



Introduction

- Recent artificial intelligence (AI) tools like ChatGPT have garnered significant interest for their ability to extract and synthesize relevant information for clinical use and education in aesthetic surgery.
- However, these general models lack domain-specific training, limiting their effectiveness in specialized medical and surgical domains.
- This proof-of-concept study aims to develop and evaluate a large language model (LLM) specifically tailored to aesthetic surgery by fine-tuning GPT-2 on current aesthetic surgery literature.

Methods

- Data Collection**
 - Developed Python scripts to automate collection of 1,000 publicly available abstracts related to aesthetic surgery from PubMed
 - Established inclusion criteria focusing on contemporary aesthetic surgery literature
- Data Preprocessing**
 - Cleaned and normalized text data
 - Tokenized text using GPT-2 tokenizer
 - Formatted data using Python and TensorFlow to create dataset suitable for LLM training
- Model Fine-Tuning**
 - Base model: Pre-trained GPT-2 (124M parameters)
 - Training environment: GPU-enabled cloud computing platform
 - Hyperparameters:
 - Learning rate: 5e-5
 - Batch size: 4
 - Training epochs: 50
 - Maximum sequence length: 512 tokens
- Evaluation Metrics**
 - Coherence and contextual accuracy of generated text
 - Domain-specific terminology usage
 - Qualitative assessment

Results

- The fine-tuned GPT-2 model successfully integrated aesthetic surgery-specific knowledge from the training process
- Generated coherent and contextually relevant text related to aesthetic surgery
- Demonstrated improved understanding of aesthetic surgery literature

Discussion

- This proof-of-concept study demonstrates the significant potential of domain-specific LLMs in aesthetic surgery.
- By fine-tuning GPT-2 on a specialized corpus of aesthetic surgery literature, we observed marked improvements in the model's ability to generate contextually relevant content that incorporates appropriate surgical terminology, anatomical considerations, and procedural nuances.
- While general AI tools like ChatGPT have broad knowledge, they lack the depth required for specialized clinical applications.
- Our fine-tuned model addresses this gap by demonstrating enhanced understanding of concepts unique to aesthetic surgery, including technique selection, patient assessment, and complication management.
- The implications of this work extend beyond text generation.
- Such models could serve as clinical decision support tools, providing surgeons with rapid access to relevant literature and potential treatment approaches tailored to specific patient scenarios.
- For surgical education, these models offer on-demand resources that adapt to learner needs, potentially supplementing traditional teaching methods.
- Limitations**
 - The current training corpus, while focused, represents only a fraction of available aesthetic surgery knowledge.
 - Future iterations should incorporate a broader range of literature, including full-text articles, clinical guidelines, and expert consensus statements.
 - Additionally, aesthetic surgery is inherently visual, and the development of multimodal AI systems that integrate text and image analysis would significantly enhance clinical utility.

Future Directions

- Expand training dataset to include full-text articles, operative reports, and clinical guidelines
- Develop multi-modal capabilities incorporating visual elements crucial to aesthetic surgery
- Create interactive tools for surgical planning and patient education
- Integrate with electronic health records for real-time clinical decision support
- Validate model outputs with prospective clinical trials
- Explore implementation of fine-tuned models in resident education programs

Conclusion

- This proof-of-concept study successfully demonstrates that fine-tuning large language models with domain-specific literature substantially enhances their utility in aesthetic surgery.
- Our approach creates an AI tool that better understands the nuanced language, concepts, and clinical considerations unique to aesthetic procedures.
- The developed methodology offers a reproducible framework for creating specialized AI assistants in plastic surgery that could aid in clinical decision-making, resident education, and efficient literature synthesis.
- While general-purpose AI tools have transformed many aspects of information retrieval and synthesis, specialization remains crucial in technically complex fields like aesthetic surgery.
- This work represents an important step toward developing AI systems that can effectively support the specific needs of aesthetic surgeons, ultimately enhancing patient care through improved access to contextualized knowledge.