Week 10: Introduction to LaTeX / Overleaf

Introduction

This worksheet will take you through a guide on how to use LaTeX through Overleaf. These together allow you to **produce more professional looking documents/reports/articles**, without the difficult hassle of trying to format on Microsoft Word! This is something that you will likely have to learn before your **dissertation** anyway, so you might as well learn it now!

LaTeX is a way of coding your documents - this may sound like it is more effort than just writing your document, but the end results are worth it.
Overleaf is an online tool that allows us to create LaTeX documents and store them.

In this sheet, I am going to go through the things that I found **useful to know as a UoB computer science student** - there are many more tips and things you can do but unfortunately I can't fit them all in this sheet!

Getting Started

First, you will need to make an account with Overleaf:

https://www.overleaf.com/

If you make an account, do it with your **university email** as I think you get additional features for free!

Once you have done this, you will need to open the template I have provided you ('template.tex'). To do this, open it within Overleaf (New Project -> Upload Project). You should now see it listed in your projects.

Once the template is open, you will see a split screen: on the left is the code used to produce the document on the right. **Your job throughout this worksheet is to correctly format the code so that the document is how it should be.** Hopefully, this can be a template for you to refer back to when you forget how to typeset something!

Section 1: Templates

One of the great things about Overleaf is they provide loads of templates. This is an outline of code, and you can insert all the text and media in that you wish.

For some academic papers, a template may be provided for you (or a style may be stated and you have to find a template). Other times, you may wish to start with a simple template and format it to how you wish.

I have provided a simple template for you. Please upload this to your project list (New project -> Upload project).

The template can be split into **two main sections**: before and after the '\begin{document}'. Everything that goes before is for formatting purposes and the document content goes after.

TO DO:

1. Edit the title to whatever you wish

2. Input your name and the date into the correct part

3. Recompile your document to see these updated!

4. Copy the following section of text into your template, **before the \begin{document}**. This text tells LaTeX that we wish to use some packages and sets some default values that you will use later. **If copy and paste doesn't work I have put this text into a plain text file ('packages.txt')** - can be found in the zip folder - please copy and paste it from there.

```
%%%%%%%%%%%%%%% Colours %%%%%%%%%%%%%%%%%%%%%
\usepackage{xcolor}
\definecolor{mylinkcolor}{rgb}{0, 0.5, 0.2}
\definecolor{codegreen}{rgb}{0,0.5,0}
\definecolor{codegrey}{rgb}{0.5,0.5,0.5}
\definecolor{backcolour}{rgb}{0.95,0.95,0.95}
\definecolor{codeblue}{rgb}{0,0,1}
\definecolor{codeorange}{rgb}{0.8,0.3,0}
\definecolor{linecolour}{rgb}{0.9 0.5 0.2}
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%% Code %%%%%%%%%%%%%%%%%%%%%%%
\usepackage{listings}
\lstdefinestyle{mystyle}{
    backgroundcolor=\color{backcolour},
    commentstyle=\color{codegreen},
    keywordstyle=\color{codeblue},
    numberstyle=\tiny\color{codegrey},
```

```
      stringstyle=\color{codeorange},
      basicstyle=\ttfamily\footnotesize,
      breakatwhitespace=false,
      breaklines=true,
      captionpos=b,
      keepspaces=true,
      numbers=left,
      numbersep=5pt,
      showspaces=false,
      showstringspaces=false,
      showtabs=false,
      tabsize=2
}
\lstset{style=mystyle}
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
```

Section 2: Basics

Anything which you want to show up in your document (text, titles etc) must be placed inside the '\begin{document}' and the '\end{document}' tags. You can type text normally but if you want to add some formatting or special characters then you use a **backslash followed by a keyword**.

Here are some basic commands that may come in handy:

- Bold is \textbf{**This text will be bold**}

- Italics is \textit{*This text will be italic*}

- You can create titles and subtitles using the commands \section*{Section Title Goes Here} and \subsection*{Subsection Title Goes Here}. **If you wish these to be numbered, simply get rid of the * in the commands.**

- You can write a new line using \\ or \newline. Notice that just creating more white space in your text doesn't create newlines for you – *you have to code your formatting.*

- Spaces are automatically condensed so only one space is shown. If you need more spaces do '\ ' (a backslash followed by a space).

- If you wish to add some vertical spacing you can do \vspace{1cm} – you can change the amount and note that you can also put negative numbers in if you wish to shorten the height of something. There is also the command \hspace{1cm} for horizontal spacing.

TO DO:

1. In the LaTeX template, the text has been split into sections – one section for each section in this worksheet. You will notice that there are section titles the same as this sheet, however they have not been formatted as titles. **Use the \section*{} command to format all the titles correctly.**

2. In 'Section 2: Basics' format the sentences as stated. For example, format 'Make this sentence bold' so the text is bold on the document.

3. For the whole template text, if the text is on a newline in the source code, then format it so each line is on a newline in the document.

Section 3: Equations

Often you will need to add mathematical equations into your coursework reports and **LaTeX** is the best way to do it. If you have used the 'Add Equation' feature in either Word or Pages then you have already done some LaTeX coding!

There are three ways I like to add equations into my work - put the equation in place of the ... :

1. \(... \) - this will put your equation inline with your text

2. \[...\] - this will put your equation on a new line

3. \begin{align}...\end{align} - this will line up your equations when you have multiple lines

For the actual content that goes inside the equations - you can find a command for every mathematical symbol. To put μ into my text I write \mu inside my equation.

