CS CAPSTONE PROBLEM STATEMENT

MAY 30, 2020

REDUCING PATIENT DOSE FROM DIAGNOSTIC IMAGING USING MACHINE LEARNING

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Abstract

This report describe the x-ray group's understanding of the problem of excessive diagnostic imagery radiation exposure. As the NDA for the group has not been signed yet, some assumptions are made for specifics.

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1 Problem to be solved

X-ray diagnostic imagery is a useful tool to view internal bodily structures. However, limiting the duration of the radiation at the frequency and intensity used is important due to its harmful side effects. If a doctor orders a diagnostic scan, they believe that the potential diagnostic findings outweigh the risk imposed by additional radiation exposure. X-ray diagnostic imagery tools currently take measurements until they have reached a certain amount of radiation exposure as detected by a radiation detector. This leads to needless exposure because a point is reached where additional radiation will not yield satisfactorily better imagery, but current tools are not sophisticated enough to know that point with enough accuracy. Finding a way to stop the imagery process earlier will in theory yield the same results with less radiation exposed to the patient.

2 Proposed Solution

The group will apply an algorithm already developed by researchers at Oregon State University and Georgetown University to better determine the stopping point for radiation. As machine learning requires good data, the group will work on data processing tools to clean and prepare the data for the implemented algorithm.

2.1 Technical Description

WEKA is an open source tool used for machine learning applications, and will be used to better estimate the optimal point of irradiation for sufficient imagery. Python, R, and other tools will be used for data preparation.

3 Performance Metrics

The main metric to be used is x-ray radiation reduction, for equivalent imagery. This will be measured by a radiation detector stationed at the Oregon State University TRIGA reactor.