SHANTANU GHOSH

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Dear Recruitment Team,

I am writing to express my interest in the Research Scientist Intern position at your company for Summer, 2024. I am currently a Ph.D. Candidate in Electrical Engineering at Boston University under the supervision of Dr. Kayhan Batmanghelich. I am also co-advised by Dr. Forough Arabshahi from Meta Inc. I also hold a Master's degree in Computer Science from the University of Florida. My research areas include medical vision and deep learning. I am interested in developing explainable AI algorithms to understand the rich internal structure of a Blackbox model and enhance the reasoning methodology in terms of human-interpretable concepts in an image. Due to my research experience in machine learning (ML), I will be a suitable candidate for this position.

During my doctoral studies, I work on several significant research problems in explainable AI. Initially, I leverage the anatomical landmarks (weak labels) from the **Stanford RadGraph NLP pipleline** to create an attention-driven algorithm to localize pneumonia and pneumothorax from **MIMIC-CXR** dataset. Later, I develop a novel deep learning algorithm to blur the line between posthoc explainability and interpretable-by-design methods. The proposed methodology involves an iterative process that commences with a Blackbox and subsequently carves out a combination of interpretable models and a residual network. Each interpretable model specializes in a subset of samples and explains them with First Order Logic (FOL). These FOL explanations comprehend how the interpretable models compose the different concepts for prediction, thereby fostering confidence in AI models. We route the remaining samples through a flexible residual until all the interpretable models explain the desired proportion of data. My subsequent research successfully applies this method to eliminate the problem of shortcut learning. Additionally, the interpretable models identify domain-invariant anatomical concepts analogous to radiologists' interpretable rules for specific diagnoses. As a result, my follow-up paper shows the effective finetuning of these models to an unseen domain with limited data. These works have been published at top-tier ML and medical imaging conferences such as ICML and MICCAI.

Previously, I worked as a graduate assistant under the supervision of Dr. Mattia Prosperi at the University of Florida, conducting research in causal inference and deep learning. My master's research has been published in top-tier venues in biomedical informatics, such as AMIA and JAMIA. Also, I have 6.5 years of solid experience in software development across two multinational companies, Lexmark and Cognizant.

I have always been passionate about the interpretability and reasoning methodology of large AI models deployed in real-life applications. My unique academic and industrial background makes me a good fit for a research position in your company. I appreciate being considered for this role and hope to hear from you soon.

Regards,

Shantanu Ghosh
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