

# **LATEX: The Language of Scientific Writing**

## **TEQIP-III Sponsored FDP**

**Presented By :**

Dr. Mukesh Saraswat  
sarawatmukesh@gmail.com

Mr. Raju Pal  
raju3131.pal@gmail.com

Mr. Himanshu Mittal

Link for the material: <https://sites.google.com/site/rajupalcse/expert-lectures>

**Jaypee Institute of Information Technology, Noida**

21-23 May, 2018

- Motivation
- Installation of  $\text{\LaTeX}$  software on Windows
- Report Writing
  - $\text{\LaTeX}$  commands
  - JabRef and its utility
- Thesis Writing
- Paper Writing: IEEE, Elseviers, Springer
- Presentation using  $\text{\LaTeX}$
- Resume/Letter/synopsis

## Problems in writing Thesis/Paper

- Formatting ( Single Column, Two Column)
- Reference Management
- Figure Management
- Table Management
- List of Figures
- List of Tables
- ....Many more



### **Introduction**

Learn by examples  
Report Writing  
References  
Thesis writing

### **Problems in writing Thesis/Paper**

Latex  
Required Components

# **Solution is Latex**



# Introduction

**Introduction**  
Learn by examples  
Report Writing  
References  
Thesis writing

Problems in writing Thesis/Paper  
**Latex**  
Required Components

- Pronounced: “**Lay-tech**”.
- Latex — universal typesetting tools for academic research community.  
Math, Physics, Engineering, Finance ...
- Supported by nearly all the publishing corporations:  
**IEEE, ACM, Elsevier, Springer, Wiley, etc.**
- Almost all the IEEE Journals are published as a classic Latex Style
- TeX: computer program released in 1982 by **Donald E. Knuth**:  
**A revolution in typesetting**
- Later, a mathematician and computer scientist, **Leslie Lamport**, wrote a variant of TEX called LaTeX that focuses on document structure:  
**Packages to make TeX easier to use**
- Low level markup language and case sensitive



## Softwares for programming or writing the .tex codes

- Windows:  
MikTeX, TeXmaker, WinEdt, LyX and so on
- Linux like ubuntu:  
TeX-Live, Kile, LyX, and so on
- Mac OS:  
MacTeX, LyX

## **Introduction**

Learn by examples  
Report Writing  
References  
Thesis writing

Problems in writing Thesis/Paper

**Latex**

Required Components

# TeX vs. LaTeX

- TeX can recognize only .ps files for images
- LaTeX can recognize .jpg files for images
- BibTeX is used for Bibliography i.e. giving references
- Recently some ways have been discovered to overcome this limitation.



## Introduction

Learn by examples  
Report Writing  
References  
Thesis writing

Problems in writing Thesis/Paper

## Latex

Required Components

# Advantages of Latex

- It is efficient for using on publication of books or articles.
- It can save user's time by automatically formatting the sections, equations, and pictures of the documents.
- Users need only to learn a few simple commands, which specify the logical structure of a document.
- Complex structures such as footnotes, references, table of contents, and bibliographies can be generated easily.
- LaTeX is highly portable and free



## Advantages of Latex

- High typeset quality
- Easy to include math formulas
- Source file format is not bounded to a particular OS or platform
- Latex implementations exists for all platforms (DOS, Windows, Linux,..)
- Good for large documents

### **Introduction**

Learn by examples  
Report Writing  
References  
Thesis writing

Problems in writing Thesis/Paper

### **Latex**

Required Components

# Advantages of Latex



## Disadvantages of Latex

- Maybe hard to use at the beginning.
- Don't support WYSIWYG ("what you see is what you get"):  
**except lyx or next version Tex**

## How LaTeX Works

- LaTeX source editor + LaTeX compiler (\*.tex).
- Like C + Borland C compiler
- Many LaTeX compilers.
- Popular LaTeX IDE for Windows: **WinEdit + MiKTeX**  
<http://www.miktex.org/> + <http://www.winedt.com/>
- Popular LaTeX IDE for Linux: **Kile + eTeX or encTeX or MiKTeX**  
<http://kile.sourceforge.net/>

For Any Problem  $\Rightarrow$  Google



## MikTex on Windows

- Download the MikTex Software.
- Go to link: <https://miktex.org/download>

The screenshot shows the MiKTeX website's download section. At the top, there's a navigation bar with links for Home, About, Download, Portable, Help, Contact, and Give Back. Below that is a sub-navigation bar for Windows, Mac, Linux, Docker, and All downloads. The main content area is titled "Getting MiKTeX" and specifically "Install for Windows 7, 8 and 10 (64-bit)". It provides download links for Windows, Mac, Linux, Docker, and All downloads. The Windows link is highlighted. Below the links, it says "To install a basic TeX/LaTeX system on Windows, download and run this installer." It shows the download details: Date: 3/12/2018, File name: basic-miktex-2.9.6643-x64.exe, Size: 206.91 MB, SHA-256: 792983b8945ddafc5285cb9942d9d88550ef3af0f8d4add9acd057233ff84584. There's a blue "Download" button with a downward arrow icon. Below the download button, it says "Looking for the 32-bit version? It is available under the "All downloads" tab." and "Please read the tutorial, if you want step-by-step guidance." At the bottom, it says "When you have Installed MIKTeX, it is recommended that you start MIKTeX Console in order to get the latest updates." and "If you want to install MIKTeX on many client computers, then you should use the MIKTeX Setup Utility to deploy MIKTeX in your organization. You can read the deployment tutorial, if you want step-by-step guidance."

