What is LaTeX?

- LaTeX is a high-quality typesetting system. It includes features designed for the production of technical and scientific documentation.

- Developed By: Leslie Lamport (based on Donald Knuth's TeX).
- The de facto standard for the communication and publication of scientific documents which is available free.

- Key Focus: Scientific, technical, and academic document preparation.

Why Use LaTeX?

- **Professional Output:** Superior document quality.
- **Complex Formatting:** Easy handling of equations, figures, and citations.
- **Consistency:** Automatic structuring and styling.
- **Cross-Platform:** Works on Windows, macOS, and Linux.

Research paper Writing

- A research paper is a detailed report on a specific topic based on original research. It presents findings, methodologies, and contributes new knowledge to a field.

- It leads to new knowledge, innovative solutions, and advancements in all fields to solve real-world problems, whether in healthcare, technology, or social issues.

- Research establishes credibility and authority by publishing papers in well-regarded journals boosts networking opportunities and open doors to scholarships, research fundings.

- It helps to develop critical thinking, problem-solving, and writing skills.

Research paper Writing: Key Components

- **Abstract**
- **Introduction**
- **Literature Review**
- **Methodology**
- **Results & Discussion**
- **Conclusion**

Research paper Writing: Find out Conferences / Journals

Search using keywords, authors, or specific journals/conferences.

- **IEEE Xplore**.
- **SCOPUS**.

Identify and explore well known conferences based on Smart CFP.

- **Easy Chair : Smart CFP**.

Download Latex or Word Copy for writing a research paper from websites provided.

Research paper Writing: Abstract

Abstract: A brief summary of the research question, methodology, and results.

```
\begin{abstract}

\noindent Gujarati script presents significant challenges to character recognition methodology due to its complex characters formed through combinations of vowels and consonants with positional modifications. Despite advancements in character recognition technology, there are limited comprehensive solutions that effectively address these challenges.

\end{abstract}
```

Figure: Abstract Formatting

Research paper Writing: Introduction

Introduction: Defines the problem and outlines the paper's objective. It may contain description, Images, etc.

```
\section{Introduction}

Identification of handwritten scripts has become of utmost importance in document processing through \textbf{OCR} due to the widespread digitization of numerous handwritten scriptures and books.

\subsection{Objectives}

The paper makes the following significant contribution:

\begin{itemize}

    \item \textbf{Data Collection:} Gathering data from diverse sources.

    \item \textbf{Data Cleaning:} Removing inconsistencies and preparing data for analysis.

    \item \textbf{Data Analysis:} Applying statistical methods and machine learning techniques.

    \item \textbf{Visualization:} Presenting insights through graphs, charts, and dashboards.

\end{itemize}

Comparative analysis with state-of-the-art techniques to demonstrate the effectiveness of CNN architecture.
```

Figure: Introduction Formatting

Research paper Writing: Introduction: Image Placement

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
\begin{figure}[htbp]%
    \centering
    \includegraphics[width=1.0\textwidth]{IMG/Intro.png}
    \caption{Abstract Formatting}
    \label{figure_2}
\end{figure}
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

you can use also:
\includegraphics[scale=0.5]{IMG/abstract.png}
\includegraphics[width=0.5\textwidth, height=0.3\textheight]{IMG/abstract.png}
```

Figure: Figure Placement and Formatting

- H: **[Here]** Places the figure exactly where it appears in the document.
- T: **[Top]** Places the figure at the top of the page.
- B: **[Bottom]** Places the figure at the bottom of the page.
- P: **[Page]** Places the figure on a dedicated page of floats.
- !: **[override]** Forces LaTeX to place the figure where it specified.

Research paper Writing: Literature Review

It shows overview of existing research in the field and its result analysis in concise way. **00** shows width of the label box. Its 00 means upto 99.

```
A novel segmentation algorithm has been proposed by S.J. Macwan and A.N.
Vyas \cite{b1}. DWT (Haar and Daubechies wavelet), DCT, and DFT were used
in the transform domain and obtained 86.78\%, 89.46\%, 89.31\%, and 96.06\%
accuracy, respectively, while Zernike moment and gradient features were
used in the spatial domain and achieved 69.86\% and 96.65\% accuracy.

\begin{thebibliography}{00}

    \setlength{\itemsep}{0em} % Controls the vertical space between items
    in a list

    \bibitem{b1} Macwan S J and Vyas A N, 2015 August Classification of
    offline Gujarati handwritten characters In \emph{2015 International
    Conference on Advances in Computing, Communications and Informatics
    (ICACCI)} (pp. 1535-1541) IEEE.

