**Collaborative Authorship in the Manuscript Development of Deep Learning Techniques and the Creation of a Medical Web App User Manual**

**Scholar:** Om Arora-Jain

**College:** University of Michigan, Ann Arbor, MI

**PI:** Xia Jiang, PhD

**Mentors:** Xia Jiang, Yijun Zhou

**Site:** CoSBBI

**Background**

During the summer, my collaboration with Dr. Jiang involved two distinct projects. Firstly, I contributed to the composition of a manuscript detailing machine learning hyperparameter meta tuning. Deep feed-forward learning, also known as deep learning, has gained significant traction in the commercialized market but is yet to be explored in-depth clinically. Our objective was to conduct meta-tuning of deep learning models concerning the prediction of late onset breast cancer metastasis (BCM) using a grid search strategy called Single Hyperparameter Grid Seach (SHGS). Secondly, I created a comprehensive user manual v0.1 for the iMed web application, developed by Jiang’s lab to offer online services such as data analyses, learning, prediction, and decision making. The user manual that I developed help users gain a deeper understanding of the functions provided by the iMed, such as train a model, plot ROC curves, or predict an outcome using models and analysis. The goal was to create a user-friendly guide that would enable anyone from professionals to patients to effectively utilize iMed’s functionalities.

**Methods**

To pursue our research objectives, we used a wide range of methodologies. For the machine learning manuscript, extensive literature search was used to gain a knowledge base and identify evidence that supports our research findings. Authors with agreeing views, disagreeing views, information that corroborated our hypotheses, or totally alternate ideas were discussed and included using a reference management software called Mendeley. I also used online resources such as Lucidchart, enabling me to create a flow chart for readers to visually understand how SHGS works. I was able to develop the user manual by first learning how to use the iMed functions and testing them under the instructions from my mentors. I also learned to deploy the user manual to AWS and create a bookmark system in WORD, which allows the user to jump to find what they need.

**Results**

I focused on writing about the procedures of SHGS for hyperparameter meta tuning and the discussion section, in which I took the responsibility of discussing 3 of the 8 hyperparameters we tuned in this study. The three hyperparameters are learning rate, momentum, and decay. I discussed the findings we have related to each of them, as well as their relationship to each other and how certain hyperparameters have more of an impact on model performance than others. The user manual was also completed and incorporated into the­­­­­­­­­­­ web application and can be found at http://imed.odpac.net/static/user\_manual.pdf.