Medical Artificial Intelligence: Futuristic Prospects and Ethical Responsibilities

Vishruth Nagam

Background

❖ Artificial intelligence (AI) is highly sensitive to small pattern changes [1]

➢ **Diagnostic accuracy**: sensitivity, specificity, positive predictive values, and negative predictive values upwards of 70% [2]

❖ Lack of breaks → **greater diagnostic efficiency** [3]

❖ When utilized in combination with clinicians, AI systems improved behavioral-health patient outcomes by more than 30% [4]

Objective

Propose a theoretical multifaceted approach for the equitable implementation of medical AI systems in healthcare facilities

- ❖ Feasibility
  - ➢ Data collection
  - ➢ Manufacturing and maintenance

- ❖ Patentability
  - ➢ Applications
  - ➢ Legal responsibilities

Visualization of how a futuristic medical AI system may be used by a clinician to aid in the diagnosis of a patient.
Source: Medical News Life Sciences

Feasibility and Equitable Accessibility

❖ Extensive validation and access to large volumes of well-selected data [5]
❖ Automated data collection methods
❖ Self-dependence for data
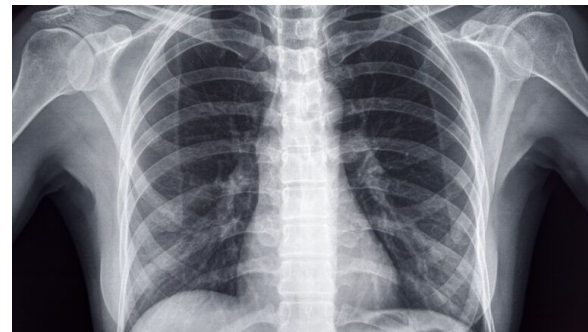❖ Eliminates human resources
❖ Quickly adapt to change

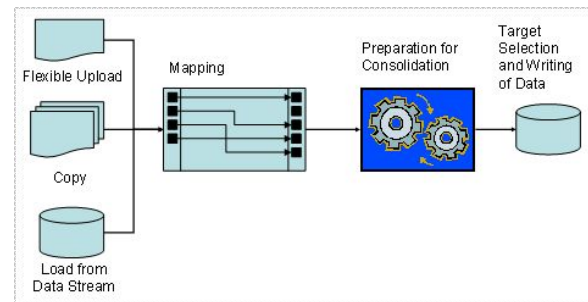**Figure 1**. Medical X-ray image in an AI dataset.
Source: STAT News - Health Tech

Flexible Upload
Copy
Load from Data Stream
Mapping
Preparation for Consolidation
Target Selection and Writing of Data

Figure 2. General principle behind the methods for automated data collection.
Source: SAP

❖ Reduce manufacturing and maintenance costs for lower selling prices [5]
  ➢ Complexity
  ➢ Upgradations
❖ Monetary assistance from governments

Figure 3. As part of the Coronavirus Aid, Relief and Economic Security (CARES) Act, the U.S. Department of Health and Human Services has provided over $175 billion USD to healthcare providers via the Provider Relief Fund. Similar policies could also be enacted for hospitals and facilities seeking to implement medical AI systems. Source: American Dental Association

Patentability

- ❖ Subject matter eligibility [6]
  - ➢ Step 2A ✅
  - ➢ Step 2B ✗
- ❖ Differentiate AI products from conventional clinical diagnosis methods in patent applications
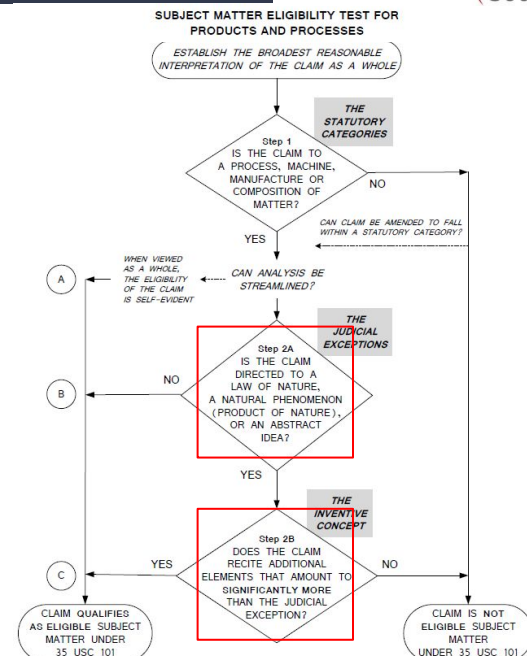

