

Thesis Project Portfolio

Detection and Measurement of Lymph Nodes Using Artificial Intelligence

(Technical Report)

A Virtue Ethics Analysis of the Development of IBM Watson in Oncology

(STS Research Paper)

An Undergraduate Thesis

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In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Sociotechnical Synthesis

My technical work and my STS Research paper are interconnected through the concept of artificial intelligence (AI), specifically in the realm of healthcare. AI, a dynamic subset of information technology (IT), is rapidly evolving and holds promise in addressing critical challenges faced by health organizations. My technical work focuses on challenges of radiology and how it can be improved using an AI tool. On the other hand, my research explores a specific failure of AI in healthcare, known as the IBM Watson. Although both pieces of work differ in their approach with AI, they both underscore its potential breakthrough in healthcare.

My technical work delves into leveraging AI to develop an automated and user-friendly tool for lymph node detection and measurement, particular in radiology. The aim is to streamline the radiological workflow, mitigate human error, and enhance diagnostic accuracy for cancer patients undergoing CT and/or MRI scans. Collaborating with two other Capstone students and our advisor, Dr. Feng, I focused on using breast cancer nodule data (DICOM images and a CSV file) to implement and compare various neural networks. Additionally, I investigated the effect of the training data distribution and the potential to improve evaluation metrics, such as accuracy and F1 score, using additional parameters and training a logistic regression model. While we did not produce a fully functional final product, our hope is that our research lays the groundwork for lymph node analysis in the near future.

My STS research scrutinizes the developmental failure of IBM Watson in healthcare and employs a virtue ethics framework to assess the moral behavior of IBM Watson stakeholders during its development. The virtue ethics approach integrates ethics and psychology, emphasizing the cultivation of virtuous attributes, which lie between two extremes. I argue that IBM Watson stakeholders lacked informative communication and commitment to quality, openness to correction and perseverance, and competence. Through deeper analysis, I am to

illuminate instances where these key virtues were deficient, shedding light on the ethical dimensions of the project and the moral responsibilities of those involved.

Concurrently working on these two projects proved invaluable. My technical work strengthened my understanding of how AI can be utilized in healthcare, specifically in cancer detection, while my STS research paper underscored the many benefits of using AI and its potential to revolutionize healthcare, juxtaposed with a case study of its failure. This inspired me to pursue my technical project, while being aware of the challenges and the significance of moral virtues in its development. In conclusion, the parallel pursuit of my technical project and STS research paper throughout the year has facilitated the ethical development of the desired technical prototype.