A great website to use is http://detexify.kirelabs.org/classify.html. Here you can draw in a symbol and it will tell you the LaTeX command for it.

TO DO:

1. In the LaTeX template given, format the 2 equations (one inline and one on a new-line)

2. Try creating the following equation:

$$e^{i\pi} - 1 = 0$$

3. Now, let's try use the \begin{align}. When using this we use \\ (new-line symbol) and we use the & symbol to determine where we want our lines to align.

    (a) We need to use a package for this so **copy the following line into your template above the \begin{document} tag**.
    ```
    \usepackage{amsmath}
    ```

    (b) Copy the following code into your template:
    ```
    \begin{align}
        y = x + 1 \\
          = 3 + 1 \\
          = 4
    \end{align}
    ```

(c) You will notice that it aligns from the RHS. **Try putting an & symbol infront of every equals sign**.

Section 4: Adding Code

Often you will need to add code to your projects. LaTeX provide a package which formats this nicely for you.
If you look at the top of your template you will notice tat you have already added in some packages - one of these is 'listings' and another is 'color'. Listings is for the code formatting and we have also define colours for the code. You are welcome to change all the default formatting settings that I have set.

```
Notice how in this worksheet I put some text in a different format
   like this block here. This is the style I use when I want to
   denote code or text sometimes.
```

To add code into your document we use the following tags:
```
\begin{lstlisting}
...
\ end{lstlisting}
```

Note that there **shouldn't** be a space between in the '\end', this is just so I can demonstrate to you (it wouldn't let me format it otherwise).

TO DO:

1. Format the function 'SumList' in your template, so that it appears in a code box.

2. Add a language tag to your code (this will mean that the right keywords are coloured). The SumList function is written in Python.
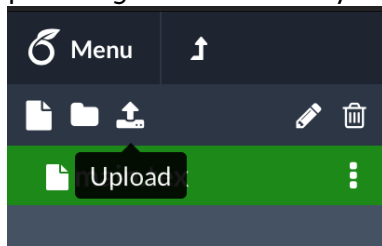   ```
   \begin{lstlisting}[language=Python]
   ...
   \ end{lstlisting}
   ```

## Figures and Tables

One very important thing you will need to know is how to input images, figures and tables.

## Images

To add an image to our document we first have to upload it to our LaTeX folder by pressing this button to your left:



There are 2 main ways we can include an image:

1. Inserting in-line

2. Inserting as a figure (puts the image at the top of the page and inserts a caption)

To insert it inline we just call the following:

```
\includegraphics[width=Xcm]{imagename}
```

Note that when using the file name we have to add the extension of the file.

To add a figure, we use the following command:

```
\begin{figure}
    \centering
    \includegraphics{}
    \caption{Caption}
    \label{fig:my_label}
\end{figure}
```

If you just type '\begin{figure}', and press enter, it will automatically bring the variables up for you - **fill in the includegraphics and the caption**.

Tables

We can add tables in similar ways to images, one for in-line and one for a figure style.

For in-line we can use:

```
\begin{tabular}{c|c}
     &   \\
     &
\end{tabular}
```

The {c|c} denotes the style of the table - this default is 2 columns with a vertical line inbetween. We could have an enclosed 3 columns by using '|ccc|'.

For a table that has a caption and sits at the top of the page (common for academic papers), we can use:

```
\begin{table}[]
    \centering
    \begin{tabular}{c|c}
         &  \\
         &
    \end{tabular}
    \caption{Caption}
    \label{tab:my_label}
\end{table}
```

To put the data into the table we separate horizontally by using & signs and we use \\to go onto the next row of our table. If you want to add a horizontal line (for formatting) into your table you can use the command \hline.

TO DO:

1. First, upload the 'universe.jpg' image to your LaTeX folder (screenshot above).

2. Now, we need to use the package 'graphicx', so copy and paste the following above the \begin{document} line:
   ```
   \usepackage{graphicx}
   ```

3. Next, add the universe image on a new line.

4. Add the universe image as a figure too. Give it a caption if you wish.

5. Try replicate the following table:

x	y	x&y
T	T	T
T	F	F
F	T	F
F	F	F

Screenshots of what your document might look like by the end can be seen on the next page:

LaTeX Template

Holly Millea

6th May 2021

Section 2: Basics

1) **Make this sentence bold.**
2) *Make this sentence italic.*

Section 3: Equations

1) Make this a proper equation in-line: $y = x + 1$
2) Make this a proper equation on a new line:

$$y = x + 1$$

3) Add the e^(i*pi) equation below:

$$e^{i\pi} - 1 = 0$$

4) Copy the code to align below:

$$y = x + 1 \tag{1}$$
$$= 3 + 1 \tag{2}$$
$$= 4 \tag{3}$$

Section 4: Adding Code

1) Format this function 'SumList' properly:

```python
def SumList(List):
    Sum = 0
    # Iterate through each element
    N = len(List)
    for i in range(N):
        Sum += List[i]
    return Sum
```

1

Figure 1: This is my universe image as a figure.

Section 5: Figures and Tables

1) Insert the 'universe.jpg' image below:

2) Insert the 'universe.jpg' image as a figure below:
3) Try replicating the truth table below:

x	y	x&y
T	T	T
T	F	F
F	T	F
F	F	F

2