Assignment 1: ArcGIS Exercises

- **Due date:** Sunday, March 22nd 2020, 11:59pm (first 3 core modules)
  Sunday, March 29th 2020, 11:59pm (remaining modules)
- **Submission**: Upload the completion certificates provided by ESRI + final map of Module 2.
- **Assessment:** This individual assignment is worth **10 marks** in total. Assessment points are:
  - Completion of the first 3 core modules (8 marks)
  - Completion of all additional modules (2 marks)

Learning objectives

These exercise modules help you familiarise with one of the most commonly used GIS software – ArcGIS by ESRI. These modules will ease you into the software and help in understanding principles taught in this subject. You are highly encouraged to start on these exercises before the semester begins. The learning objectives are:

- To familiarise yourself with the basic functions of ArcGIS, including data storage, manipulation, and displaying of spatial data.
- Demonstrate practical understanding of the fundamentals of spatial analysis and visualisation using GIS software.
- Using GIS software to support decision making in a selected scenario, eg. emergency management, land administration, environmental assessment etc..

Tasks

An ESRI account is required to download ArcGIS Pro and begin these exercise modules. Sign-up at https://accounts.esri.com/signup and an email will be sent to you sometime early in the semester to activate and link your account to Unimelb. Once linked, you can download ArcGIS Pro as follow: Select your account name on top right after sign in > My Esri > My Organizations tab > Downloads Products > ArcGIS Pro (2.2). Be sure to also download ArcGIS Pro 2.2 Patch 4 (2.2.4).

This software requires Windows operating system to run. If you are using OSX, Bootcamp with Windows will work fine.To obtain a free copy of Windows, visit https://unimelb.onthehub.com and sign up with your student email.

These modules can be found by entering each module name into the search function at https://www.esri.com/training/catalog/search/

Exercise modules:

3 Core Modules:	ArcGIS Pro Basics	(certificate)
	Getting Started with ArcGIS Pro	(upload final 2D-map, PDF)
	Displaying Raster Data in ArcGIS (*Pro)	(certificate)
Additional Modules:	Processing Raster Data using ArcGIS Pro	(certificate)
	Distance Analysis using ArcGIS Pro	(certificate)

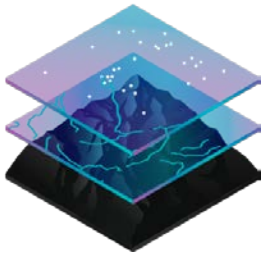
*For Displaying Raster Data in ArcGIS, select ArcGIS Pro as your software when you begin. Note that most modules above require a special licence key which will be emailed to you early in the semester. To download your Certificates, click on your ESRI username on the top-right > Training, select My Academy > My Learning Activity > View Certificate. Click download icon on top right of new page.

ArcGIS 'Cheat Sheet'

