

Research Theme: Future Healthcare
Research Project Title: Understanding 3D genome organization in cancer through an integrated artificial intelligence and molecular biology approach
Principal Investigator/Supervisor: Asst/Prof Melissa Fullwood
Co-supervisor/ Collaborator(s) (if any): NA
Project Description <p>Cancer genome sequencing has revealed that many factors associated with epigenetic processes are mutated in cancers, and epigenetic processes have been targeted by specific drugs. One of the mechanisms by which the non-coding “dark matter” of the human genome could be functional is by long-range chromatin interactions with target genes. Chromatin interactions are regions of the genome that are far apart in the linear genome sequence but come together in close 3-dimensional spatial proximity, may constitute common mechanisms for gene regulation. In the lab, we have been using artificial intelligence to predict chromatin interactions, and are interested to apply these models to look at differences between chromatin interactions in cohorts of patient samples. We are also interested to use artificial intelligence to predict transcription factor binding and histone modifications at chromatin interactions. We will then analyze chromatin interactions that are present in cancer but not in normal patients, or chromatin interactions associated with different subtypes of cancers, by using a combination of molecular biology tools including CRISPR to functionally characterize the chromatin interactions and associated genes. We hope that this project will give a better understanding of the role of chromatin interactions in cancer, and lead to the development of new epigenetic therapies for reversing chromatin interactions and cancer, as well as the development of new chromatin interaction-based biomarkers for cancer. The ideal PhD student would be highly motivated and self-directed, with an understanding of both bioinformatics and molecular biology.</p>
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