AI4AI – From Image to Model using AI-assisted AI

1. Project Methodology

What's better than an image? How about a full editable model of the very object the image represents? The AI4AI project enables you and your colleagues to successfully deliver just that. You use AI methods to solve a concrete problem arising in the field of engineering. You will further use the help of AI to implement this very method while also learning to work in a team.

- **Knowledge Share Format:** The project is designed to ensure maximum diffusion of gained knowledge across the team. For this purpose, students will be asked to critically analyse and explain the decisions they make when it comes to tools they create.
- **Primary Domain:** We will use LLMs and Computer Vision Models to address challenges most easily found within the engineering sciences.

2. Project Timeline

Weeks 1–4: Using LLMs to Code + Setup

LLM basics, reproducible development setup (VM + individual conda environments), and AI-assisted coding practices.

Artefacts: setup guide, "LLM coding" checklist, repo/project scaffold.

Weeks 5–8: Preprocessing + Vision Basics + Evaluation + LLMs for Data

Data pipelines, computer vision fundamentals, and evaluation methodologies; LLM support for data documentation and pipeline development.

Artefacts: preprocessing template, CV baseline + evaluation notebook, reporting template.

Weeks 9–12: Challenge - LLM + Vision

A final challenge focused on combining vision models and LLMs, e.g. recreating CAD models from images (image → structured representation → CAD/BIM/LaTeX/TikZ output), with a clear evaluation protocol and a reproducible submission format.

Artefacts: end-to-end reference solution, final report and reusable challenge kit.

3. Technical Scope

- Programming with LLMs
- LLM tool calling
- Data pipelines
- Computer vision basics
- Software engineering: REST APIs, VS Code/Cursor
- Application domains: CAD, BIM, LaTeX, TikZ

4. Links

Text2CAD: https://arxiv.org/pdf/2409.17106

TikZero: https://arxiv.org/pdf/2503.11509

LLMs: https://www.youtube.com/watch?v=LPZh9BOjkQs

Virtual Environments: https://www.youtube.com/watch?v=KxvKCSwlUv8