Week 5: Introduction to LaTeX / Overleaf

Introduction

This worksheet will take you through a guide on how to use LaTeX through an online system called Overleaf. Using LaTeX, allows you to **produce more professional looking documents/reports/articles**, without the difficult hassle of trying to format on Microsoft Word (or other similar text editors)! This is something that you will likely have to learn before your **dissertation** anyway, so you might as well learn it now! (By the way, this document was created in LaTeX.)

LaTeX is a way of typing your documents - this may sound like more effort than just using a text editor, but the end results are worth it.

Overleaf is an online tool that allows us to create LaTeX documents, collaborate and store them online.

In this worksheet, we will go through some of the things that you might find **useful as a student** - there are many more tips and things you can do in LaTeX, but unfortunately we can't fit them all here!

Getting Started

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

`https://www.overleaf.com/` [use your **university email** to get additional features for free!]

Throughout the worksheet, if you encounter any problems, first try to find a solution online (e.g. use the Overleaf Documentation as a reference to find how to do certain things). If you still cannot figure something out, ask the person next to you for help and finally ask the lecturer.

Section 1: Templates

One of the great things about LaTeX are templates, and Overleaf provides loads of them. Templates are premade LaTeX documents that follow a certain style, and you can use them by simply inserting your text and media without having to deal with any of the formatting.

Sometimes, a template may be provided for you, or a style may be stated and you have to find a template. Here are the official templates for IEEE papers for example:

`https://www.overleaf.com/latex/templates/tagged/ieee-official`

Overleaf even has some templates specific to our university, although these seem a bit outdated: `https://www.overleaf.com/latex/templates/tagged/bristol`

For our worksheet, we have provided a simple template for you (template.zip). Proceed to upload the template to Overleaf (New Project -> Upload Project). 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.

The template is 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.

Your job throughout this worksheet is to correctly format this document to produce the specified elements in the document. Hopefully, this can become a template for you to refer back to, in the future!

TO DO:

1. Edit the title to whatever you wish
2. Input your name and the current date
3. Recompile your document to see these updated!
4. Copy the following section of text into your template (also in add.txt in the zip folder to make copying easier), **before \begin{document}**. This text tells LaTeX that we wish to use some packages and sets some default values that you will use later.

```
%%%%%%%%%%%%%%%% 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 in your document, 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 add a new line using \\ or \newline. Notice that just adding more white space in your text doesn't add newlines - *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 use negative numbers if you wish to shorten the height of something.
- Similarly, 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. 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 main ways to add equations (replace the ... with your equation):

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. For example, to put μ into your equation, you can write \mu.

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

TO DO:

1. In the LaTeX template, format the 2 equations (one inline and one on a newline)

2. Try creating the following equation:

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

3. Now, let's try the \begin{align}. When using this, we can use '\\' and '&' symbols 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 this aligns from the RHS. **Try putting an & symbol in-front of every equals sign** and observe the change.

Section 4: Adding Code

Often you will need to add code to your reports. LaTeX provides a package which formats this nicely for you.
If you look at the top of your template you will notice that we have already added some packages - one of these is 'listings' and another is 'color'. 'Listings' is for code formatting, and 'color' is for colors. You are welcome to change all the default formatting settings.

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

To add code into your document we use the following tags:

```
\begin{lstlisting}
...
\end{lstlisting}
```

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 color the right keywords). The SumList function is written in Python.

   ```
   \begin{lstlisting}[language=Python]
   ...
   \end{lstlisting}
   ```

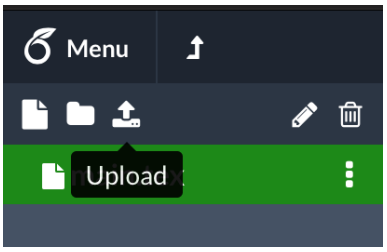
   You might find the 'gobble' tag useful as well.

Section 5: Figures and Tables

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

Images

To add an image to our document we first have to upload it to our LaTeX folder by pressing this button (top left side of the Overleaf interface):



There are 2 main ways we can include an image:

1. Inserting in-line
2. Inserting as a figure (referencing, captions etc)

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{...}
    \label{fig:my_label}
\end{figure}
```

If you just type '\begin{figure}', and press enter, it will automatically complete the rest of the commands for you - **fill in the includegraphics and the caption**, you can also customize the label to make referencing easier. The square brackets at the beginning of the figure command are for positioning - you can use **'t'** for top, **'b'** for bottom, **'h'** for here, **'p'** for page. Sometimes, LaTeX will not put your figure where you specified, so you can also use **'!'** to force LaTeX to put it where you want it.

Tables

We can add tables in similar ways.

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 between them. We could have a line then 3 columns then another line by using '|ccc|'. Similarly, we could have no lines by using 'ccc'. We can specify the alignment

of the text by using **'l'** for left aligned, **'r'** for right aligned and **'c'** for centered. We can also use **'p{Xcm}'** to specify a column width.

Similar to figures, we can also use the 'table' environment to add a caption and label to our table:

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

To add data into the table, we simply type them in the 'tabular' section. We separate columns (horizontally) by using **'&'** signs and we use **'\\'** to go onto the next row of our table. For example, '123 & 456 \\' would be a valid row in the table above and would look like this:

123	456

If you want to add a horizontal line into your table you can use the command \hline. This is done inside the 'tabular', at the place where you want your line to be (as opposed to the vertical lines which are defined at the top.)

You can use this website to help you with table formatting:
https://www.tablesgenerator.com/.

TO DO:

1. First, add the package 'graphicx' to your document, so copy and paste the following above the \begin{document} line:

   ```
   \usepackage{graphicx}
   ```

2. Inside the zip folder, there is an image 'universe.jpg'. Add the universe image on a new line.

3. Add the universe image as a figure too. Give it a caption.

4. Try to replicate the following table:

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