# Tutorial on

## LaTeX: A type setting system

Swagat Ranjan Sahoo

Research Scholar
Department of Computer Science & Engineering
IIT Guwahati, Assam
India 781039

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# What is LaTex?

- LaTeX (pronounced either "Lah-tech" or "Lay-tech") is a markup level text editing tool
- It separates the word formatting from the content entry task
- Most commonly used text editor in the academia for the people dealing with scientific papers and publishing
- Written on an ordinary text editor and translated by means of a program into a finalized version, usually in pdf format

# What is LaTex? (contd...)

- Formatting codes are embedded in the text
- Equations, symbols, tables, etc. are created by means of formatting codes
- It is particularly suited to producing long, structured documents
- It is very good at type-setting equations
- It is open-source

# History

- 1977: **TeX** by Professor Donald E.Knuth of Stanford University
- TeX is a programming language, its main job is that of a markup language for describing how your document should look
- **LaTeX** was then developed by Leslie Lamport as an overlay to the TeX language, enabling easier use, especially for including mathematical formulas


Figure: Donald E.Knuth

# Benifits of LaTex

- Documents with a lot of mathematical equations can be generated easily in LaTex
- Outstanding features such as automatic numbering of equations, chapters and sections, figures, and tables
- Easy to produce bibliographic entries, with changable formats, on fly.
- With LaTex taking care of formatting, the writer can concentrate on important activites such as content generation and logical sequencing of ideas.

# Caution !!

- LaTeX is very unforgiving of errors
- Everything must be exactly right in order for it to work
- This is one reason why a well tested template is very helpful

# General structure of a LaTex file

- Every LaTeX file begins with \documentclass{...}
- Article, book, report etc. are examples of different document class
- The beginning section called the "preamble", which contains global instructions for the fil.
- \usepackage{...} commands and others are placed here.
- After the preamble, the body of the text begins with \begin{document}
- At the end of the file is \end{document}

# Packages in LaTex

- Add-on features for LaTeX are known as packages
- A package is a file or a collection of files containing extra LaTeX commands
- Add new styling features or modify those already existing
- There are two main file types: class files with .cls extension, and style files with .sty extension
- eg. \usepackage {xcolor}

# First LaTex Program

```
\documentclass[11pt]{beamer}
\usepackage{xcolor}
\begin{document}
    \begin{frame}{First slide}
        \textcolor{blue}{Welcome to System Programming
        Lab}
    \end{frame}
\end{document}
```

Figure: First LaTex Program

# Commenting in LaTex

- % is used for single line comment
- \begin{comment} \end{comment} pair is used for multi-line comment
- \iffalse \fi pair is also used for multi-line comment

# Installation in Linux

1. Open the terminal and update the current ubuntu system by sudo apt-get update
2. Install TexLive in your system. Use the command sudo apt-get install texlive-full
3. Install the editor TexStudio in Linux using the command sudo apt-get install texstudio

# Installation in Linux *Contd...*

To install the individual packages:

1. Download the package from `www.ctan.org`
2. Extract the package
3. copy the extrated folder to
   /usr/local/share/texmf/tex/latex/
   or
   /usr/share/texmf/tex/latex
4. If still the package is not included in the enviroment, run sudo texhash in the teriminal

# Installation in Windows

- It is a home assignment for you
- Write the steps for installation in Windows
- Specify how to install the individual packages
- Use TexStudio as the editors

# Offline editors

Some of the popular editors are listed below:

1. TeXmaker
   `http://www.xm1math.net/texmaker/download.html`
2. TeXStudio
   `https://www.texstudio.org/`
3. Kile
   `https://kile.sourceforge.io/download.php`
4. TeXWorks
   `http://www.tug.org/texworks/`

# Online editors

These editors can be used without installing the LaTex in the machine.

