

Isaac Olatunji

PERSONAL STATEMENT

I was the first on call in the Maxillofacial department during my National Youth Service year when I was invited to attend to a 19-year-old male patient who presented with a rapidly growing, severely painful, ulcerated facial swelling that had extended from left to right side of his lower face and neck. As I had to refer him to a more equipped hospital for a comprehensive management, the boy's father asked me in their native language "Doctor, are you sure everything will return to normal once we get there?". Of course, I couldn't give a definitive answer even though I knew the most likely outcome, from putting one and two together. How cool would it have been if I could write a prescription on the spot and reassure them? After completing my first degree in Dental Surgery in Nigeria, I already knew I would have a research career. From my experiences, and observations during my clinical years as a student, I had become more curious about the presentations, and course of some conditions beyond the scope of clinical practice, particularly cancer. Rather atypical of a pure clinician's training, I began to dig more into the molecular basis for cancer, and I did find interesting revelations in the literature. However, with more knowledge came more questions. In summary, this led to the publication of my article titled "Potential Application of Tumor Suppressor MicroRNAs for Targeted Therapy in Head and Neck Cancer". Along the way, I found it cool the idea of creating something from the scratch, and building it based on one's specifications. In short, I taught myself how to program! The combination of these knowledge, and other skills from various sources have all culminated in my research interests, and current work.

In our recently published work, which was part of my masters thesis, we explored the use of multimodal data- genomic, clinical, and histopathology images for the prediction of Distant Metastasis (DM) in carcinoma patients. In this work, we applied an optimization technique with

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the random forest algorithm for identification of gene expression biomarkers in distant metastasis samples, and also investigated whether similarities exist between metastatic genes in the three different types of cancer studied. The genes selected by our method performed better than differentially expressed genes that were selected using the DESeq2 software. Also, our results confirmed that no single specific gene can certify the presence or absence of DM, rather DM is influenced by various combination of genes which are different in each cancer type.

To predict DM directly from histopathology images, we tested the DenseNet121 Convolutional Neural Network (CNN) architecture as well as KimiaNet, a DenseNet121 architecture model pretrained on ImageNet data and finetuned on about 250000 domain histopathology images. KimiaNet did not provide a tangible advantage over DenseNet121 in the task of prediction of DM from histopathology images. Overall, combining genomic, image, and clinical data for prediction of DM gave better results, however genomic data provided the highest contribution.

Beside my thesis work I have also been actively involved in multiple group and individual projects, some of which are listed on my resume. I am passionate about application of AI in precision medicine, and drug discovery. Going through the list of faculty members, I am fascinated by the research of Dr. Mohammed AlQuraishi, Dr. Elham Azizi, and Dr. David Knowles.

I believe my past experiences have prepared me well for this position. I possess a combination of computational and statistical skills, strong knowledge of molecular biology, as well as clinical patient management experience. This means I can identify research gaps, design research with consideration of its final clinical applications, and with my technical skills carry out the research. I am certain that the PhD Computer Science program at Columbia University will be just perfect

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to merge my skills, and experiences as I look forward to creating better healthcare solutions.

Perhaps in future, a 19-year-old's life will be saved by writing a prescription.