WTDTP Projects for September 2023

Project Reference: T1/54

Project Title: **Applying machine learning to find clinical and genetic predictors for radiotherapy side effects**

Theme(s): Theme 1: Genomics for drug development & pharmacogenetics

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Project Summary: Radiotherapy is effective at killing tumours but can cause side effects that impair a patient’s quality of life. Efforts are underway to find predictive factors for radiotherapy toxicity, which would then allow alterations to treatment. Known predictive factors include genetics, co-occurring diseases, radiation dose distribution, chemotherapy and others. Additional complexity comes from there being different side effects in different body tissues, even if the underlying biology has common pathways.

We have previously collected treatment and outcome data on radiotherapy patients treated for breast, lung and prostate cancer. Some genetic studies have been carried out using conventional statistical approaches, but this project aims to apply machine-learning methods to the problem. The student will compare different methods to conventional statistical approaches, working as part of a multi-disciplinary team. We were recently awarded a five-year EU funded grant for a project called PRE-ACT, which aims to leverage the huge potential of AI towards prediction of radiotherapy side effects and will provide an excellent framework for the student to work collaboratively with experts across Europe. The outcome will be an improved ability to identify patients at increased risk of having side effects from radiotherapy, and understanding of the factors that cause them. The results will allow personalised medicine approaches to radiotherapy to improve treatment outcomes.

The student will be co-supervised by academics with experience in genetics, statistics, machine learning and oncology, with other collaborators who are experts in artificial intelligence. Full training will be given according to prior experience, and the project is suitable for students from a range of backgrounds e.g. genetics, computing & physics.