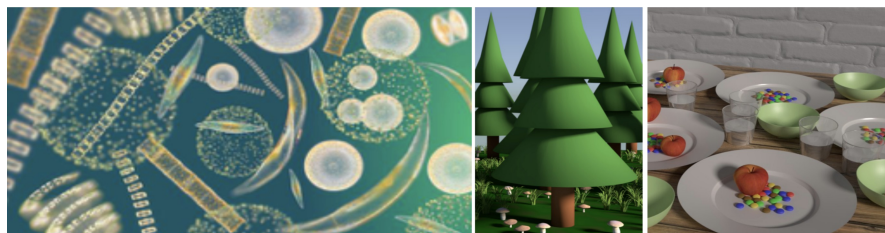


Multi-Class Geometric Distribution Synthesis using Example-based Learning



This project aims in introducing example-based efficient learning methods to synthesize multi-dimensional distributions of sample shapes like points, disks, segments and cylinders using different spatial and spectral tools such as correlation functions. The efficiency of such representation tools has been already shown in the case of point or disk distributions [1]. However, in order to tackle the challenging case of multi-class distributions (such as planktons' distributions with various shapes in this figure) the generation process needs to be optimized considerably. To this end, we plan to use some modern deep learning pipeline to better model and generate correlations in multiple dimensions [2]. We believe that such a neural network can optimize correlations that were not possible to conceive earlier in a straight forward manner without any particularly heavy constraints or requirements on the training data.

The project is based on two main axes:

- a. Provide a first prototype using some provided code for disk distributions as well as the learning toolbox.
- b. Analyze the performance of such method and the advantages and drawback in terms of multi-class distribution synthesis.

References:

[1] Accurate Synthesis of Multi-Class Disk Distributions
(Ecomier-Nocca et al. 2019) <https://hal.inria.fr/hal-02064699>

[2] Deep Point Correlation Design
(Leimkuhler et al. 2019) <https://sampling.mpi-inf.mpg.de/deepsampling.html>

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