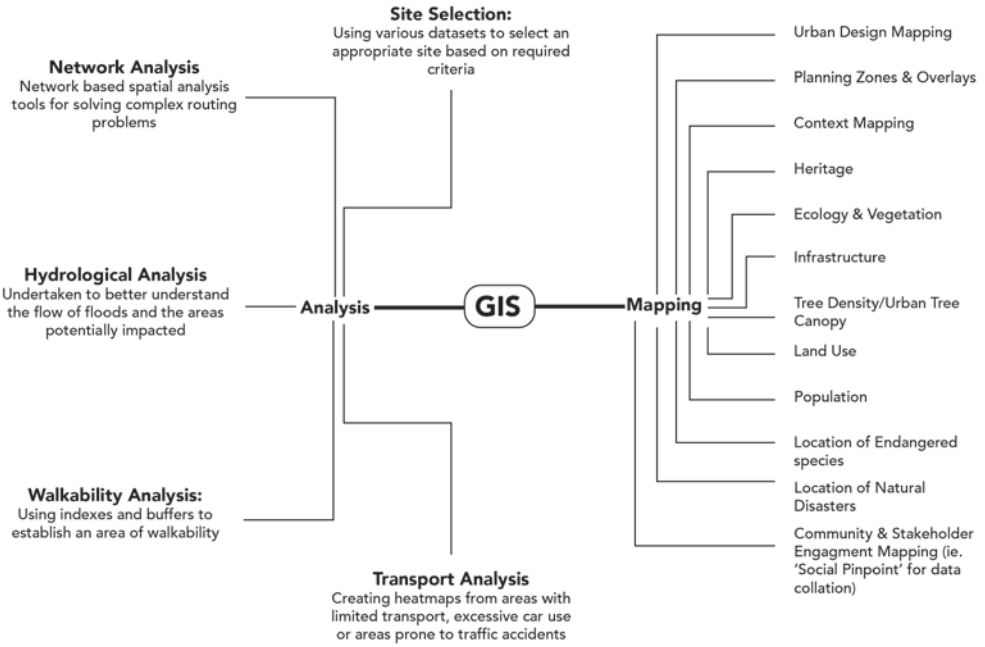
A Geographical Information Systems (GIS) at its core, is a programme that helps you make maps amongst many other things! You can organise, communicate and understand the science of our world. It allows users to gather, manage and analyse spatial data. This can be done in a variety of different forms, with outputs including 2D maps, 3D scenes, animation and even charts!

What can you do with GIS?

- Find/measure geographic features
- Perform site selection analysis
- Summarise geographic information
- Compare map layers
- Perform surface analysis



How does GIS help you?
GIS can be used for a variety of different fields. If there's a spatial component to your work, GIS can be used. Some of the work you can do include:

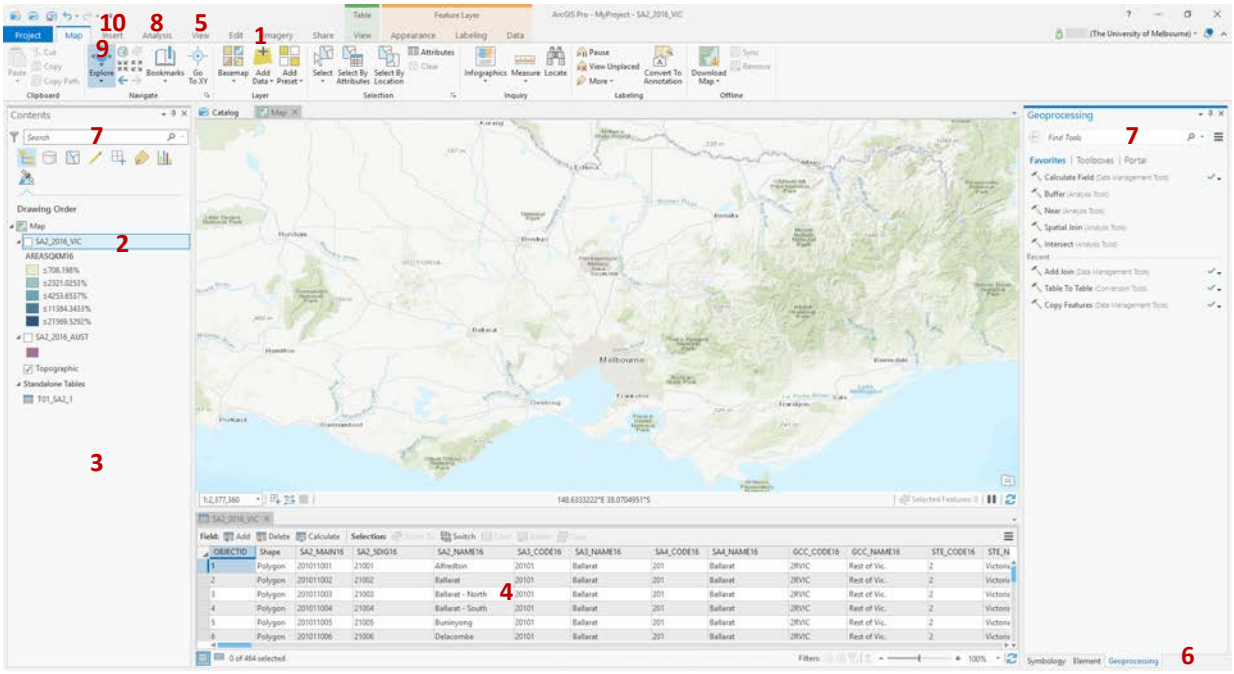


Things to Keep in Mind:

