What the Hell is Latex and How Do I Use it

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Abstract

Latex is the standard word-processing tool used for research papers and reports at tertiary institutions. Latex gives the user more control than word processing applications such as Microsoft Word, and can be a powerful tool for formatting reports to your specific needs.

1 Introduction

This document was made using Latex and will contain some helpful tips and tricks to get you started using Latex.

2 How Can I Use Latex

Head over to overleaf.com for a simple way to use latex. Overleaf also allows for collaboration, so multiple people can work on a document at the same time - great for group reports.

3 Sections and Subsections in Latex

Latex allows you to use sections and subsections.

3.1 I am a subsection

This is a subsection.

3.1.1 I am a sub-subsection

Here we are in a sub-subsection.

4 Figures in Latex

Let's put a picture in this document:

Figure 1: A nice picture of a frog.

Let's make this picture even bigger.

Figure 2: A nice big picture of a frog.

Let's add a figure showing how we did this:

```
\section{Figures in Latex}
Let's put a picture in this document:
\begin{figure}[H]
    \centering
    \includegraphics[width=5cm]{frog.jpg}
    \caption{A nice picture of a frog.}
    \label{fig:1}
\end{figure}
Let's make this picture even bigger.
\begin{figure}[H]
    \centering
    \includegraphics[width=15cm]{frog.jpg}
    \caption{A nice big picture of a frog.}
    \label{fig:2}
\end{figure}
\section{Tables in Latex}
```

Figure 3: Screenshot of helpful latex code...

Let's break down the code in the above snippet.

- First, we begin our figure.
- Do you see the little "H" in square brackets? This little guy makes sure that our figures are right where we want them to be in our document, leave it out and latex will push it somewhere else.
- We then use centering to make sure our image is nice and centered.
- With include graphics, we link the picture that we uploaded to Overleaf. We also set the width of our image in cm.
- The caption is where we put the caption of our image.

- We use labels so that we can reference our figures elsewhere in the document, like this 1.

5 Tables in Latex

Below is a table, made in Latex.

Table 1: Voltage and Current Values

Component	Voltage (V)	Current (A)
Resistor 1	5.0	0.2
Resistor 2	3.3	0.1
Capacitor 1	0.0	0.0

Making tables in Latex can be tedious. So here's a great tool that you can use instead: tablesgenerator.com.

With this website, you can make your tables in a simple program like Excel and then export them into Latex code, which you can easily paste into Latex.

You should take a look at the Latex documentation to find out more about making cool tables in latex.

6 Maths in Latex

You can put fun and fancy maths equations in Latex, like so:

$$f(x) = \frac{1}{x^2 + 2x + 1} \tag{1}$$

$$e^{i\pi} + 1 = 0 \tag{2}$$

$$\int_0^{\infty} e^{-x^2}\, dx = \frac{\sqrt{\pi}}{2} \tag{3}$$

$$\sum_{n=1}^{100} n = \frac{100 \times 101}{2} \tag{4}$$

$$\lim_{x \to 0} \frac{\sin(x)}{x} = 1 \tag{5}$$

Here is an image showing you the latex code for these equations:

```
You can put fun and fancy maths equations in Latex, like so:
\begin{equation}
    f(x) = \frac{1}{x^2 + 2x + 1}
\end{equation}

\begin{equation}
    e^{i\pi} + 1 = 0
\end{equation}

\begin{equation}
    \int_{0}^{\infty} e^{-x^2} \, dx = \frac{\sqrt{\pi}}{2}
\end{equation}

\begin{equation}
    \sum_{n=1}^{100} n = \frac{100 \times 101}{2}
\end{equation}

\begin{equation}
    \lim_{x \to 0} \frac{\sin(x)}{x} = 1
\end{equation}
```

Figure 4: Screenshot of latex code showing how to make equations.

7 Referencing in latex

Let's say you are required to have a list of figures and tables in your document, Latex lets you do this:

List of Figures

List of Tables

Now I'm doing some research on penguins. Penguin fact number one, they're so cute [1]. Here's another fact, they can't fly [2]. And here's one more fact, I love them [3].