# MikTex on Windows

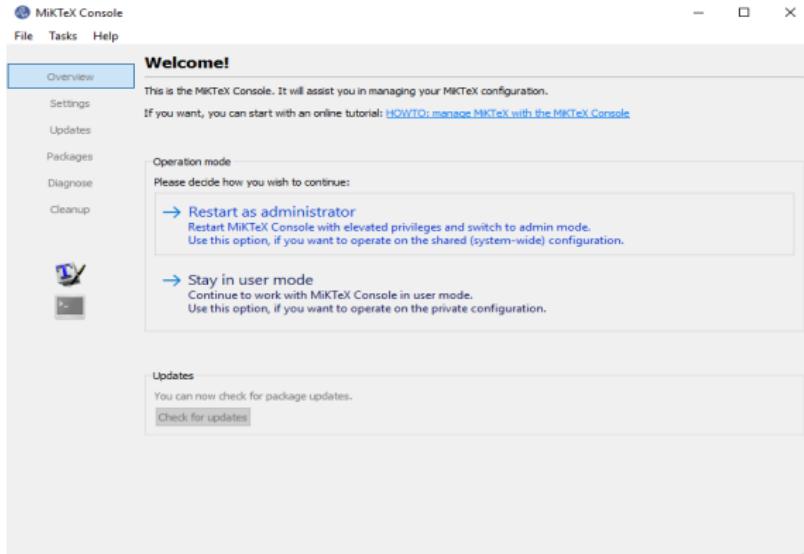


**Introduction**  
Learn by examples  
Report Writing  
References  
Thesis writing

Problems in writing Thesis/Paper  
**Latex**  
Required Components

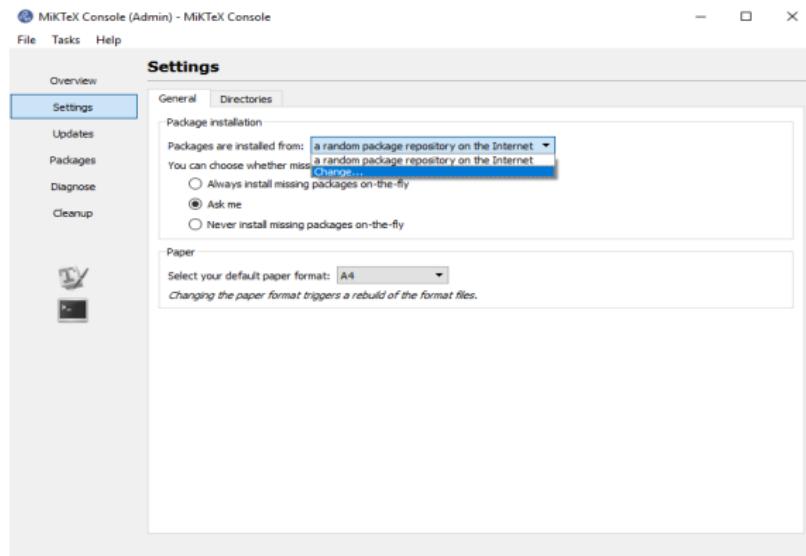


# MikTex on Windows



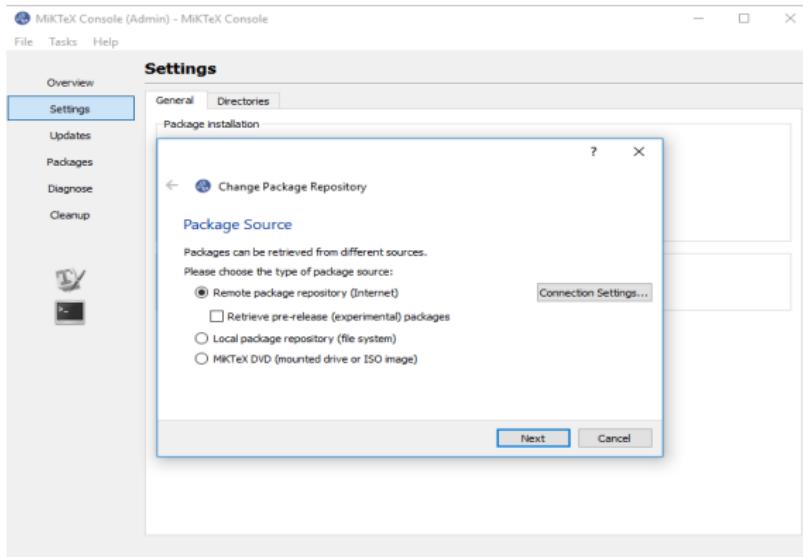
(b) Step 3: Open the MikTex Console and Select the operation mode.

# MikTeX on Windows



(c) Step 4: Change the package repository.