- On GIS you can work with both Vector data and Raster Data.
  - **Vector Data:** Datasets in the form of Points, Polylines and Polygons.
  - **Raster Data:** Datasets containing cells (or pixels) organised into rows and columns (grids), with each cell containing a value representing information. Rasters can be digital aerial imagery, imagery from satellites or even digital photos.
- GIS uses 2 different types of vector file formats: **Shapefiles (SHP)** or feature classes in a **Geo-database (GDB)**. Just remember, when you open a shapefile in file explorer, there will be multiple files. You need all of these to be able to open the file from within the programme. When you add data in ArcMap, you'll notice that they collate and become one single shapefile.

- Getting the co-ordinates from a round globe to a 2D map can be rather difficult! For this reason, there are 2 types of coordinate systems used in GIS:
    1. Global or spherical coordinate systems such as Latitude and Longitude are known as **Geographical Coordinate Systems**.
    2. **Map Projections** which is known as the process of 'projecting' the earth's spherical surface and coordinates onto a 2-D Cartesian plane.
- For most of Victoria, the best Map Projection to use is: GDA 94 MGA Zone 55. The zones are broken up sort of line how you see time zones broken up on a map! For more information on Projections, watch this video: https://www.youtube.com/watch?v=kIID5FDi2JQ
- Vector datasets contain something called an **Attribute Table**. This is like an excel spreadsheet attached to the data. Each spatial element has information attached to it. For example, a polyline road network dataset will have the road name, type as well as several other key information attached! Imagine each feature is a row in the spreadsheet. If there's no information for certain columns, it remains blank.
- To change the **symbology** of datasets, double click on the symbol within the contents pane, under the layers and a new window will pop up to prompt you to change the symbols and the colours as you like.

Sample Workspace:



1. **Add Data** This button allows you to add shapefile and raster data as well as adding aerial/Basemap imagery.
2. **Layers** To change properties of this map, right click on this button and select *Properties*. This is where you can also add in the appropriate Map Projection or Geographical Coordinate System
3. **Contents Pane** All datasets will appear in this section, broken up like layers. As it can be seen here, there are 2 vector layers, 1 raster, and 1 table.
4. The **Attributes Table** contains invaluable information about all the spatial data in the map! To get to this, right click on the data layer within the contents pane and select *Attribute Table*. In this example, we're looking at the attribute table for Victoria's regional statistics. As you can see the data includes the name of the regions, and the unique numerical ID for each region.
5. **Layout View** In this sample below we are viewing the map in data view. We can undertake spatial analysis and sort through our data easily in this view. It's sort of like a workspace before you get to Layout View.

When you have completed all the analysis and included all layers you need, switch to the layout view to work on your template.

6. **Catalog** This is an additional pane / programme that comes within the ESRI Suite (Imagine ESRI as 'Microsoft', ArcMap is 'Word', ArcCatalog is 'Excel' etc etc). This is used to keep track of data management. You can create shapefiles within ArcCatalog and work on them in ArcMap.
7. **Search** The search function can be used to search for data, maps, tools etc.
8. **Tools** This is where all the fun begins! Under Analysis tab, Tools contains all you need to complete any type of spatial analysis and create any type of cartographic map! If you're unsure about where tools sit, use the *search* icon to type it in, and it'll link you to its location in the toolbox!
9. **Explore** By clicking on this and then selecting a feature in your data view, you will be able to see all the attributes associated with that item.
10. **Insert** North Arrows, Legends, Scale bar and Scale Text can all be added from this drop-down menu. Mostly useful after you insert a New Layout and a new Map Frame.