

Agenda

- > Recap from Latex I
- > Sections
- > Placement
- > Bibliographies

What are the basics of LaTeX?

> Why is it used

 Writing academic papers with predefined structure and consistent formatting, allows representation of maths formulas.

> Basic document structure

 Document typically contains paper name, date, and author name at top, and is split into sections. A document class is chosen out of many predefined templates to follow a set structure.

> Text formatting, lists, images, formulas

• All of the above are done by simple commands

Sections

- Split the document into logical parts with bold subheadings
- Different types of sections available depending on the document class (here is for the "article" class)
- Allow a table of contents to be generated for the beginning of the paper, by placing the commands on the left after the paper title

```
\section{...}
\subsection{...}
\subsubsection{...}
\paragraph{...}
\subparagraph{...}
```

\tableofcontents \newpage

Section exercise - recreate this page

LaTeX II InfPALS

Insert your name

February 2024

1 Getting Started with LaTeX

This is the introduction.

2 Methods

2.1 Stage 1

The first part of the methods.

2.2 Stage 2

The second part of the methods.

3 Results

Here are my results.

Section exercise - solution

```
\documentclass{article}
\usepackage{graphicx} % Required for inserting images
\usepackage{amsmath}
\title{LaTeX II InfPALS}
\author{Insert your name}
\date{February 2024}
\begin{document}
\maketitle
\section{Getting Started with LaTeX}
This is the introduction.
\section{Methods}
\subsection{Stage 1}
The first part of the methods.
\subsection{Stage 2}
The second part of the methods.
\section{Results}
Here are my results.
\end{document}
```

Placement in LaTeX

- The principle of LaTeX is: the user does not need to control where the elements are on the page, the user only chooses the document class and content
- Therefore, images are usually placed at the top of a page, since they are a float element in LaTeX, despite where they are within the code
- Figures and subfigures can be tricky so appropriate packages must be included in the document

Group Number: 11 Project Plan

ware team has a variety of interests ranging form Machine learning and AI to web development. We have one team member with a lot of UX/UI design experience and an interest in marketing so they will be managing the design and marketing of the final project. Our Final team member is a "floater" so to speak. They have a wide-ranging interest in marketing, software, and hardware so will be floating around the three groups, assisting when extra help is required and acting as liaison between the sub-groups. Multiple people are keen on working on app development and doing data analysis to broaden their skill.

Currently, we anticipate our biggest struggle to be the hardware component of the project. After discussing the team's skills, we observed that everyone has experience working on software projects through coursework and extracurriculars. However, there are team members who have undertaken the course 'Digital Systems Design' which teaches you about electronic behaviour but don't have any hardware knowledge. Therefore, the people working on the hardware will face difficulty building it as they don't have any existine skills and knowledge about it.

We were all in agreement about having meetings in person and working during the day. We have seen so far that we work best by brainstorming together and throwing ideas and feedback to get the best possible solution. We also think it would be best to start prototyping early to ensure maximum time for working on the hardware in case we encounter difficulties. It would be beneficial to make the most out of our time at the start of the semester before we get busy with coursework and more commitments.

3. User

The top primary users of SmartSymphony are piano beginners who are teaching themselves. Since 48% of piano novices are self-teaching (The Note, 2023), this is a huge user base that are looking for budget and time-friendly alternatives to reading sheet music or hiring a tutor. The product serves as a visual aid for these learners, as sheet music is known to be complex and difficult to read for beginners. Lighting up the correct keys instead allows the user to find the note faster and build confidence as they develop their piano skill, increasing the tempo (speed) of the piece as they learn. Additionally, the mechanical attachment could assist the player just as a piano teacher would—through either slowly playing the piece (helping the student learn audibly) or assisting them with the left hand chords.

The same visual benefits apply for dyslexic piano learners, a huge market accounting for approximately 1 in 10 of the world population (Elias, 2023). Difficulties when reading sheet music include notes blurring and moving, and short-term memory restrictions - which we have learnt about through the personal experience of a member in our team. The British Dyslexia Association recommends music as a tool to boost self-esteem and motor coordination, however recognises the visual discomfort that traditional sheet music can cause (B. D. Association). The core needs of these

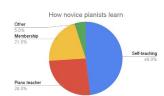


Figure 1. Pie chart displaying the top methods used by novice pianists to learn piano, with the top options being self-teaching online using books and materials, employing a piano teacher, membership of a music club.

learners usually require a specialist piano teacher, however this is an unaffordable option to many so Smart Symphony provides an accessible alternative to sheet music.

