

## **Hilary Term: Health Data & Methods**

Orientation - Introduction to health data research; transferrable skills training (e.g. scientific writing)

### **Ethics of Health Data Science**

Public versus private data ownership; electronic health records and wearables: ethical issues; ethical issues in infectious disease research; data security and ethics; and consent for data usage.

### **Health Data: Patient pathways**

Introduction to healthcare systems; patient pathways; decision making; health records, messaging, and interoperability; pathway and process modelling.

### **Health Data: Linkage**

Data and metadata standards; data provenance, security, and integrity (hash functions, digital signatures, distributed ledgers, privacy-preserving technologies); record linkage, normalisation, and de-identification.

### **Health Data: Hospital Episode Statistics**

Terminologies; ontologies; knowledge representation and reasoning (propositional, predicate, and description logics); natural language processing; decision support and recommender systems.

### **Health Tech: Wearables**

Fundamentals of sensing and measurement; types of biosignals (ECG, pulse oximetry, blood pressure, accelerometry); sensor data feature extraction (time-based, frequency-based, waveform shape).

### **Health Tech: Imaging**

Medical imaging; image processing (normalisation, segmentation, registration); image quality; imaging feature extraction; imaging biomarkers.

### **Health Tech: Genetics**

Genomic medicine; human genome; genetic variation; gene regulation; mutational mechanisms; modes of inheritance; sequencing and testing; genomic biomarkers.

## **Introduction to Epidemiology**

Foundations of Epidemiology; disease frequency, association, and population impact; causation; confounding and effect modification; large-scale randomised evidence; cohort studies; case-control studies; randomised controlled trials.

## **Infectious Disease Epidemiology**

Introduction to infectious disease modelling; outbreak analysis; geostatistical modelling; neglected tropical diseases.

## **Pathogen Evolution and Phylodynamics**

Introduction to genomic epidemiology; viruses and phylodynamics; bacteria evolution and antimicrobial resistance; within-host evolution.

## **Data Challenge**

Two weeks using at-scale health data to answer a practical question of interest.