# MikTeX on Windows

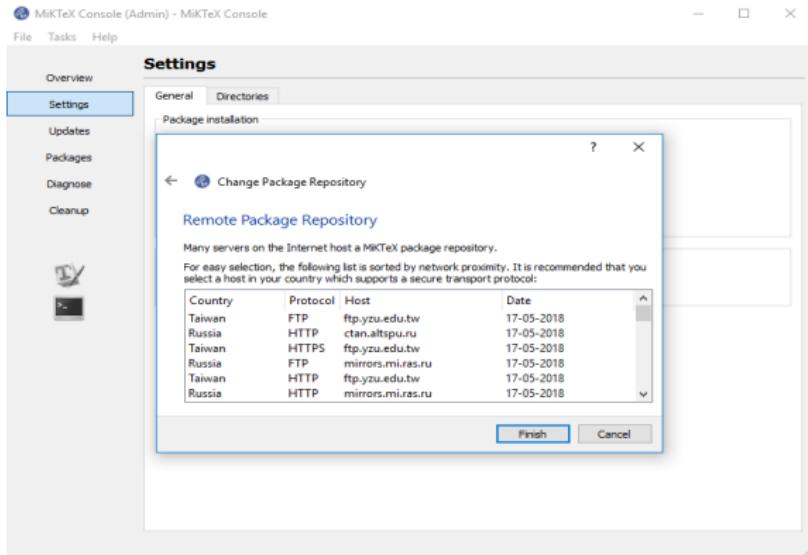


(d) Step 5: Check the Connection Settings.

**Introduction**  
Learn by examples  
**Report Writing**  
**References**  
**Thesis writing**

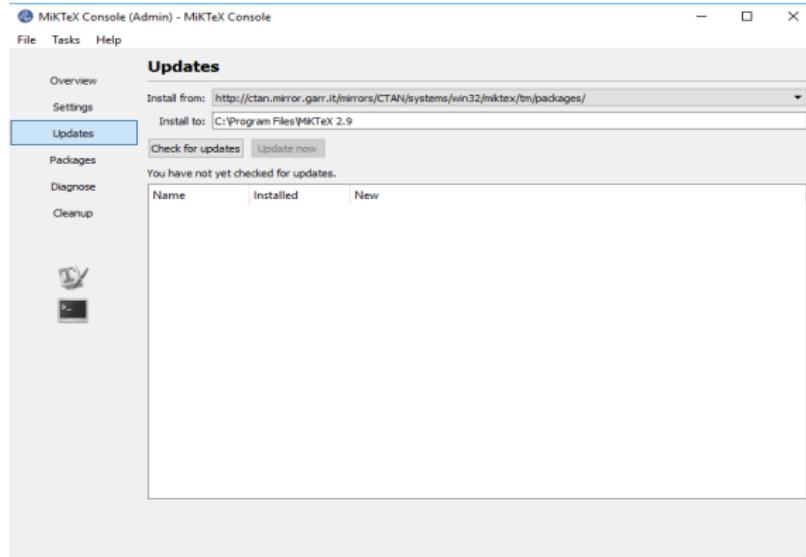
Problems in writing Thesis/Paper  
**Latex**  
**Required Components**

# MikTeX on Windows



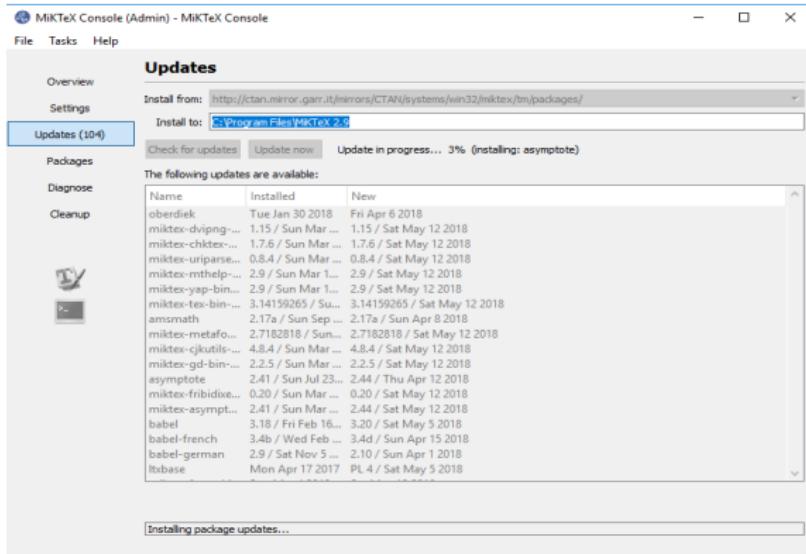
(e) Step 6: Select the repository.

# MikTeX on Windows



(f) Step 7: Check package updation.

# MikTeX on Windows



(g) Step 8: If any, perform package updation.

