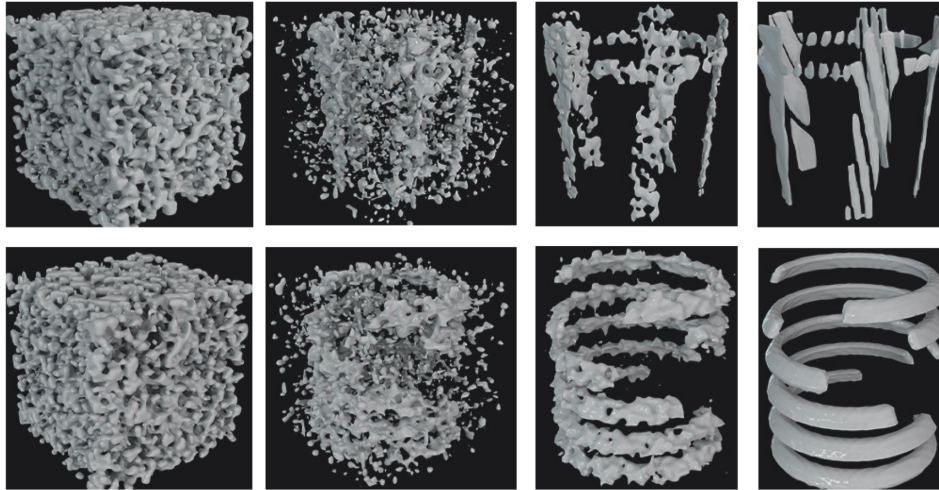# Artificial Architectural Intelligence: Generating 3D Geometries with Diffusion Models

Generative deep learning with denoising diffusion models have been attracting mainstream attention in the field of 2D image generation. Together with our collaborators from the Institute of Architecture and Media, we have recently introduced a prototype which brings a diffusion network into the third dimension, with the purpose of generating architectural geometries for conceptual design [1]. Our early prototype demonstrates the viability of the approach and suggests future options to develop deep learning generative 3D tools for architectural design. In this project, we will extend our work to explore the effectiveness of implicit sampling algorithms and appropriate architecture/design-specific model conditioning pipelines.

[1] A. Sebestyen, O. Özdenizci, R. Legenstein, U. Hirschberg, "Generating conceptual architectural 3D geometries with denoising diffusion models", Proceedings of the 41st Education and Research in Computer Aided Architectural Design in Europe (eCAADe) Conference, 2023.

Goals & Tasks

- Review of the state-of-the-art on 3D generative diffusion models.

- Experimenting with diffusion models on customized datasets in 3D representation.

- Exploring novel sampling and conditioning approaches for diffusion models.

Qualifications

- Interest in generative deep learning.

- Experience with Python based deep learning frameworks such as PyTorch.

- Registered to one of the following:

  - ✓ **Bachelor Thesis**
  - ✓ **Seminar Project**
  - ✓ **Master Thesis**

Contact

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