

Thesis Portfolio

Digitization of Perioperative Medical Records

AI for Social Good: Responsible Use of Artificial Intelligence to Solve Modern Social Issues

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

John Radossich
Spring, 2021

Department of Systems and Information Engineering

Table of Contents

Sociotechnical Synthesis

Digitization of Perioperative Medical Records

AI for Social Good: Responsible Use of Artificial Intelligence to Solve Modern Social Issues

Thesis Prospectus

Sociotechnical Synthesis

Over the course of the past few years, artificial intelligence has boomed in terms of its research, development, and integration. This obsessive following has created a hype surrounding artificial intelligence, further propelling the demand users have for these products. While there is nothing wrong with technological advancement, the uncertain repercussions that will come from its integration into society should be considered. This thesis provides two perspectives: a technical report of AI integration to benefit society as a collective, and a critique on the irresponsible use of several machine learning algorithms that contain major flaws.

The Age of Information has drastically changed the way data is collected, utilized, and valued. With a parallel development of data analysis and visualization tools, system insights can be studied in order to optimize indices of performance. Hospitals in Rwanda, Africa lack the digitization of their patient medical records as they only exist in paper form. This is clearly problematic as the country is missing an opportunity to significantly enhance the performance of their healthcare system. In fact, the analysis of this data is critical to understand trends in the perioperative mortality rate, a metric that defines a successful surgery. Thus, an Android application was developed to streamline the digitization of these patient medical records into a centralized database, employing artificial intelligence powered image processing and edge detection technologies. With this development, the hospital will be able to translate a patient record to the database in a matter of seconds. In this case, artificial intelligence is being utilized for the improvement of a third-world healthcare program, potentially saving lives through proper analysis and integration.

While the technology stated above displays the sheer power of these tools, they are often developed irresponsibly with dangerous shortcomings. It is important to understand that these

tools are only as powerful as the data they are built upon. If this data contains strong biases towards factors such as age, race, or gender, these biases will be reflected in the machine's decision making. In the second part of this thesis, several examples of these misuse cases will be identified, showing that these algorithms are imperfect and must be carefully developed and tested. Furthermore, this section will highlight several opportunities to integrate artificial intelligence into socially beneficial projects such as sustainability optimization devices or the previously mentioned Rwanda example. In closing, this paper recommends political action regarding these influential technologies prior to their integration into society.