# How LaTeX Works

Sample.tex - TeXworks

File Edit Search Format Typeset Scripts Window Help

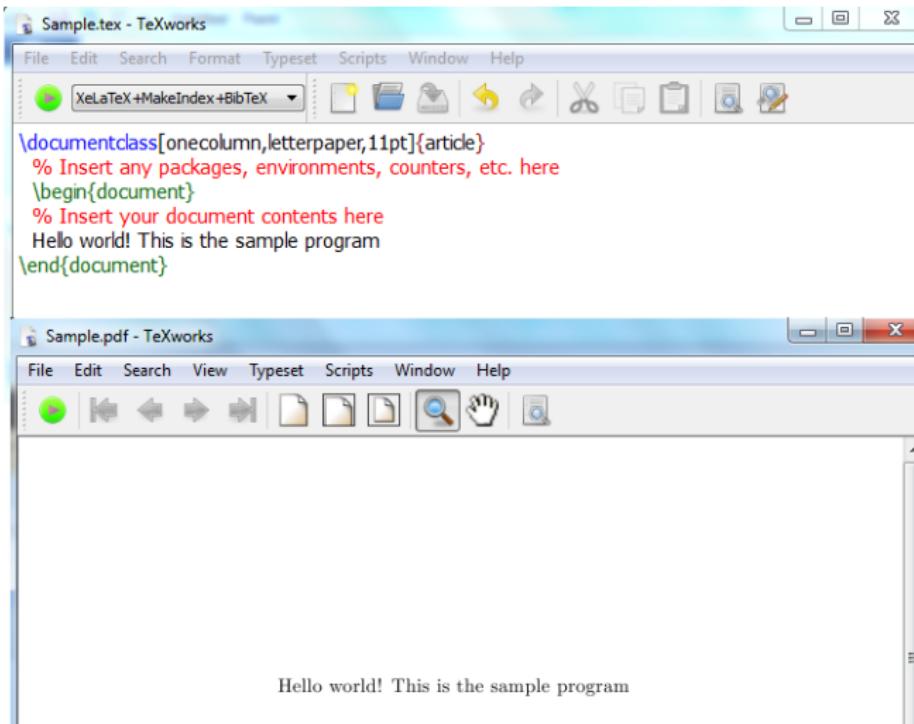
XeLaTeX + MakeIndex + BibTeX

\documentclass[onecolumn,letterpaper,11pt]{article}  
% Insert any packages, environments, counters, etc. here  
\begin{document}  
% Insert your document contents here  
Hello world! This is the sample program  
\end{document}

Sample.pdf - TeXworks

File Edit Search View Typeset Scripts Window Help

Hello world! This is the sample program



## Required Components of a LaTeX Document

- Every LaTeX document must contain the following three components.  
Everything else is optional (even text).

### ① \documentclass{article}

- Tells LaTeX what kind of document it is to process: article, report, book, etc.
- The default font size for each class is 10 point.
- `\documentclass[11pt]{article}` or `\documentclass[12pt]{article}`
- Required information is included in LaTeX commands in braces {}.
- Optional information is included in square brackets []

### ② \begin{document}

### ③ \end{document}

## Learn by examples

### Example 1. Basic

```
\documentclass{article}  
\begin{document}
```

This is my \emph{first} document prepared in \LaTeX.  
\end{document}

**Note:** Select pdfLateX+MakeIndex+BibTeX from the top menu bar and hit F5 or run icon or ctrl+T



## Learn by examples

### Typesetting Text

- \\ or \\newline and \\newpage
- For quotes, use `` (two backquotes) and '' (two apostrophes) instead of ". For single quotes, just use ' and '.
- Bold \\textbf{...} or {\\bf ...}
- Italics \\emph{...} or \\textit{...} or {\\it ...}
- Underline \\underline{...}
- Color \\textcolor{name of color}{...} or {\\color{name of color}...}. You have to use <xcolor> package.
- The predefined color names are:  
black, blue, brown, cyan, darkgray, gray, green, lightgray, lime,  
magenta, olive, orange, pink, purple, red, teal, violet, white, yellow
- New colors are defined as {in preamble}:  
**\\definecolor{name}{RGB}{10,20,30}**

## Learn by examples

### Exercise 2. Play with text

- Write a LaTeX code for the content given in **Ex2\_1.pdf**
- Write a LaTeX code for the content given in **Ex2\_2.pdf**

## Learn by examples

- Consecutive whitespace characters (blank or tab) are treated as one space.
- Paragraphs must be separated by at least one line in the .tex file.
- Comments can be added using the % character. Any text on a line after % will be ignored by the TeX compiler.
- Special Characters:
  - The following symbols are reserved:  
# \$ % & - { } ^ ~ \
  - To include them in your text:  
\# \\$ \% \& \\_ \{ \} \^{} \~{}\
  - Note: you cannot just do \\ (which is a linebreak) , but instead:  
\\$\\backslash\\$

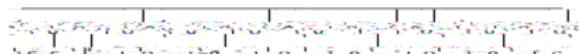
## Learn by examples

**Example 3. Type code to produce the following sentence in your document**

Item #1A\642 costs \$8 & is sold at a ^10% profit.

## Learn by examples

- **Spaces:** \ \ or \newline ...
- **Quotes:** \lq\lq double quotes \rq\rq and \lq single quotes\rq
- **Dashes:** 2-5 : - ; 2–5 : - -; 2—5 : - - -
- **Accents:**



- **Type size:**

## Learn by examples

- Type style:
- 

- Double Spacing: put `\renewcommand{\baselinestretch}{2}` between the `\documentclass` command and the `\begin{document}` command.
- `\newpage` will force the start of a new page.

## Paragraph Alignment

- Left justified: `\begin{flushleft} ... \end{flushleft}` or `\raggedright`
- Right justified: `\begin{flushright} ... \end{flushright}` or `\raggedleft`
- Center: `\begin{center} ... \end{center}` or `\centering`
- Page break: `\pagebreak`
- New page: `\newpage`

## Learn by examples

### Exercise 4. Spacing

- Make a LaTeX document given in **Ex4\_1.pdf**
- Make a LaTeX document given in **Ex4\_2.pdf**

## Command Types

Only **3** types of commands:

{\command} OR {\command{}}

OR

\begin{command}  
{Everything you want to do using that command comes here}  
\end{command}



## Few supports available in the software

- Tab Key or long wait for auto completion of the commands
- Make sure that your spell check is ON.
- Make sure line numbers are enabled.
- Syntax coloring is enabled for LaTeX

# Report Writing

## Chapters, Sections and Cross-References

- To create new chapter, use command:  
`\chapter{chapter name}`
- There are two related commands for creating sections:
  - `\section{sectiontitle}`: It numbers the sections.
  - `\section*{sectiontitle}`: It does not number the sections.
- **subsection:** `\subsection{subsectiontitle}`
- **subsubsection:** `\subsubsection{subsubsectiontitle}`
- **Cross-References:** use `\label{name}` to label the point in your document.
- Use `\ref{name}` to refer to that point.

