PHD STUDENTSHIP PROJECT PROPOSAL

PROJECT DETAILS	
Project Title:	**Deep learning the chemopreventive action of NSAIDs in Barrett's oesophagus**
SUPERVISORY TEAM	
Primary Supervisor(s):	Yinyin Yuan
Additional members of the supervisory team:	Shan Raza and Alan Melcher
Lead contact person for the project:	Yinyin Yuan
DIVISIONAL AFFILIATION	
Primary Division:	Molecular Pathology
Primary Team:	Computational Pathology and Integrative Genomics

PROJECT DESCRIPTION

Barrett's oesophagus is a common premalignant condition of the lower oesophagus. The associated cancer, oesophageal adenocarcinoma, is a devastating disease with an average five-year survival of only 15%. Lacking effective strategies to predict and prevent the progression to EAC, significant time and resources are spent on patients who will never progress, while failing to identify many patients who will develop subsequent disease with significant morbidity and mortality.

To develop novel approaches for the study of Barrett's esophagus, this project will use deep learning at the forefront of artificial intelligence for analysing histology images of BE. There are three components in this PhD project: 1) Develop a computer vision pipeline for analysing routine Barrett's histology samples using deep learning; 2) Characterize the spatio-temporal changes in Barrett's histology over drug use and 3) Combine with genomics using bioinformatics.

This project is driven by the urgent clinical need for greater understanding of driving factors for Barrett's oesophagus progression. It aims to bring together digital pathology, artificial intelligence, and integrative bioinformatics, which could have direct translational impact. It will contribute to the scientific understanding of Barrett's esophagus and help accelerate the integration of digital biomarker with clinical practice in the future.

The student will develop transferable skills and full competency in programming in Python and R, computer vision, and machine learning. Specifically, he/she will acquire expertise in the development of deep learning algorithms and digital pathology software, experience in applying statistical methods to

cancer data, a deep understanding of pathology and neoplastic progression, and excel at working in a highly translational and collaborative research.

This is an exciting project to use artificial intelligence for cancer prevention in collaboration with Prof. Maley (http://www.maleylab.org/) and Prof. Reid (https://sharedresources.fredhutch.org/profile/reid-brian). Students receive an annual stipend, currently £21,000 per annum, as well as having fees and project costs currently at £12,500 per year for the first three years and £6250 in the final year.

CANDIDATE PROFILE	
Note: the ICR's standard minimum entry requirement is a relevant undergraduate Honours degree (First or 2:1)	
Pre-requisite qualifications of applicants: e.g. BSc or equivalent in specific subject area(s)	BSc or MSc in computer science, bioinformatics, or equivalent quantitative disciplines
Intended learning outcomes: Please provide a bullet point list (maximum of seven) of the knowledge and skills you expect the student to have attained on completion of the project.	• expertise in the development of deep learning algorithms, • expertise in the development of digital pathology software, • transferable skills and competency in programming and image processing, • experience in applying spatial statistics to cancer data, • a deep understanding of BE pathology, and • experience working in a highly translational and collaborative research environment.