The following projects are all advertised as 11 week projects over summer 2020/21 with the Monash Data Visualisation and Immersive Analytics Lab

Tangible Devices for interacting with immersive data visualisations
Tim Dwyer, Maxime Cordeil, Lonni Besancon

Background and Motivation
To interact with data in charts, plots and other visualisations, traditionally we use standard desktop mouse, keyboard and touch interactions. The IA Lab has been developing novel devices that are better suited to interacting with data, using tangible, actuated slider and rotational encoders to perform data selection and navigation tasks. In Immersive environments these devices can be especially valuable to help participants to "feel" and interact with data with precise control.

Aims
We want to further explore this mode of interaction by developing new hardware devices and the software (mostly in Unity3D) to employ them in Immersive Data Visualisation.

Skills Required
Strong programming skills, particularly in creating interactive, graphical systems, ideally using Unity3D and C#.

BodyVis: Using our bodies to interact with data
Tim Dwyer, Maxime Cordeil, Barrett Ens, Lonni Besancon

Background and Motivation
Why limit data visualisation to only our eyes? We want to make data understanding a "whole body" experience. This project will explore using finger, hand, head and whole-body interaction with data in immersive environments.

Aims
We will use an advanced Vicon 3D tracking system to precisely track peoples movements in a 3D Data interaction space and allow them to use these movements to work with and better understand data.

Skills Required
Strong programming skills, particularly in creating interactive, graphical systems, ideally using Unity3D and C#.

Funding
Immersive Analytics

Telling the story of Australian Energy: the Past, Present and Future.
Sarah Goodwin and Roger Dargaville (Civil Engineering)

Background and Motivation
The energy industry is evolving, and transiting to a new era with renewable energy being at the forefront. Making Australia aware of the lessons from the past and the predictions for the future is essential for us to start to understand how the country is changing for the better and what still needs to be done to ensure a more sustainable energy future for the population.

Aim
Based on an interactive storytelling example for the UK developed CarbonBrief (video) this project will seek to bring this story to life by exploring the data to show the history, present and future of energy in

this country. This project involves collecting, aggregating and preparing spatial-temporal data for an interactive website, that has been initially designed and developed based on the UK example. In addition it will include improving the design and implementing interventions to allow the reader to see and explore the visual story of how the Australian energy industry is changing for the better.

Skills Required - basic knowledge of geographical, network and temporal data, data wrangling, visualisation interface design, basic programming with html, javascript and Mapbox JS GL, interest in the energy sector

Using Smart Meter Information to Map Low Voltage Energy Networks
Sarah Goodwin and Reza Razzaghi (Electrical Engineering)

Background and Motivation
With the transition of the electricity industry from centralised generation with one way-flow to generation distributed (DER) throughout the low voltage (LV) distribution networks which results in bidirectional flows from multiple points throughout the electricity grid. The LV networks were not designed for such capability, and the detailed understanding of their capabilities is not sufficiently monitored or understood. In order to maximise the capacity of the networks, and ensure minimal expenditure for any upgrades, while also maintaining a safe and reliable supply, the distribution companies need to have much smarter ways of analysing, visualising and understanding of their LV Distribution Networks. This includes using new data sets, such as smart meter data, that is increasingly becoming available and can be seen as more accurate and detailed data set to take advantage of.

Aim
This project aims to address some of the visibility challenges currently seen in power distribution networks. Using Victoria as a case study we seek to explore the benefit of using smart meter data (location and attributes) to approximate the LV network topology and visually presenting this network spatially.

Skills Required
Geographical data analysis, network visualisation, data wrangling, basic programming

Data visualisation on low-cost computing devices

Supervisors
Maxime Cordeil, Tim Dwyer

Background and Motivation
Data visualisations are a powerful means to understand data and make informed decisions with it. Most interactive visualisation tools available today are designed for high-end, powerful computing devices such as laptops, tablets and smartphones. However those devices are costly -- making them less accessible to some communities -- and are also very power-consuming. The motivation of this project is to explore the possibilities of data visualisation on low-cost and low-power computing devices and display. This research will help explore the design of low-cost interactive visualisation devices for communities, and the possibilities for general purpose low-cost and low-power computing.

Aims
The aims of this project are

1- to build a low-cost microcontroller-based interactive display device for data visualisation, inspired by projects such as this ESP32 low-energy interactive device
2- to build a basic interactive data visualisation library to run on the low-cost device

At the end of the summer internship, the prototype should be able to load a basic dataset and display multiple types of visualisations (e.g. bar graphs, scatterplots), and allow for basic interaction such as point selection and filtering.

Skills Required

The project will involve assembling a simple electronic device with a low-power display such as this prototype: https://hackaday.io/project/169103-low-power-esp32-handheld. Hence previous experience with electronics such as Arduino/Raspberry Pi and basic electronics would be required. Programming in Java/C style will be required to handle user input and display data on the screen.