## Sample Report writing

### Exercise 5. Chapters, Section and cross referencing

- Make a LaTeX file which produces the output shown in the pdf file **Ex5.pdf**

## Page Numbering and Headings

- The command `\pagestyle` controls page numbering and headings.
- It should always go between the `\documentclass{article}` and the `\begin{document}`.
  - `\pagestyle{plain}` is the default, which puts the page number at the center of the bottom of the page and provides no headings.
  - `\pagestyle{empty}` provides neither page numbers nor headings.
  - `\pagestyle{headings}` will provide page numbers and headings from any `\section`'s that you are using.
  - `\pagestyle{myheadings}` will provide page numbers and custom headings.
    - `\markright{right head}` (used for book, report and article class)
    - `\markboth{left head}{right head}` (only in the book class)

## Creating a Title Page

- `\title{your title here}`
- `\author{your name here}`
- `\date{\today}`

*commands must be between the `\documentclass` command and the `\begin{document}` command*

- `\documentclass[titlepage]{article}` may be used as options
- use `\maketitle` just after `\begin{document}`



## All indexes in report

- To insert table of contents use command `\tableofcontents{}`
- To insert list of tables use command `\listoftables{}`
- To insert list of figures use command `\listoffigures{}`
- To insert appendix use command `\appendix{}`
- Appendix needs chapter(s) defined.

# Table of Contents and Abstracts

## • **Table of Contents:**

- Use `\tableofcontents` after your `\begin{document}` command to provide a Table of Contents.  
(Use if you have been using `\section` commands throughout your document)
- It may be necessary to run L<sup>A</sup>T<sub>E</sub>Xtwice on a document with a Table of Contents.
- The First time, L<sup>A</sup>T<sub>E</sub>Xstores the page numbers for the sections in a separate File,
- Then the second time L<sup>A</sup>T<sub>E</sub>Xwrites this information into the Table of Contents.

## • **Abstracts:**

- To create an abstract, place your text in an abstract environment, i.e., between `\begin{abstract}` and `\end{abstract}` commands
- The abstract should come immediately after your `\maketitle` command, but before any `\tableofcontents` command.

## Sample Report writing

### Exercise 6. Title, content, and abstract

- Edit the solution of Exercise 5 as follows
  - Add title page to the report as name of your institute
  - Add author name to the report as your name
  - Add page break so that title page is separated.
  - Add table of contents
  - Add abstract to the report.

Refer **Ex6.pdf**



## About package manager and packages

- Packages are required for additional functionalities . (total 2600+ are available.)
- Open package manger and check which all are installed.
- packages may be added according to the need.
- Command: `\usepackage{package_name}` just before `\begin{document}` line.

## Text Tweaks

- To get  $a^{text1}$ , use command: `a\textsuperscript{text1}`
- To get  $a_{text1}$ , use command: `a\textsubscript{text1}`

Note: you need to used following package. `\usepackage{fixltx2e}`

- `\hspace{10 pt}` or `\vspace{1 in}` is used for giving horizontal or vertical spaces of 10 points and 1 inch respectively. Units can be cm, mm, pt, in etc.

## Text Tweaks contd...

- For colored text, you need to use `\usepackage{color}`
- Command: `\textcolor{colored text}` E.g. This the example of colored text
- Pre-defined colors: white, black, red, green, blue, cyan, magneta, yellow etc. User defined colors can also be used.  
e.g. `\textcolor[rgb]{0.98,0.00,0.00}`
- To have tiny font, type command `\tiny` <text>  
E.g. This is tiny text
- This is huge text `\huge`
- Other similar commands are:  
tiny, scriptsize, footnotesize, small, normalsize, large, Large, LARGE, huge, Huge.



## Bulleted Lists

- Use `\item` between `\begin{itemize}` and an `\end{itemize}` to create a bulleted list.

```
\begin{itemize}
  \item A bulleted item.
  \item Another bulleted item.
\begin{itemize}
  \item A nested bulleted item.
\end{itemize}
\item You get the idea.
\end{itemize}
```

**produces**

- A bulleted item.
- Another bulleted item.
  - A nested bulleted item.
- You get the idea.



## Numbered Lists

- Use `\item` between `\begin{enumerate}` and an `\end{enumerate}` to create a numbered list.

```
\begin{enumerate}
    \item A numbered item.
    \item Another numbered item.
\begin{enumerate}
    \setcounter{enumii}{4}
    \item A nested numbered item.
\end{enumerate}
    \item You get the idea.
\end{enumerate}
```

**produces**

- ❶ A numbered item.
- ❷ Another numbered item.
- ❸ A nested numbered item.
- ❹ You get the idea.