The gamification aspect of in-app learning exercises will also make the product great for those with attention-deficit disorders, since it requires little short-term memory and is engaging and rewarding. Gamification - application of game-playing elements to non-game contexts thus improving enjoyability of a task (Merriam-Webster, 2019) - is a popular strategy in making tasks more ADHD-friendly, due to "rewarding" the user on a completed task and encouraging the release of dopamine. This strategy has worked well for successful applications like Duolingo (Chasse) and will be applied in the SmartSymphony application, where the user will be congratulated when they have played a piece without mistakes, further encouraging them to learn.

Additional considerations for primary users include UX/UI design that is accessible for those with visual impairments. This includes designing with a large font size and clear, distinguishable colours suitable for those with colour-blindness. The app must also be simple and non-distracting since it could be used by both young and elderly people, constraining the amount of feedback it offers the user. Lastly, the tempo of the piece will be able to be changed to allow a slower version to be accessible to anyone who struggles with motor coordination, or is simply a beginner, as well as the mechanical attachment providing extra support with the notes of the player's non-dominant

Secondary users can arise when the product is deployed in a family home, since other family members might want to try their hand at piano, encouraging higher usage and further spreading a love for piano. Notably, if there is a very young child in the family who might also interact with the device, not necessarily knowing what it is, the product should not be easily broken. If the young child does become interested in using the product to learn piano,

Packages

```
\usepackage[T1]{fontenc}
\usepackage{amssymb,amsmath}
\usepackage{txfonts}
\usepackage{microtype}
\usepackage{xspace}
\xspaceaddexceptions{\%}
% Lists with less spacing between items
\usepackage{paralist}
% For figures
\usepackage{graphicx}
\usepackage{subfig}
% For citations
\usepackage{natbib}
% For algorithms
\usepackage{algorithm}
\usepackage{algorithmic}
```

- > This is an example of just a part of the package dependencies in an average LaTeX file
- In the example: fonts and text spacing, list customisation, figures and subfigures (for tables and images), bibliography, and algorithms
- There are usually found at the top of the document, or in a separate file then referenced by \input{<<name_of_package_file>>}

Figures

- Generally, to insert an image or a table it must be wrapped in a \begin\{figure\} component, showing it is not part of the text and needs a wide margin around it
- > Dimensions can be specified in the \includegraphics[...] line.
 - keepaspectratio can be used to force a constant aspect ratio.
- Remember to include \centering when using centered alignment

```
\begin{figure}
\centering
\includegraphics[width=1\textwidth]{ImageFilename}
\caption{My test image}
\end{figure}
```

It is good practise to include concise and informative captions in academic papers to explain the figure

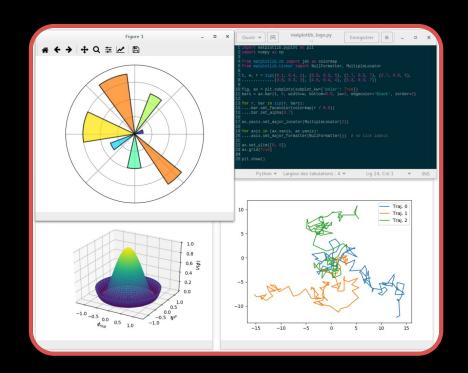
Placement (Revisited)

- The figure environment provides the option to alter the float preference.
- > This is placed in square brackets after the \begin{figure},
 - e.g. \begin{figure}[h]
- They can be combined to give an order of preferences
 - e.g. \begin\{figure\}[htb] would be 'try here, then top, then bottom'
- Can be overridden using packages such as here or float and using [H]

| | Place the float <i>here</i> , i.e., <i>approximately</i> at the same point it occurs in the source text (however, not <i>exactly</i> at the |
|---|---|
| | spot) |
| t | Position at the <i>top</i> of the page. |
| b | Position at the <i>bottom</i> of the page. |
| р | Put on a special page for floats only. |
| ! | Override internal parameters LaTeX uses for determining "good" float positions. |
| Н | Places the float at precisely the location in the LATEX code. Requires the float package. This is somewhat equivalent to h!. |

Figures in MatPlotLib

- When using figures generated in MatPlotLib or R, make sure the figure generated has:
 - Width of 6 inches
 - Large font size in title, axes, and legend (marks are often deducted for lack of readability)
 - Check for high DPI when exporting. Low DPI + large width = blurry plot
 - Clear and contrasting use of colour (check colour-blindness guidance)



> Figure exercise - subfigures

2 Methods

2.1 Stage 1

The first part of the methods.

