ATOMIC: Avatar-based Teaching for an Optimized Medical Imaging Course

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Introduction

ATOMIC (Avatar-based Teaching for Optimized Medical Imaging Course) modernizes imaging education. A human-like digital avatar preserves the original instructional style while allowing a learner to pause, rewind and rewatch complex parts, and interact with the instructor (under development). Compared with traditional online courses, avatar-based production improves cost-effectiveness, ensures consistent and engaging delivery, and allows rapid updating and multilingual outreach. This project helps build a democratic learning environment in an educational metaverse.

Motivation

- Medical Imaging topics are dense and require repeated review; avatar-based videos support flexible, self-paced learning in ways that classrooms cannot accommodate [1,2].
- AI-generated avatars avoid recording workload and enable scalable, consistent lecture creation from one refined script.
- Avatars instruct with natural expression and movement, facilitating engagement and comprehension [3]. The avatar can interact with students, empowered by a dedicated AI model (in progress).

Data

- Lecture Recordings: Complete semester-long medical imaging course (two lectures per week).
- Audio–Text Pairs: Audio extracted, transcribed automatically, and refined with a Large Language Model (LLM) for clarity and accuracy.
- Slide Materials: Original PowerPoint slides serving as synchronized visual anchors.
- ATOMIC Dataset: Refined scripts and slide decks as inputs to Synthesia for generating high-quality avatarized videos in specified languages.

Methodology

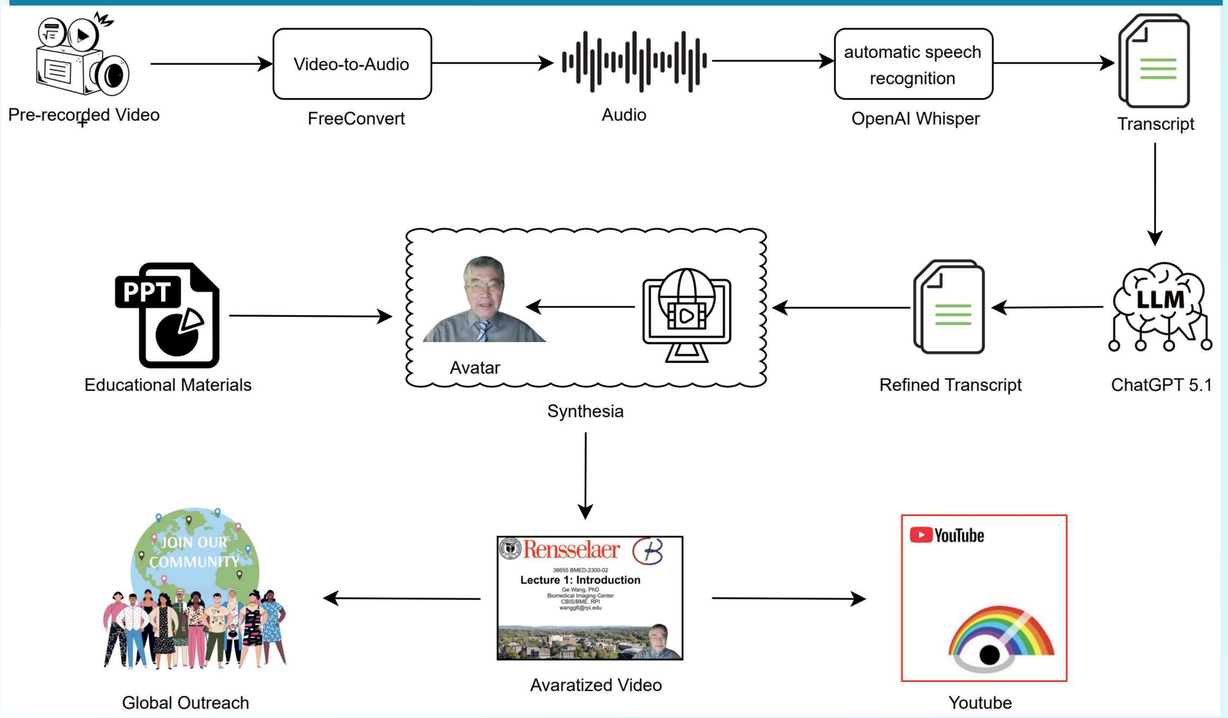

Figure 1. ATOMIC Workflow

- Audio Preparation: Convert lecture videos into high-quality audio for uniform transcription.
- Speech Recognition: Generate initial transcripts using OpenAI Whisper.
- Script Refinement: Use GPT-5.1 to create structured, pedagogically coherent scripts aligned with slide progression.
- Avatar Construction: Build a human-like digital avatar using the Synthesia [4] platform to ensure consistent visual identity and delivery continuity.
- Video Synthesis: Integrate refined scripts with lecture slides in Synthesia to produce synchronized avatarized videos.
- Quality Assessment & Publication: Validate accuracy, pacing, and conceptual correctness before releasing all avatarized lectures.

Evaluation

- Transcript Accuracy: Refined scripts align closely with original content, capturing terminology while removing transcription noise.
- Avatar Fidelity: The human-like avatar maintains consistent delivery pace, realistic facial expressions, and clear speech across lectures.
- Engagement & Accessibility: Early analytics show improved viewer retention, with learners frequently using pause, rewind, and replay features.

Conclusion

Avatar-based videos elevate medical imaging instruction to a new level. LLM-refined scripts and avatarized delivery ensure high quality and realistic presentation, while asynchronous access enhances learner engagement. **ATOMIC** is a modern approach to medical imaging education. All lectures are publicly available on the **MILEAGE** YouTube channel [5]. International collaborations are underway with Chinese, Korean, and Indian educators.

Directions

- Interactive Expansion: Add avatarized Q&A where learners can ask text or voice questions and receive Retrieval-Augmented Generation (RAG) answers generated by an LLM.
- Embedded Assessment: Integrate quick quizzes, branching cases, and adaptive prompts, as well as user feedback.
- Controlled Studies: Compare avatar, live, and recorded formats on retention and comprehension.
- Global Reach: Build multilingual avatars and synergistic features.

References

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