## Description Lists

- Use `\item[]` between `\begin{itemize}` and an `\end{itemize}` to create a Description list.

```
\begin{itemize}
```

```
    \item[First] A numbered item.  
    \item[Second] Another numbered  
item.  
    \itemitem[Third] You get the idea.  
\end{itemize}
```

**produces**

**First** A description item.  
**Second** Another description item.  
**Third** You get the idea.

## List Exercise

**Exercise: 7** Write LaTeX code to generate following list.

This is a great list to practice on:

- let's make some embedded lists
  1. different types of lists can be nested
  2. you can also write math inside a list:  $x = a + b^2$
- here are directions for a nested list

**first** to nest a list, just insert a begin-item-end sequence between items  
**second** it's that easy!
- try “description” for labeled lists with `\item[descriptionname]` list content



## Some Important Commands

- For two column document class use:  
`\documentclass[twocolumn]{article}`
- If you want to make the article class two-sided: use  
`\documentclass[twoside]{article}`
- To set the page size, add the following after `\documentclass`:  
`\usepackage{geometry}`  
  
`\geometry{a4paper}`
  - a0paper, a1paper, ..., a6paper,
  - b0paper, b1paper, ..., b6paper,
  - letterpaper,
  - legalpaper,
  - executivepaper
- For custom page size: `\geometry{paperwidth=5.5in, paperheight=8.5in}`

## Some Important Commands

- To specifies the style of page numbers use: `\pagenumbering{num_style}`
- Possible values of num\_style are:

**arabic:** Arabic numerals

**roman:** Lowercase roman numerals

**Roman:** Uppercase roman numerals

**alph:** Lowercase letters

**Alph:** Uppercase letters



# Page Margin

- 
- ① \hoffset
  - ② \voffset
  - ③ \oddsidemargin = 31pt
  - ④ \topmargin = 20pt
  - ⑤ \headheight = 12pt
  - ⑥ \headsep = 25pt
  - ⑦ \textheight = 592pt
  - ⑧ \textwidth = 390pt
  - ⑨ \marginparsep = 10pt
  - ⑩ \marginparwidth = 35pt
  - ⑪ \footskip = 30pt
  
  - \hoffset = 0pt
  - \voffset = 0pt
  - \paperwidth = 597pt
  - \paperheight = 845pt



## Page Margin

**!!USE TEMPLATES!!**

## Math mode for writing equations

Two ways in which one can write equations:

- Use `\$ Equation here \$`
  - Typically used inside a text or paragraph
- Use `\begin{equation}`  
write a single line equation here  
`\end{equation}`

Use package **amsmath**

- Instead of `equation` other commands that can be used are: `align`, `multiline` etc.



## Math mode for writing equations

**Task:** Try these commands

`\hat{x}, \tilde{x}, \dot{x}, \ddot{x}`

`\leq, \geq, \left[, \right], \left(, \right)`

**Result:**

$\hat{x}, \tilde{x}, \dot{x}, \ddot{x}, \leq, \geq, [], ()$



## Math mode for writing equations

### Greek characters

$\alpha$	<code>\alpha</code>	$\theta$	<code>\theta</code>	$\circ$	<code>\circ</code>	$\tau$	<code>\tau</code>
$\beta$	<code>\beta</code>	$\vartheta$	<code>\vartheta</code>	$\pi$	<code>\pi</code>	$\upsilon$	<code>\upsilon</code>
$\gamma$	<code>\gamma</code>	$\gamma$	<code>\gamma</code>	$\varpi$	<code>\varpi</code>	$\phi$	<code>\phi</code>
$\delta$	<code>\delta</code>	$\kappa$	<code>\kappa</code>	$\rho$	<code>\rho</code>	$\varphi$	<code>\varphi</code>
$\epsilon$	<code>\epsilon</code>	$\lambda$	<code>\lambda</code>	$\varrho$	<code>\varrho</code>	$\chi$	<code>\chi</code>
$\varepsilon$	<code>\varepsilon</code>	$\mu$	<code>\mu</code>	$\sigma$	<code>\sigma</code>	$\psi$	<code>\psi</code>
$\zeta$	<code>\zeta</code>	$\nu$	<code>\nu</code>	$\varsigma$	<code>\varsigma</code>	$\omega$	<code>\omega</code>
$\eta$	<code>\eta</code>	$\xi$	<code>\xi</code>				
$\Gamma$	<code>\Gamma</code>	$\Lambda$	<code>\Lambda</code>	$\Sigma$	<code>\Sigma</code>	$\Psi$	<code>\Psi</code>
$\Delta$	<code>\Delta</code>	$\Xi$	<code>\Xi</code>	$\Upsilon$	<code>\Upsilon</code>	$\Omega$	<code>\Omega</code>
$\Theta$	<code>\Theta</code>	$\Pi$	<code>\Pi</code>	$\Phi$	<code>\Phi</code>		