Want to know how I did those great citations? Here is a screenshot:

```
Now I'm doing some research on penguins. Penguin fact number one,
they're so cute \cite{davis2012penguinspecies}. Here's another fact,
they can't fly \cite{smith2008penguins}. And here's one more fact, I
love them \cite{wwf2020penguinconservation}.
```

Figure 5: Citations in latex.

How do we make sure that our citations show up as our references? We simply do the following:

```
\bibliographystyle{ieeetr}
\bibliography{sample}
```

Figure 6: Referencing my bibliography in latex..

And what does my bibliography look like?

```bibtex
@book{smith2008penguins,
  author    = {Smith, John},
  title     = {Penguins: A Comprehensive Guide},
  year      = {2008},
  publisher = {Penguin Publications},
}

@article{jones2015penguinbehavior,
  author  = {Jones, Emily},
  title   = {Behavioral Patterns in Penguins},
  journal = {Journal of Ornithology},
  year    = {2015},
  volume  = {42},
  number  = {3},
  pages   = {321--335},
}

@online{wwf2020penguinconservation,
  author       = {World Wildlife Fund},
  title        = {Penguin Conservation Efforts},
  year         = {2020},
  url          = {https://www.worldwildlife.org/species/penguin},
  organization = {World Wildlife Fund},
}

@book{davis2012penguinspecies,
  author    = {Davis, Sarah},
  title     = {Penguin Species of the World},
  year      = {2012},
  publisher = {Nature Books},
}
```

Figure 7: A latex bibliography.

In Overleaf my bibliography file is called sample.bib. That is where the references are placed and then subsequently referenced by Latex. Below you can see what the file structure for this document looks like in Overleaf.

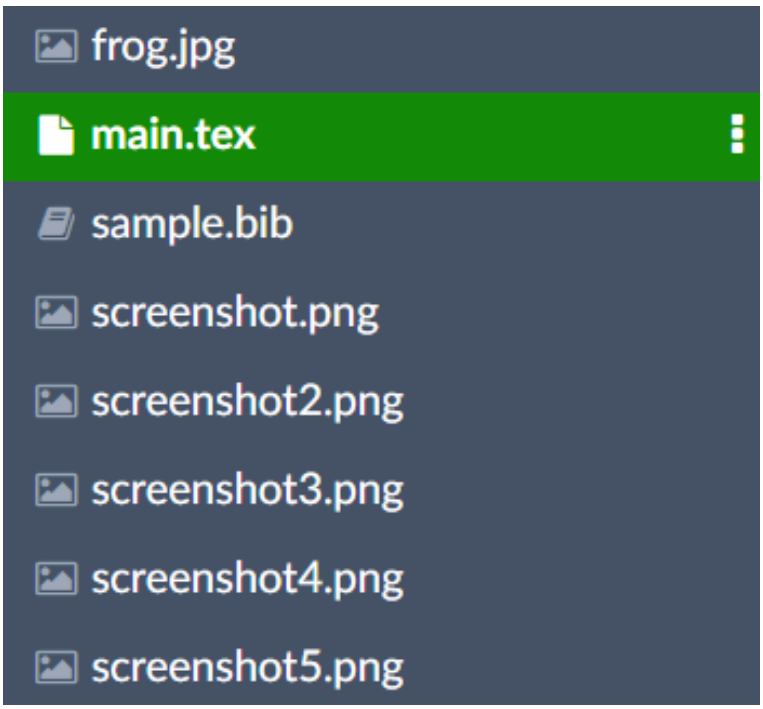

Figure 8: Overleaf file structure.

8 Conclusion

Now you basically know how to use Latex! There is so much more you can find out by reading the Latex documentation, which is very extensive and helpful. ChatGPT can also be your friend!

You can also find the Latex file that this document uses here: Github Page with all the Latex stuff on it

Have fun!

References

[1] S. Davis, *Penguin Species of the World*. Nature Books, 2012.

[2] J. Smith, *Penguins: A Comprehensive Guide*. Penguin Publications, 2008.

[3] W. W. Fund, "Penguin conservation efforts," 2020.