\end{thebibliography}
```

Figure: Literature Citation and Bibliography

Research paper Writing: Methodology

It shows details of the implemented approach taken to gather and to analyze data. It may contain Description, Images, equations, etc.

How to Generate Equation?.

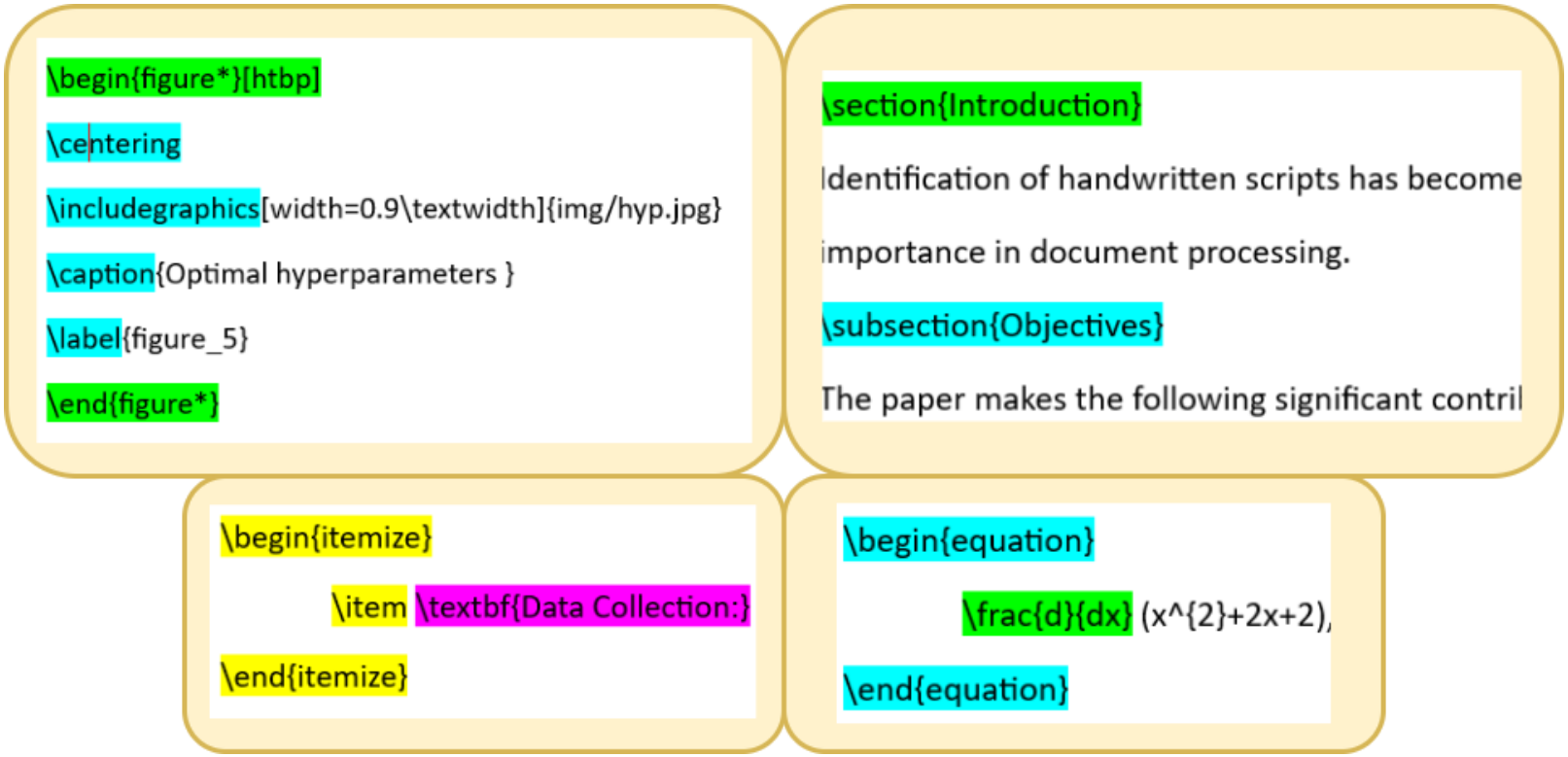

Figure: Methodology Writing

Research paper Writing: Results and Findings

Presentation of results and findings by charts, graphs, and tables.
Where, "l" for Left "c" for Centre "r" for Right alignment.
How to Generate Table?.

```
\begin{table}
\begin{tabular}{|c|c|c|c|c|}
Sr.No & Method  & Accuracy & Precision & Recall \\
1    & ML     & 89\%    & 88\%     & 86\%  \\ \hline
2    & CNN    & 92\%    & 90\%     & 92.5\% \\
3    & CNN-RNN & 90\%    & 89\%     & 88\%
\end{tabular}
\caption{Comparison of methods based on performance metrics.}
\label{tab:comparison}
\end{table}
```

Figure: Table Placement

Research paper Writing: Conclusion

Summarizes findings, and suggestions for future research

```
\section{Conclusion}

\noindent This study introduces a novel approach for the recognition
and classification of handwritten characters, addressing a significant gap
in existing research.