## Math mode for writing equations

### Relation symbols

$\wedge$	<code>\leq</code>	$\vee$	<code>\geq</code>	$\equiv$	<code>\equiv</code>	$\models$	<code>\models</code>
$\prec$	<code>\prec</code>	$\succ$	<code>\succ</code>	$\sim$	<code>\sim</code>	$\perp$	<code>\perp</code>
$\preceq$	<code>\preceq</code>	$\succeq$	<code>\succeq</code>	$\simeq$	<code>\simeq</code>	$\mid$	<code>\mid</code>
$\ll$	<code>\ll</code>	$\gg$	<code>\gg</code>	$\asymp$	<code>\asymp</code>	$\parallel$	<code>\parallel</code>
$\subset$	<code>\subset</code>	$\supset$	<code>\supset</code>	$\approx$	<code>\approx</code>	$\bowtie$	<code>\bowtie</code>
$\subseteq$	<code>\subseteq</code>	$\supseteq$	<code>\supseteq</code>	$\cong$	<code>\cong</code>	$\Join^b$	<code>\Join^b</code>
$\sqsubset$	<code>\sqsubset</code>	$\sqsupset$	<code>\sqsupset</code>	$\neq$	<code>\neq</code>	$\smile$	<code>\smile</code>
$\sqsubseteq$	<code>\sqsubseteq</code>	$\sqsupseteq$	<code>\sqsupseteq</code>	$\doteq$	<code>\doteq</code>	$\frown$	<code>\frown</code>
$\in$	<code>\in</code>	$\ni$	<code>\ni</code>	$\propto$	<code>\propto</code>	$=$	<code>=</code>
$\vdash$	<code>\vdash</code>	$\dashv$	<code>\dashv</code>	$<$	<code>&lt;</code>	$>$	<code>&gt;</code>
:	:						

## Inserting Equation

### Example 1:

```
\begin{equation}\label{eq:Addition}
a = b + c
\end{equation}
```

$$a = b + c$$

### Example 2:

```
\begin{equation}\label{eq:Addition}
x^2 = y^3 + z_7
\end{equation}
```

$$x^2 = y^3 + z_7$$

## Inserting Equation

### Example 3:

```
\begin{equation} \label{eq:Xbase}
x_2 = y_{34} + z_{71} + a_{83}^{ 94 } + b_{12}^{ 56 }
\end{equation}
```

$$x_2 = y_{34} + z_{71} + a_8 3^9 4 + b_{12}^{56}$$

### Example 4:

```
\begin{equation} \label{eq:SumOfSum}
S_{ij} = \frac{n}{100} \sum_i^{10} \sum_j^{10} (x_i + x_{ij})
\end{equation}
```

$$S_{ij} = \frac{n}{100} \sum_i^{10} \sum_j^{10} (x_i + x_{ij})$$

## No-number Equation

### Example 1:

```
\begin{equation*}\label{eq:Addition}
a = b + c
\end{equation*}
```

**Note:** Insert mathematical expressions within text using \$ sign i.e. \$a+b\$



## Additional features in a math mode

\begin{align}: multi-line equations with alignment.

**Example:**

```
\begin{align}
2x - 5y &= 8 \\
3x + 9y &= -12
\end{align}
```

**Output:**

$$\begin{aligned} 2x - 5y &= 8 \\ 3x + 9y &= -12 \end{aligned} \quad (1) \quad (2)$$

```
\begin{align*}
x&=y & w &=z \\
2x&=-y & 3w&=\frac{1}{2}z \\
-4 + 5x&=2+y & w+2&=-1+w
\end{align*}
```

$$\begin{aligned} x &= y & w &= z \\
2x &= -y & 3w &= \frac{1}{2}z \\
-4 + 5x &= 2 + y & w + 2 &= -1 + w \end{aligned}$$

\nonumber: removes numbers for an equations.

## Additional features in a math mode

\begin{multiline}: command to enter long equations

```
\begin{multiline*}  
p(x) = 3x^6 + 14x^5y + 590x^4y^2 + 19x^3y^3\\  
- 12x^2y^4 - 12xy^5 + 2y^6 - a^3b^3  
\end{multiline*}
```

$$p(x) = 3x^6 + 14x^5y + 590x^4y^2 + 19x^3y^3 \\ - 12x^2y^4 - 12xy^5 + 2y^6 - a^3b^3$$

# Equations

## Exercise 8. Equation writing

- Make a LaTeX file which produces the output shown in the pdf file **Ex8.pdf**



## Labelling Standards

- For Equations : \label{**eq**:Addition}
- For Tables : \label{**table**:AnalysisResult}
- For Figure : \label{**fig**:Methodology}
- For Section : \label{**sec**:Methodology}

## Inserting Tables

```
\begin{tabular}{ l c r p }
```

Table contents

```
\end{tabular}
```

- Four columns table
- **I for left, c for center, r for right, p for paragraph**



## Inserting Tables

Example 1:

```
\begin{tabular}{ l c r }
}
1 & 2 & 3 \\
4 & 5 & 6 \\
7 & 8 & 9 \\
\end{tabular}
```

1	2	3
4	5	6
7	8	9

Example 2:

```
\begin{tabular}{ l | c || r }
}
1 & 2 & 3 \\
4 & 5 & 6 \\
7 & 8 & 9 \\
\end{tabular}
```

1	2	3
4	5	6
7	8	9

## Inserting Tables

Example 3:

```
\begin{tabular}{ l | c || r }
    \hline
    1 & 2 & 3 \\
    4 & 5 & 6 \\
    7 & 8 & 9 \\
    \hline
\end{tabular}
```

1	2	3
4	5	6
7	8	9

Example 4:

```
\begin{center}
    \begin{tabular}{ l | c || r }
        \hline
        1 & 2 & 3 \\
        4 & 5 & 6 \\
        7 & 8 & 9 \\
        \hline
    \end{tabular}
\end{center}
```

