Translational Medicine in the collaborative “cloud” is a new model being offered for online collaborative ILP/ HONS research. This virtual research program will be able to accommodate >15 RCS ILP projects / Hons students interested in translational medicine research while being located within a UNSW rural campus. Translational research in the “cloud” provides experience across a number of scientific field’s, including but not limited to; medical informatics, evidence based medicine, ICU physiological data analysis, pathology, cardiology, radiology, clinical neuroscience, genomic medicine, population medicine and surgical sciences. The translational research “cloud” model has a team approach consisting of research active collaborators. The ideal model is a small virtual team of 4 to 5 like minded students per project working on a common core theme however asking slightly different research problems.

Example Projects can range from:
- Gene SNP association studies either from public domain resources or from work being undertaken with the UNSW Rural Biobank; OR
- Modelling molecular signatures to understand aggressive brain tumour outcomes (access to whole genome data and detailed digitised brain tumor pathology sections, MRI images and patient survival); OR
- Pathological assessment of immunohistochemistry protein expression in translational models of cardiovascular remodelling; OR
- Heart rate variability in rural communities (develop a deep understanding of the cardiac autonomic nervous system, the ECG and learn to calculate HRV parameters); OR
- Web based pharmaco-informatics (predict adverse side effect trends in a therapeutic via analysis of thematic reviews); OR
- Use a global stroke data base of 20,000 patients to model rural community needs and or costs
- Model ICU physiological parameters or derive new parameters from real time ICU data and clinical information.

Benefits of translational medicine in the “cloud” include: Know what you are doing early on; ethics has been pre-approved Or simply ethics is not required - as projects are based around use of public domain information and or open source data. Access to high level clinical and genomic data can be provided. More than one student can be involved in the same project, while addressing slightly different research questions. Thus the concept of student collaboration and bouncing ideas around / across different locations is possible. Spend your time productively thinking about science and being trained in the art of science without worrying about will my ethics ever be approved. You will be working with academics that are experienced in student mentorship and know the acceptable level for an ILP year. We suggest that while in our program you also find one or more clinical mentors for a self negotiated clinical observer role. In summary - the aims of these translational projects in the “cloud” are to provide a risk adverse and highly stimulating ILP / Hons year. Be part of the next collaborative platform – virtual data driven science. Care to meet minds in the “cloud”

Summary

- No ethics required
- Transparent data sharing
- A common ecosystem for all projects
- Higher probability for a co-authored paper
- Supportive high level academic supervisor/s and mentors
- Asynchronous engagement through collaborative platforms
- Higher level statistical support
- Academic writing mentoring
PROJECT 1  Real time ICU data predicting associations and outcomes

We are in the process of obtaining a large clinical data base with real time ICU data including continuous ECG, pressures, clinical biochemistry, ICU SOFA scores, hourly temperature, blood glucose. Patient cohort includes post surgery and sepsis. We wish to compute and model novel heart rate and blood pressure dynamics and determine how these relate to changes in systematic inflammation over longitudinal time and clinical outcomes.

**Student Development**

Awareness of the types data collected in an ICU ward and its interpretation. Gain experience in understanding the meaning of non obvious parameters in clinical medicine that may underlie serious infections, such as heart rate or blood pressure fluctuations, temperature, white cell counts. Assistance will be provided in requesting data base information and modelling physiological parameters. **Suitable for students interested** in general medicine, intensive care medicine, surgery, cardiology, respiratory medicine, renal medicine

**Probability of a co-authored publication**

medium
**PROJECT 2**

**GENOME WIDE ASSOCIATE STUDIES: SNP INTERACTIONS WITH CHRONIC DISEASE AND CANCER PHENOTYPES**

Genome Wide Association Studies (GWAS) are an increasingly popular method used to investigate genetic diseases and traits. These studies produce large-scale individual genetic data; generated by assaying hundreds of thousands of common Single Nucleotide Polymorphisms (SNPs) across hundreds of individuals in the search for genetic variants that have causative effects on a disease phenotype or trait. Certain chronic conditions such as diabetes have been shown to be associated with a higher incidence of certain cancers. This project aims to identify genes associated with a selected chronic condition and determine whether these same gene polymorphisms are present in cancer populations using public domain and library data.

