Generative deep learning with denoising diffusion models have been attracting mainstream attention in various research domains. Together with our collaborators from the Institute of Structural Design, we are aiming to explore a new application of such advanced techniques in the field of synthetic data generation and machine learning. The primary focus of this project is to generate physically realistic synthetic 2D images of flexural cracks in concrete. Our goal is to study applications of conditional denoising diffusion probabilistic models (DDPM) and latent diffusion models (LDM) to enhance the state-of-the-art in vision-based structural health monitoring, and initiate a path towards future research in AI-driven structural damage detection.

Goals & Tasks

- Review and implementation of seminal works on generative diffusion models.
- Experimenting with diffusion models on datasets with flexural cracks in concrete.
- Exploring conditional diffusion modeling techniques based on segmentation masks.

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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