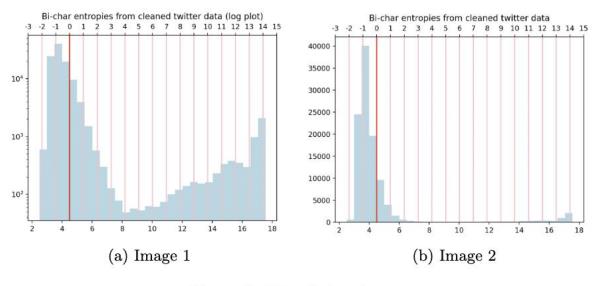


Figure 1: Here is two images

Use any two images, for extra practice, use MatPlotLib plots if you have any.

> Figure exercise - solution

```
\begin{figure}[htbp]
\centering
\begin{subfigure}{.5\textwidth}
  \centering
  \includegraphics[width=1\linewidth]{Media/FNLPGraph.png}
  \caption{Image 1}
 \label{fig:piano}
\end{subfigure}%
\begin{subfigure}{0.5\textwidth}
  \centering
 \includegraphics[width=1\linewidth]{Media/FNLPGraph2.png}
  \caption{Image 2}
 \label{fig:fnlpgraph}
\end{subfigure}
\caption{Here is two images}
\label{fig:images}
\end{figure}
```

Bibliography

- By now, you might be used to including citations in your academic papers, using a standardised format to credit the author at the end
- LaTeX uses a separate bibliography file to input all data about every source that is used
- This file is then quoted at the start of the main document and the bibliography style can be customised to the user's choice by quoting a specific package in the dependencies file

Bibliography data file

```
title = {How Long Does It Take to Learn Piano? We Asked 1000+ Pianists}.
 author = {{The Note}},
 year = \{2023\},\
 note = \{Aug. 27\},
 url = {https://www.pianote.com/blog/how-long-does-it-take-to-learn-piano-
 survev/
@misc{2,
 title = {21 Dyslexia Statistics \& Facts: How Common Is It?},
 author = {M. Elias},
 year = \{2023\},
 note = \{0ct. 31\},
 url = {https://www.discoveryaba.com/statistics/dyslexia}
@misc{3.
 title = {Music and dyslexia},
 author = {{B. D. Association}},
 note = {British Dyslexia Association},
 url = {https://www.bdadyslexia.org.uk/advice/adults/music-and-dyslexia-1}
```

- As mentioned, LaTeX requires a separate bibliography file (e.g. my_refs.bib) that includes all the required data of your citation style (seen here)
- Each citation has a reference ID (in this case, 1,2 3, etc.) that is used to refer to it in the document exactly where the source is quoted

\cite{2}

This in-text citation produces a small description of the source (depending on chosen citation style) that then links to the bibliography at the end of the document that shows all the included data

Citation Styles

When using a provided template by the University of Edinburgh, the document will automatically use a very specific format:

\bibliographystyle{icml2017}

- This quotes the author and year in-text when the citation appears and then provides more information at the end of the document in the bibliography.
- IEEE is also often accepted, but check with your course organiser/dissertation supervisor, as each lab has a preferred style.

References

Explore the yamaha music europe hub.

URL https://hub.europe.yamaha.com/article/
10-benefits-from-learning-to-play-keyboard. Yamaha
Music Europe Hub.

The shape and future of adult music learning | making music. URL https://www.makingmusic.org.uk/campaigns-and-advocacy/adult-music-education. www.makingmusic.org.uk, 2020.

B. D. Association. Music and dyslexia. URL https://www.bdadyslexia.org.uk/advice/adults/ music-and-dyslexia-1. British Dyslexia Association.

Chasse, B. Taking a crack at gamification. URL https://blog.duolingo.com/gamification-design/. Duolingo Blog, Jul. 27, 2021.

> Bibliography exercise - cite this

Title: Ada Lovelace: In search of "a calculus of the nervous system"

Author: Georgina Ferry

Journal: The Lancet

Volume: 386

Pages: 1731

Year: 2015

Georgina Ferry. "Ada Lovelace: In search of "a calculus of the nervous system". In: *The Lancet* 386 (2015), p. 1731.

Result should look like this

> Bibliography exercise - solution

```
@article{Ferry2015,
   Author = {Georgina Ferry},
   Title = {Ada Lovelace: In search of ``a calculus of the nervous system''},
   Journal = {The Lancet},
   Volume = {386},
   Pages = {1731},
   Year = {2015}
}
```

Any questions?

Feel free to ask the leaders!

Thank you!