\newline
Utilizing a self-developed dataset on various hybrid models was evaluated.
Among those, the CNN-LSTM combination achieved the highest accuracy.
```

Figure: Conclusion Formatting

Research paper Writing: Bibliography

It is necessary to include reference materials and research papers to give proper credit to the authors for their valuable research contributions. The **cite**{**b1**} command can be used for in-text citations.

```
A novel segmentation algorithm has been proposed by S.J. Macwan and A.N.
Vyas \cite{b1}. DWT (Haar and Daubechies wavelet), DCT, and DFT were used
in the transform domain and obtained 86.78\%, 89.46\%, 89.31\%, and 96.06\%
accuracy, respectively, while Zernike moment and gradient features were
used in the spatial domain and achieved 69.86\% and 96.65\% accuracy.

\begin{thebibliography}{00}

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    offline Gujarati handwritten characters In \emph{2015 International
    Conference on Advances in Computing, Communications and Informatics
    (ICACCI)} (pp. 1535-1541) IEEE.

\end{thebibliography}
```

Figure: Creation of Bibliography

Report Writing

Using LaTeX for report writing ensures **professional and consistent formatting**, especially for **mathematical equations** and **technical documents**.

It offers **efficient citation management**, dynamic **cross-referencing**, and superior **handling of figures and tables**.

Additionally, LaTeX is **highly customizable**, scalable for large documents, and widely used in **academia and research.**

Report Writing: Key Components

- **Type of Document**
- **Front Page Formatting:** Themes, Fonts, Font Size, Font Colour, Styles, Indent, Header, Footer, Logos, Watermarks
- **Contents**
- **List of Figures**
- **List of Tables**
- **Report Details:** Description, Sections, Subsections, Items, Lists, Tables, Images, Equations, etc.
- **Conclusion**
- **References**

Report Writing: Type of Document

LaTeX provides different document classes for creating various types of documents, each tailored to specific needs. Here are some common types:

- **Article:** Used for short documents like research papers, journal articles, or essays.
- **Report:** Suitable for longer documents like project reports, theses, or dissertations.
- **Book:** Used for books or comprehensive documents.
- **Letter:** Designed for writing formal or informal letters.
- **Beamer:** Used for creating professional presentations.
- **proc:** Ideal for conference proceedings.

Report Writing: Front Page Formatting

Themes and Styles: Document Class Can be: article, report, book, letter.

Custom Font and Size: Change font size globally (e.g., 10pt, 11pt, 12pt)

```
\documentclass[12pt]{article}
```

Fonts: Use Times New Roman font,

ex: helvet, courier, charter, utopia, etc.

```
\usepackage{times}
```

Specific Fonts: % Calibri, Georgia, Comic Sans MS, palatino, etc.

```
\usepackage{fontspec}
```

```
\setmainfont{Arial}
```

Figure: Type of Document, Fonts, Font Size

Report Writing: Font Size and Style

- `\tiny`: Very small text
- `\scriptsize`: Slightly larger than `\tiny`
- `\footnotesize`: Larger than `\scriptsize`
- `\small`: Small text size
- `\normalsize`: Default size
- `\large`: Slightly larger than normal
- `\Large`: Larger than `\large`
- `\LARGE`: Larger than `\Large`
- `\huge`: Very large text
- `\Huge`: The largest text size

Figure: Various Font Sizes

Report Writing: Font Style and Colors

Font Colour: For custom colors: Black, White, Gray, Red, Green, Blue,

Cyan, Magenta, Yellow, Brown, Lime, Olive, Orange, Pink, Purple, Teal, Violet, Navy.

```
\usepackage{xcolor}

\textcolor{blue}

Define custom colors

\definecolor{myBlue}{RGB}{0, 102, 204}

\definecolor{myGray}{gray}{0.6}
```

Figure: Type of Document, Fonts, Font Size

Report Writing: Paragraph Formatting

Apply styles: No paragraph indentation

```
\setlength{\parindent}{0em}
```

Apply styles: Add space between paragraphs

```
\setlength{\parskip}{1em}
```

Figure: Paragraph Indent and Space Formatting

Report Writing: Headers and Footers

```
\usepackage{fancyhdr}

\pagestyle{fancy}

Clear header and footer

\fancyhf{}

Left header

\fancyhead[L]{Your Title}

Right header with logo

\fancyhead[R]{\includegraphics[width=1cm]{logo.png}}

Center footer with page number

\fancyfoot[C]{Page \thepage}
```

Figure: Header Footer Formatting

Report Writing: Watermarks and Logos

Insert Logo:

