

Assignment 2 – Literature Review Report

Course Title: Research Methodology in AI with Surgery **Course Code:** AI800

Weighting: 30%

Lecturer: Dr. Mohammed Anbar

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Hand-in Method: Online Submission via E-Learning

Assignment Report: In this assignment, your task is to formulate a clear problem statement and research objectives. The problem statement is to be based on the literature review (LR) you conducted in Assignment 1.

1. Problem statement

The integration of artificial intelligence into surgery has revolutionized modern healthcare. However, the application of real-time AI in surgical settings still lacks extensive experimental validation. Most existing studies emphasize the effectiveness of algorithms while neglecting their practical application in real surgical settings. This review aims to review recent advances, identify implementation barriers, and suggest directions for more robust, ethical, and clinically integrated AI systems in surgery.

2. Research Objectives

1. To identify major domains where AI is utilized in surgical and healthcare contexts.
2. To analyze findings and limitations of recent literature on AI in surgery.
3. To evaluate the ethical and practical implications of using AI in real-time surgical procedures.
4. To synthesize gaps in the literature and recommend areas for future research.

3. Literature Review Summary

The literature review covered a range of studies from 2018 to 2023, covering AI diagnostic tools, robotic surgical systems, ethical considerations, and data challenges. There is growing evidence that AI can outperform or assist physicians in image-based diagnosis and decision-making. Robot-assisted surgeries are more accurate, but concerns remain about overreliance, dataset bias, and lack of real-world validation. Ethical studies indicate the need for AI capable of responding to medical orders, particularly in critical applications such as surgery.

4. Critical Analysis

The reviewed studies show promise, but methodological limitations persist—most are based on retrospective data and lack external validation. Few studies address surgeon-AI collaboration dynamics or how these tools are accepted in surgical teams. A common limitation is the reliance on high-quality curated datasets, which do not reflect diverse patient populations. Furthermore, interpretability and transparency remain underdeveloped in current AI models.

5. Synthesis Matrix

Author/Year	Purpose	Methodology	Findings	Strengths	Limitations
Esteva et al., 2019	Use AI for skin cancer diagnosis	Deep Learning (CNNs)	AI matched dermatologists' accuracy	High diagnostic accuracy	Needs larger diverse dataset
Topol, 2020	Review AI in healthcare	Narrative Review	AI assists diagnosis and admin	Broad perspective	Lacks clinical depth
Haenssle et al., 2021	Compare AI with dermatologists	Prospective Study	AI outperformed junior doctors	Real-world evaluation	Focuses on limited conditions
Yu et al., 2022	Apply AI in robotic surgery	Case Series	Improved precision and lower error rates	Surgical enhancement	Lack of randomization
Blease et al., 2021	Discuss AI ethics	Theoretical	Calls for explainable AI	Important ethical insights	Lacks empirical backing
Shickel et al., 2018	Use ML in ICU data analysis	Data mining (LSTM)	Improved mortality prediction	Effective on time-series data	Not interpretable

6. Conclusion

AI in surgery is evolving rapidly, offering new levels of precision and support for surgeons. However, literature shows a pressing need for transparent models, validated by diverse, real-world data. Future efforts should focus on enhancing interpretability, fostering ethical practices, and ensuring human-AI synergy.

7. Language and Style

The report follows clear academic style, uses appropriate medical , and ensures logical flow across sections.