1. ShareLaTeX
   Weblink: `https://www.sharelatex.com/`
2. Overleaf
   Weblink: `https://www.overleaf.com/`

# Compilation

- Write the LaTex code and store with .tex file extension
- Compile the file with command pdflatex filename.tex
- The file extenstion is optional here

# Bulleted List

- Item One
  - subitem1
  - subitem2
  - subitem3
- Item Two
  - subitem1
  - subitem2
  - subitem3
- Item Three
  - subitem1
  - subitem2
  - subitem3

# Bulleted List

```
\begin{itemize}
    \item Item One
    \begin{itemize}
        \item subitem1
        \item subitem2
        \item subitem3
    \end{itemize}
    \item Item Two
    \begin{itemize}
        \item subitem1
        \item subitem2
        \item subitem3
    \end{itemize}
    \item Item Three
    \begin{itemize}
        \item subitem1
        \item subitem2
        \item subitem3
    \end{itemize}
\end{itemize}
```

Figure: Unorder-list

- Item One
  - subitem1
  - subitem2
  - subitem3
- Item Two
  - subitem1
  - subitem2
  - subitem3
- Item Three
  - subitem1
  - subitem2
  - subitem3

# Enumeration

1. Item One
   I. subitem1
   II. subitem2
   III. subitem3
2. Item Two
   (a) subitem1
   (b) subitem2
   (c) subitem3
3. Item Three
   1. subitem1
   2. subitem2
   3. subitem3

```
\begin{enumerate}
    \item Item One
    \begin{enumerate}[I]
        \item subitem1
        \item subitem2
        \item subitem3
    \end{enumerate}
    \item Item Two
    \begin{enumerate}[(a)]
        \item subitem1
        \item subitem2
        \item subitem3
    \end{enumerate}
    \item Item Three
    \begin{enumerate}
        \item subitem1
        \item subitem2
        \item subitem3
    \end{enumerate}
\end{enumerate}
```

Figure: order-list

1. Item One
   I. subitem1
   II. subitem2
   III. subitem3
2. Item Two
   (a) subitem1
   (b) subitem2
   (c) subitem3
3. Item Three
   1. subitem1
   2. subitem2
   3. subitem3

# Table Creation

Simple table with 3 rows and 3 columns

| | | |
|---|---|---|
| cell1 | cell2 | cell3 |
| cell4 | cell5 | cell6 |
| cell7 | cell8 | cell9 |

# Table Creation

Simple table with 3 rows and 3 columns

```
\begin{center}
    \begin{tabular}{ c c c }
        cell1 & cell2 & cell3 \\
        cell4 & cell5 & cell6 \\
        cell7 & cell8 & cell9  \\
    \end{tabular}
\end{center}
```

| | | |
|---|---|---|
| cell1 | cell2 | cell3 |
| cell4 | cell5 | cell6 |
| cell7 | cell8 | cell9 |

Figure: Table syntax

# Table Creation (contd..)

Table with lines in between each column

| | | |
|---|---|---|
| cell1 | cell2 | cell3 |
| cell4 | cell5 | cell6 |
| cell7 | cell8 | cell9 |

# Table Creation

Table with lines in between each column

```
\begin{center}
    \begin{tabular}{ |c|c|c| }
        \hline
        cell1 & cell2 & cell3  \\
        cell4 & cell5 & cell6 \\
        cell7 & cell8 & cell9  \\
        \hline
    \end{tabular}
\end{center}
```

Figure: Table syntax

| | | |
|---|---|---|
| cell1 | cell2 | cell3 |
| cell4 | cell5 | cell6 |
| cell7 | cell8 | cell9 |

# Table Creation (contd..)

Table with matrix format and with different alignments

| cell1 | cell2 | cell3 |
|---|---|---|
| cell4 | cell5 | cell6 |
| 7 | 8 | 9 |

# Table Creation

Table with matrix format and with different alignments

```
\begin{center}
    \begin{tabular}{ |r|c|l| }
        \hline
        cell1 & cell2 & cell3  \\
        \hline
        cell4 & cell5 & cell6 \\
        \hline
        7 & 8 & 9  \\
        \hline
    \end{tabular}
\end{center}
```