```
\usepackage{graphicx}
\title{\includegraphics[width=2cm]{logo.png}}
```

Watermark (Using draftwatermark):

```
\usepackage{draftwatermark}
```

Text for watermark

```
\SetWatermarkText{Your Text}
```

Size of the watermark

```
\SetWatermarkScale{3}
```

```
\SetWatermarkAngle{0}
```

Light gray color

```
\SetWatermarkColor[gray]{0.8}
```

Figure: Watermark and Logo Formatting

Report Writing: List of Figures & Tables

List of Figures and Tables

\listoffigures

\newpage

\listoftables

\newpage

Figure: List of Figures and Tables

listoffigures and **listoftables**: It Creates a List of Figures / List of Tables, with their captions & page numbers to locate and reference all the **Figures/Tables** in the document quickly.

newpage: It Ensures that each of these lists begins on a new page.

Report Writing: Content Writing

```
\section{Introduction}

Identification of handwritten scripts has become of utmost importance in document processing.

\subsection{Objectives}

The paper makes the following significant contribution:

\begin{itemize}
    \item \textbf{Data Collection:} Gathering data from diverse sources.
\end{itemize}

\begin{figure*}[htbp]
\centering
\includegraphics[width=0.9\textwidth]{img/hyp.jpg}
\caption{Optimal hyperparameters }
\label{figure_5}
\end{figure*}

\begin{equation}
    \frac{d}{dx} (x^{2}+2x+2),  \int_{0}^{10} x^{3}+y^{3},
\end{equation}
```

```
\begin{table}
\begin{tabular}{|c|c|c|c|c|}
Sr.No & Method  & Accuracy & Precision & Recall \\
1   & ML    & 89\%   & 88\%    & 86\%  \\ \hline
2   & CNN   & 92\%   & 90\%    & 92.5\% \\
3   & CNN-RNN & 90\%   & 89\%    & 88\%
\end{tabular}
\caption{Comparison of methods based on performance metrics.}
\label{tab:comparison}
\end{table}
```

Figure: Content Writing and Formatting

Presentation with Latex

- **Professional Formatting**: Consistent, polished layout with automated alignment and spacing.
- **Customization**: Easy to modify themes, colors, fonts, and slide structure.
- **Mathematical Notation**: Ideal for complex equations and scientific symbols.
- **Automated Table of Contents**: with **tableofcontents**.
- **Code Reusability**: Reuse formatting across presentations.
- **Consistency**: Ensures uniform formatting throughout the slides.
- **Citations Support**: Integrate citation management with **cite** and bibliography.
- **Portability**: PDF output ensures cross-platform compatibility.

Presentation with Latex: Key Components

- **Document Class:** Use of \documentclass{beamer} for presentations.
- **Title Page:** Customizing title, author, and date (\title{}, \author{}, \date{}).
- **Frames:** Use \begin{frame} and \end{frame} to create individual slides.

Presentation with Latex: Structure Formatting

\documentclass{beamer}

UTF-8 allows for a wide range of characters across different languages.

Inputenc for encoding of the input Tex file

\usepackage[utf8]{inputenc}

For text justification

\usepackage{ragged2e}

Theme selection

\usetheme{Madrid}

Extra Sample Themes: AnnArbor, Berlin, Copenhagen, Darmstadt, Frankfurt,

Goettingen, Malmoe, PaloAlto, Rochester, Singapore

Figure: Presentation Structure Formatting

Presentation with Latex: Title, Subtitle, Author

```
\title{Introduction to LaTeX }

\subtitle{Beneficial For Research Papers, Reports, and Presentations}

\author{

        \textbf{Name of Author}

\date{\DD-MM-YYYY}
```

Figure: Formatting of Title, subtitle and Author name in presentation

Presentation with Latex: Bullet Points and Equations

- **Unordered Lists:** Use `\begin{itemize}` for unordered lists.
- **Ordered Lists:** Use `\begin{enumerate}` for ordered lists.
- **Incremental Points:** Add `\pause` to show bullet points one-by-one.

- **Inline Equations:** Use `\(...\)` for inline equations.
- **Display Equations:** Use `\begin{equation}...\end{equation}` for displayed equations.

Presentation with Latex: Figures and Tables

- **Images:** Use `\includegraphics{}` for adding images or figures.
- **Creating Tables:** Use `\begin{table}` and `\begin{tabular}` for tables.
- **Aligning Data:** Align data left, right, or center with `\begin{tabular}`.

Captions and References: Add captions with `\caption{}`.