inf \left\{ \int_X c(x, T(x)) \mathrm{d}\mu(x) \mid T_*(\mu) = \nu \right\}$$

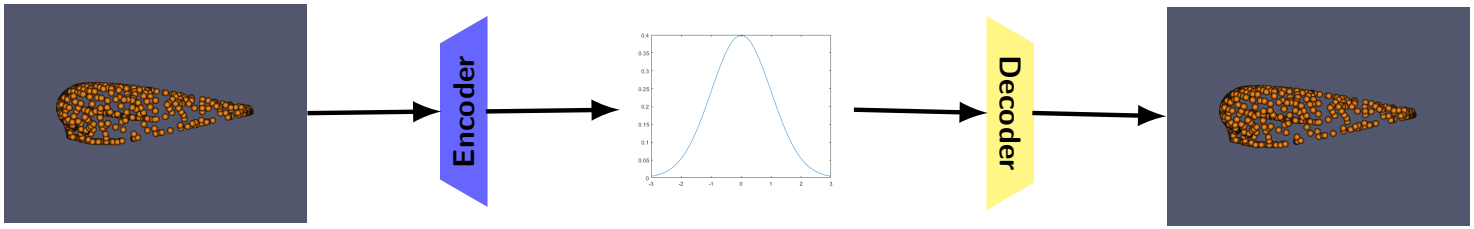
- Regularity constraints
- Application to design optimization



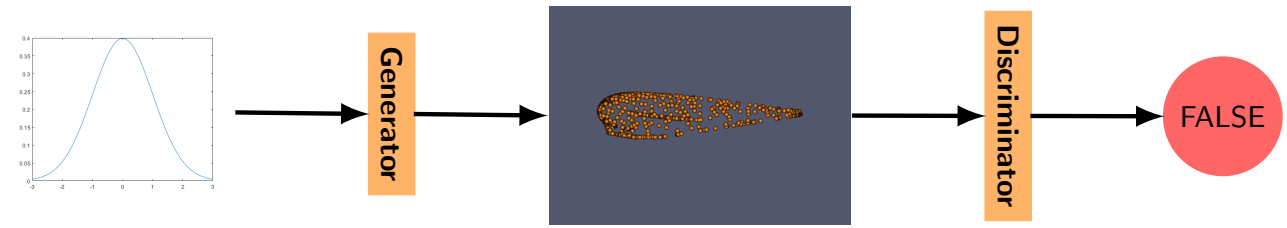
Line 2: Generative models

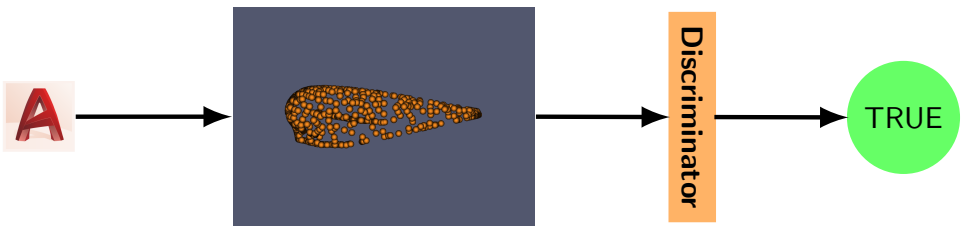
Generative models for shape optimization of complex geometries with a large number of parameters.

- Variational autoencoders:



- Generative adversarial networks:





Line 2: Generative models

Models tested:

- Basic Autoencoder
- Variational AutoEncoder
- Adversarial AutoEncoder
- Basic Generative Adversarial Network
- Boundary Equilibrium Generative Adversarial Network
- Variational AutoEncoder Generative Adversarial Network

In progress:

- Integration with PCA
- Generalization of the models to more complex data (Rabbits, Blood Vessels, Heart Valves, etc.).