



Research (Hypothesis-driven) Abstract Template

Topic

- Analytics/Business Intelligence
- Artificial Intelligence/Machine Learning/Deep Learning
- Enterprise Imaging
- Natural Language Processing/Reporting
- New Technology
- Productivity & Workflow
- Quality Improvement

Preferred Method of Presentation

- Oral Abstract Presentation (8 minutes + 2 minutes for Q&A)
- Poster (4'x8' poster board)
- Demonstration (interactive computer display; 4'x8' poster board also provided)

Title

Application of deep learning model in assisting radiologists to protocol cross-sectional radiologic studies

Introduction

Assigning the appropriate protocol is a critical step in radiology workflow. While on average it takes less than 30 seconds to protocol a study in our institution, currently over 1000 hours are spent annually on protocolling over 100,000 cross-sectional studies. Furthermore, in about 1/3 of the time, the radiologist has to scroll through the protocol list to identify the appropriate protocol.

Deep learning (DL) (a subset of artificial intelligence) has been applied to computer vision, speech recognition and other aspects of radiology. While the use DL in identification of pathology on diagnostic imaging has comprised the majority of AI research in the field, other potential applications of the DL are less understood. We set out to develop and test a DL model to assist radiologists in protocolling.

Hypothesis

DL based protocolling applications can reduce the time required to protocol studies.

Methods

Five years of historical data was used to train the DL model using available patient and exam information such as age, gender, patient type (ED, inpatient or outpatient), reason for the exam, modality, exam description, and selected protocol.

The deep learning service predicts a top 5 of most appropriate protocols for each scheduled CT and MR exam that is presented to the Radiologist above other protocol options. The top 5 of predicted protocols are sorted by probability and the first protocol displayed on top is auto selected.

In the pilot phase 500 consecutive studies from body CT list were protocolled by an experienced user before the implementation and 50 consecutive studies from body CT list were protocolled after model implementation. The time spent on protocoling was compared.

Results

There was no significant difference between the average time spent to protocol a study before and after implementation of DL (20 vs. 22.6 seconds, respectively). Interestingly 92% of the protocols selected were among top 3 suggested protocols by the DL, with the number one suggested protocol being selected 72% of the time.

Conclusion

We did not observe a significant decrease in protocoling time. However, it's noteworthy that this experienced user had a significantly lower protocoling time compared to average users (20 vs. 30 Seconds). Our preliminary results suggest that the deep learning proposed protocols are typically on point and selected most of the time (92%) by the Radiologist.

Our next step is to make the deep learning based protocoling available to a larger group of Radiologists at our institution, and analyze the data in great detail which we hope to present at SIIM 2020.

Statement of Impact

AI based protocoling applications can optimize workflow by improving efficiency and have the potential to play a pivotal role in assisting radiologists protocoling studies.

Keywords

Deep learning, protocoling, artificial intelligence