Figure: Table syntax

| cell1 | cell2 | cell3 |
|---|---|---|
| cell4 | cell5 | cell6 |
| 7 | 8 | 9 |

# Table Creation (contd..)

Table with Multicolumn feature

| Fruit Details | | Cost Calculations | | |
|---|---|---|---|---|
| Fruit | Grade | No. of Units | cost/unit | cost(Rs.) |
| Mango | A | 20 | 75 | 1500 |
| Jackfruits | B | 10 | 50 | 500 |
| Banana | A | 10 | 20 | 200 |

# Table Creation (contd..)

## Table with Multicolumn feature

```
\begin{tabular}{|| l | c | c |c|r||}\hline
    \multicolumn{2}{||c|}{Fruit Details} & \multicolumn{3}{c||}{Cost
    Calculations}\\ \hline
    Fruit & Grade & No. of Units & cost/unit & cost(Rs.)\\\hline
    Mango & A &20 & 75& 1500\\ \hline
    Jackfruits & B&10 & 50 & 500\\ \hline
    Banana & A & 10 & 20 & 200\\ \hline
\end{tabular}
```

Figure: Table syntax

| Fruit Details | | Cost Calculations | | |
|---|---|---|---|---|
| Fruit | Grade | No. of Units | cost/unit | cost(Rs.) |
| Mango | A | 20 | 75 | 1500 |
| Jackfruits | B | 10 | 50 | 500 |
| Banana | A | 10 | 20 | 200 |

# Figure with caption

```
\begin{figure}
    \centering
    \includegraphics[width=0.5\linewidth]{logo}
    \caption{IITG logo}
\end{figure}
```

Figure: Insert Graphics


Figure: IITG logo

# Figure with angle


Figure: IITG logo

```
\begin{figure}
    \centering
    \includegraphics[width=0.5\textwidth,angle=-90]{logo}
    \caption{IITG logo}
\end{figure}
```

Figure: Graphics with angle

# Graphics Alignment

The default alignment is left.


```
\begin{figure}
    \includegraphics[width=0.2\textwidth, right]{logo}
\end{figure}
```

