AI-Assisted Creation of Lecture Scripts: A Best Practice Case Study

Johannes Schmitt
Department of Mathematics
ETH Zurich

Context

As a postdoc at ETH Zurich's Mathematics Department, I supported Prof. Johannes Lengler and Prof. David Steurer from the Computer Science department in creating several chapters of a comprehensive German script for their Fall 2024 course "Algorithmen und Datenstrukturen".

Tools

Our approach combined multiple AI technologies:

- **Whisper** (OpenAI): An open-source speech recognition system used to transcribe lecture recordings from the previous year
- **Gemini** (Google DeepMind): Selected for its extensive context window of 2 million tokens, enabling the processing of lengthy input materials

Input materials included:

- Video recordings of previous lectures (transcribed via Whisper)
- PDF of handwritten blackboard notes (converted to image format)
- Existing LaTeX code of a script from a related lecture serving as a style guide

Method

The workflow was structured to maximize efficiency while ensuring quality:

- Gemini was provided with comprehensive context including the desired format, tone, and all input materials
- Due to output length limitations (approximately 8,000 tokens), content generation was managed section by section
- The AI was instructed to use LaTeX comments for "chain of thought" reasoning, making its planning process transparent
- Maintaining a positive interaction style with the AI (e.g., "Good job with the first part, thanks so much!") appeared to improve output consistency

Outcomes

The project achieved significant efficiency gains:

- Generation speed: Approximately 30 minutes of work per 90 minutes of lecture content
- Output volume: Each lecture yielded about 7 pages of PDF notes
- Quality assessment: Text, pseudocode, and simple equations were generated successfully, though complex diagrams (TikZ) required manual creation

Challenges and Solutions

Challenge	**Solution**
Gemini's **output limit** of 8,000 tokens restricted content generation	Implemented a systematic **section-by-section approach** with **human oversight** between generations
AI occasionally lost track of proper **section ordering**	Provided **explicit guidance** between sections to maintain proper content flow
AI defaulted to **Markdown formatting** within LaTeX code	Implemented **manual correction** procedures, finding this more efficient than complex prompt engineering
Direct video input, while technically possible with Gemini's **multimodal capabilities**, led to literal transcription including filler words	Pre-processing videos into **transcriptions** reduced context window usage and helped the AI maintain focus on its formatting instructions

Samples

- Example session in Gemini, describing different sorting algorithms and their runtime
- First draft of corresponding script chapter, written by AI
- Comparison of AI draft with final version

Interesting Learning Experiences (a.k.a. "Bloopers")

- Once the lecturer accidentally started the lecture in English, before being reminded by the students to switch to German. The whisper transcription AI by default uses the first 30 seconds of the recording to infer the language, and correspondingly transcribed the entire lecture in English (translating on the fly). The transcription was then repeated, manually specifiying the language as German.
- In one case of a runtime analysis of three example algorithms, Gemini changed the problem and code of the second algorithm, but gave a correct new runtime analysis, which it included in the script.