Figure 4. Flowchart of subject matter eligibility test. Steps 2A and 2B assess whether the product targets a patent-ineligible concept and is an inventive concept, respectively (see red boxes).
Source: United States Patent and Trademark Office

Patentability (Cont.)

❖ Long-term viability
  ➢ Medical supervision
❖ AI developers and manufacturers are liable for unintentional harm to patients due to malfunctions
  ➢ Ease financial burden on healthcare providers, who have lost an average of $50.7 billion USD monthly due to COVID-19 [7]

University of Maryland surgeon supervising the Smart Tissue Autonomous Robot (STAR). Source: University of Maryland

Conclusion

- ❖ Medical AI could greatly assist healthcare providers in terms of accuracy and efficiency
- ❖ Governments, AI manufacturers, and healthcare providers should consider the following proposed methodologies to address the ethical responsibilities involved in medical AI's implementation
  - ➢ **Feasibility:** automated data collection systems, reduced manufacturing costs, government financial support
  - ➢ **Patentability:** drafting patent applications, medical supervision, financial liabilities

Future Work

❖ Analyze patent law in additional countries
❖ Improve the theoretical design of proposed methods by surveying healthcare providers, AI manufacturers, legislators, and patients
❖ Conduct a small-scale pilot study to assess the empirical effectiveness of proposed methods
❖ Expand testing to multiple case studies to affirm reliability
❖ Dependent on the success of further experimentation, work with AI manufacturers and legislators to draft and implement policies in accordance with proposed methods

Acknowledgments and References

[1] Bruffaerts, Rose. "Machine learning in neurology: what neurologists can learn from machines and vice versa." *Journal of Neurology*, vol. 265, no. 11, 2018, p. 2745+. *Academic OneFile*.

[2] Zhang, Chenzi, et al. "Tu1217 The Use of Convolutional Neural Artificial Intelligence Network to Aid the Diagnosis and Classification of Early Esophageal Neoplasia. A Feasibility Study." *Gastrointestinal Endoscopy*, vol. 85, no. 5, 2017, pp. AB581-AB582. *Academic OneFile*.

[3] Siuly, Siuly, et al. "Guest editorial: special issue on 'Artificial Intelligence in Health and Medicine'." *Health Information Science and Systems*, vol. 6, no. 1, 2018. *Academic OneFile*, http://link.galegroup.com/apps/doc/A546393221/AONE?u=fol36665&sid=AONE&xid=1d74f8b3.

[4] Conn, Joseph. "Computing better healthcare; Artificial intelligence seen as aiding decision support." *Modern Healthcare*, 18 Feb. 2013, p. 0014. *Academic OneFile*, http://link.galegroup.com/apps/doc/A319765622/GPS?u=fol36665&sid=GPS&xid=2009a08e.

[5] Reddy, Krishna. "Advantages and Disadvantages of Artificial Intelligence." WiseStep, WiseStep.

[6] Tull, Susan Y. "PATENTING THE FUTURE OF MEDICINE: The Intersection of Patent Law and Artificial Intelligence in Medicine." Landslide, Jan.-Feb. 2018. Academic OneFile.

[7] "Hospitals and Health Systems Face Unprecedented Financial Pressures Due to COVID-19: AHA." *American Hospital Association*, American Hospital Association, May 2020, www.aha.org/guidesreports/2020-05-05-hospitals-and-health-systems-face-unprecedented-financial-pressures-due.