**Student Development**

- The concept of GWAS explored in depth, public domain gene data and medical informatics, SNPs, chronic disease genes, genome data mining; Research collaboration; Personalised medicine; Genomic medicine; Population diversity; Basic statistics; Searching the literature

**Suitable for students interested in**

- General medicine
- Genetics
- Oncology
- Personalised medicine
- Research

**References / Videos**

- [https://www.youtube.com/watch?v=o4KNG7nd938](https://www.youtube.com/watch?v=o4KNG7nd938)
- [http://www.nature.com/nature/journal/v447/n7145/full/nature05911.html](http://www.nature.com/nature/journal/v447/n7145/full/nature05911.html)

**Probability of a co-authored publication**

- Low – medium
**PROJECT 3  GENETIC SNP TESTING IN A RURAL POPULATION**

Our group has invested considerable time and effort in developing a rural bio-bank for gene association studies. We have collected information at the population level on age, sex, smoking, BMI, blood pressure, ECG parameters, eGFR, blood glucose, lipids, insulin resistance, medications etc. DNA has been extracted and tested for purity using nanodrop technology. This project allows an ILP student to pick one gene of interest to correlate with a rural patient phenotype. For example you may wish to test a novel gene polymorphism/SNP for associations with high cholesterol OR increased systolic blood pressure. You can be the virtual translational project manager and explore a new and novel gene in a research consultation with the PIs for the rural bio-bank projects.

<table>
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<tr>
<th>Student Development</th>
<th>SNP identification; Gene Association Studies in rural populations, Diabetes; CVD risk; Research collaboration; Personalised medicine; Genomic medicine; Population diversity; Basic statistics; Searching the literature; Ordering a SNP from a company; Project management;   Risk: Low   Experience required: Basic  Suitable for students interested in general medicine, cardiology, genetics, rural medicine, personalised medicine, research</th>
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<tr>
<td>References / Videos</td>
<td><a href="https://www.youtube.com/watch?v=o4KNG7nd938">https://www.youtube.com/watch?v=o4KNG7nd938</a></td>
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<tr>
<td>Probability of a co-authored publication</td>
<td>Medium</td>
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We have developed a translational model of cardiac hypertrophy in mice via inhibiting nitric oxide synthase (NOS). Our cardiac bio-bank provides heart tissue for students to explore novel protein expression markers in tissues in which are either hypertrophic or have a lack of nitric oxide. Students have the option to select an antibody biomarker and characterize its expression profile across the cardiac LV and RV cross sectional surface. Expression is determined via immunohistochemistry using the ABC method. Microscopy images and data are placed in a virtual platform for online analysis. This will permit analysis of pathological myocardial tissue expression using NIH image. Thus an opportunity for a student to characterise a protein in the normal and pathological heart.

**Student Development**

Literature review on cardiac hypertrophy. Experience in understanding the methods of tissue immunohistochemistry, myocardial anatomy. Students will gain an understanding of the role of cardiac hypertrophy and its pathological regulation. Experience will be gained in image analysis software and quantification of protein expression in tissues with respect to microscopy images. **Suitable for students interested** in general medicine, cardiology, pathology, biochemistry, pharmacology

**Probability of publication**

High
In 2011, there were recorded 60,000 new and recurrent strokes in Australia. Seventy four percent of stroke survivors return home to the community and require ongoing care and support. The burden of care most often falls to family members with 57% of survivors receiving assistance from a family member. The cost of treating a stroke in a NSW hospital on average is estimated to be $10,700. However, the likely costs incurred if you are over the age of 75 and your stroke is treated or not treated in rural or regional areas of NSW have not been modelled with respect to short and long term costs. This project provides an opportunity for a group of students to model health costs in a select and venerable stroke population in regional NSW. Students will have access to a data base of more than 10,000 international stroke outcomes including Australia.

**Student Development**

- Literature review, systematic review of stroke costs in NSW using published data. Building computer models for decision tree analysis for health costs based on older stroke patient outcomes presenting to hospitals in rural and regional areas of NSW. Learning decision tree analysis that can be applied to health policy or treatment modelling outcomes. Risk: Low
- An interest in data modelling or informatics. Suitable for students interested in general medicine, cardiology, neurology, geriatrics, health services, health economics

**Probability of a co-authored publication**

High
It has been known for a long time that the growth of prostate cancer cells are driven by androgens. In males, androgens are synthesized by the testes and by the adrenal gland. Despite a primary response rate of 80%–90% with hormonal ablation, almost all patients, in due course, advance to a state of androgen independence manifested by increasing prostate-specific antigen (PSA) levels, new lesions on bone scans, and worsening symptoms. The aims of this project are to produce a systematic review of current practice and to model length of androgen ablation on either side effect outcomes or its influence on new cancer relapse. Can we find a signal in the literature?

**Student Development**

Literature review, systematic review of data sets from the published literature. Building computer models for decision tree analysis for androgen inhibition outcomes based on length of inhibition. Understanding prostate cancer, hormone levels of testosterone on bone and fatigue and cancer cell biology. Learning decision tree analysis that can be applied to health policy or treatment modelling outcomes. **Suitable for students interested** in *general medicine, endocrinology, general practice, cancer medicine, urology*

**Publication Probability**

Low