# Multiple images in one figure


(a) logo


(b) Zoomout

Figure: Caption for this figure with two images

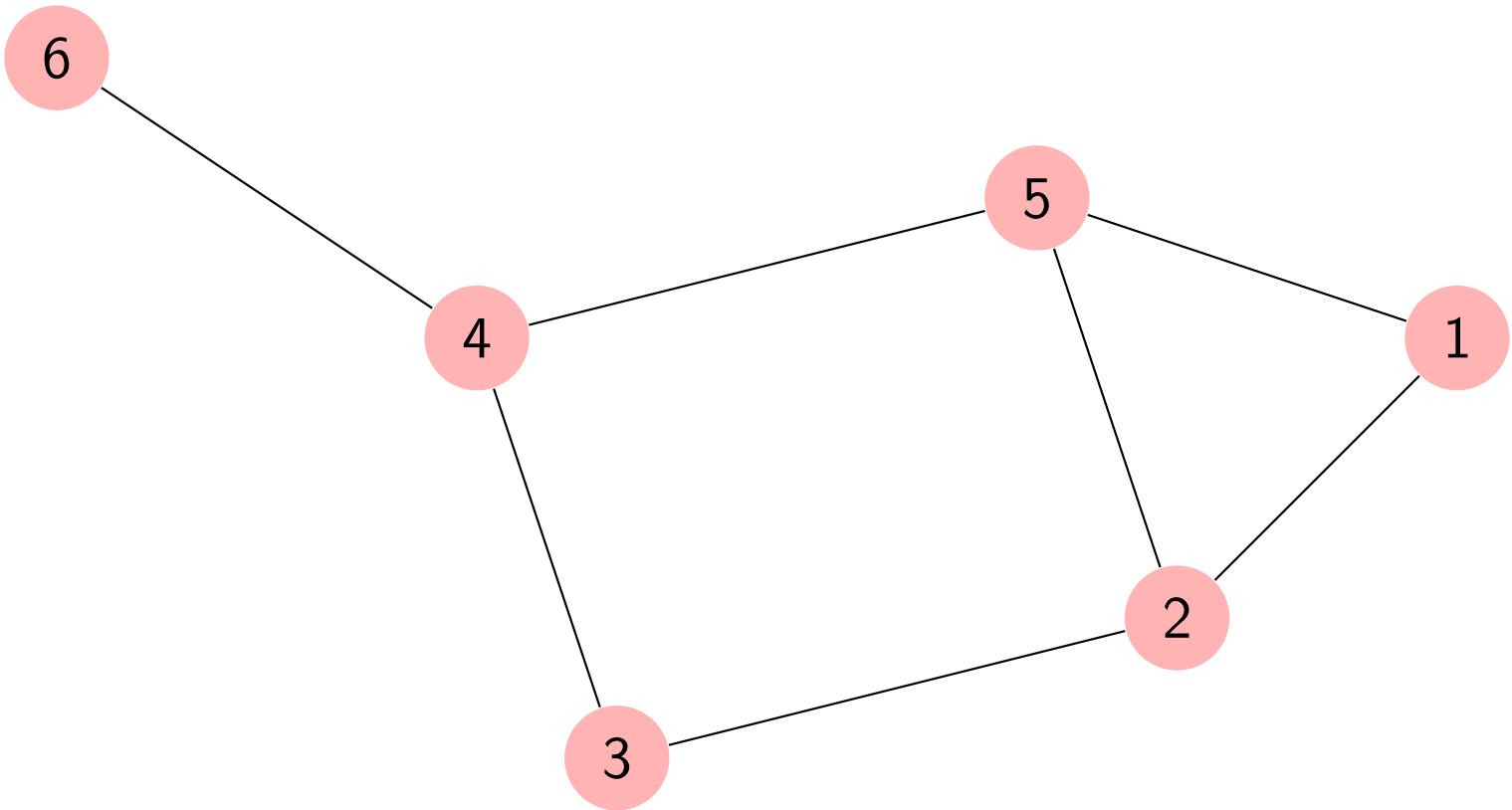
# Multiple images in one figure(contd...)

```
\begin{figure}
    \begin{subfigure}[c]{0.45\textwidth}
        \includegraphics[width=0.5\linewidth, center]{logo}
        \caption{logo}
        %\label{fig:subim1}
    \end{subfigure}
    \hfill
    \begin{subfigure}[c]{0.45\textwidth}
        \includegraphics[width=0.4\linewidth, center]{logo}
        \caption{Zoomout}
        %\label{fig:subim2}
    \end{subfigure}

    \caption{Caption for this figure with two images}
    %\label{fig:image2}
\end{figure}
```

Figure: Inserting figure with two images

# Drawing graph in LaTex



# Drawing graph in LaTex*contd*...

```
\begin{tikzpicture} %\usepackage{tikz}
[scale=.9,auto=left,every node/.style={circle,fill=red!30}]
\node (n6) at (1,10) {6};
\node (n4) at (4,8)  {4};
\node (n5) at (8,9)  {5};
\node (n1) at (11,8) {1};
\node (n2) at (9,6)  {2};
\node (n3) at (5,5)  {3};

\foreach \from/\to in {n6/n4,n4/n5,n5/n1,n1/n2,n2/n5,n2/n3,n3/n4}
\draw (\from) -- (\to);

\end{tikzpicture}
```

Figure: Inserting graph in LaTex

# Sources to Follow

- Book from the creator of LaTex, Leslie Lamport.
- LaTex: A document preparation system: User's guide and reference manual.Addison Wesley, Reading, MA, USA, 2nd edition, 1994.
- Book for advaced user by F.Mittelbach, M.Goossens and others.
- The LaTex companion.MA, USA, 2nd edition, 2004.
- The main website for LaTex realated materials is `www.ctan.org`

# End of Part-1