1	2	3
4	5	6
7	8	9

## Inserting Tables

### Example 5:

```
\begin{center}
  \begin{tabular}{| l | l | l | l | l |}
  \hline
  Day & Min Temp & Max Temp & Summary \\ \hline
  Monday & 11C & 22C & A clear day with lots of sunshine.
  However, the strong breeze will bring down the temperatures. \\ \hline
  Tuesday & 9C & 19C & Cloudy with rain, across many northern regions. Clear spells
  across most of Scotland and Northern Ireland,
  but rain reaching the far northwest. \\ \hline
  Wednesday & 10C & 21C & Rain will still linger for the morning.
  Conditions will improve by early afternoon and continue
  throughout the evening. \\ \hline
  \end{tabular}
\end{center}
```

Day	Min Temp	Max Temp	Summary
Monday	11C	22C	A clear day with lots of sunshine. However, the strong breeze w
Tuesday	9C	19C	Cloudy with rain, across many northern regions. Clear spells ac
Wednesday	10C	21C	Rain will still linger for the morning. Conditions will improve by



# Inserting Tables

## Example 6:

```
\begin{center}
  \begin{tabular}{ | l | l | l | l | p(5cm) | }
    \hline
    Day & Min Temp & Max Temp & Summary \\ \hline
    Monday & 11C & 22C & A clear day with lots of sunshine.  

    However, the strong breeze will bring down the temperatures. \\ \hline
    Tuesday & 9C & 19C & Cloudy with rain, across many northern regions. Clear spells  

    across most of Scotland and Northern Ireland,  

    but rain reaching the far northwest. \\ \hline
    Wednesday & 10C & 21C & Rain will still linger for the morning.  

    Conditions will improve by early afternoon and continue  

    throughout the evening. \\ \hline
  \end{tabular}
\end{center}
```

Day	Min Temp	Max Temp	Summary
Monday	11C	22C	A clear day with lots of sunshine. However, the strong breeze will bring down the temperatures.
Tuesday	9C	19C	Cloudy with rain, across many northern regions. Clear spells across most of Scotland and Northern Ireland, but rain reaching the far northwest.
Wednesday	10C	21C	Rain will still linger for the morning. Conditions will improve by early afternoon and continue throughout the evening.

## Inserting Tables

### Example 7:

```
\begin{tabular}{|l|l|} \hline
\multicolumn{2}{|c|}{Team sheet} \\
\hline
GK & Paul Robinson \\
LB & Lucas Radebe \\
DC & Michael Duberry \\
DC & Dominic Matteo \\
RB & Dider Domi \\
MC & David Batty \\
MC & Eirik Bakke \\
MC & Jody Morris \\
FW & Jamie McMaster \\
ST & Alan Smith \\
ST & Mark Viduka \\
\hline
\end{tabular}
```

Team sheet	
GK	Paul Robinson
LB	Lucas Radebe
DC	Michael Duberry
DC	Dominic Matteo
RB	Dider Domi
MC	David Batty
MC	Eirik Bakke
MC	Jody Morris
FW	Jamie McMaster
ST	Alan Smith
ST	Mark Viduka

## Adding Caption to Tables

```
\begin{table}  
  \begin{tabular}{ l c r p }  
    \end{tabular}  
  \caption{}  
  \label{}  
\end{table}
```

# Tables

## Exercise 10(a). Making Tables

- Write Latex code which produces following output.

Number	Full Equation
a	$\xi = \alpha$
b	$\Xi = \beta^2$
c	$\zeta = \phi + \epsilon$
$\delta$	$z = p + e$

Table 1: Move the caption to the bottom by putting the caption command under the end of “tabular”. Add additional lines by simply repeating a `\midrule` (etc.) where desired. Use “r” for right and “l” for left alignment. Place the “|” symbol between the appropriate alignment letters for a vertical line as desired.

## Tables

### Exercise 10(b). Making Tables

- Write Latex code which produces following output.

**Table:** Table Type Styles

Table Head	Table Column Head		
	Table column subhead	Subhead	Subhead
copy	More table copy <sup>a</sup>		

<sup>a</sup>Sample of a Table footnote.

## Inserting Figures

Add Package: \usepackage{graphicx}

Example 1:

```
\begin{figure}
\includegraphics{FiguresName} % figure
\caption{Result} %Caption
\label{fig:Result} %Label
\end{figure}
```

Example 2:

```
\begin{figure}
\includegraphics[height=3cm, width=3cm]{FiguresName} % figure
\caption{Result} %Caption
\label{fig:Result} %Label
\end{figure}
```

# Subfigures

Add Package: \usepackage{subfigure}

Example 1:

```
\begin{figure}
\subfigure[Subfigure 1]
{\includegraphics[height=3cm,width=3cm]{Koala.jpg}}~~~
\subfigure[Subfigure 2]
{\includegraphics[height=3cm,width=3cm]{Penguins.jpg}}
\caption{Result} %Caption
\label{fig:Result} %Label
\end{figure}
```



(h) Subfigure 1



(i) Subfigure 2

Figure: Result

## Inserting figures in document

### Exercise 11. Making Figures

- Write Latex code for the content given in **Ex11- figures.pdf**.

!!Compile & Run Multiple Times!!  
Dealing with large documents



## Environment Setup

Internet Setting and error handling for **Packages**

!... Demonstration ...!



## Inserting References

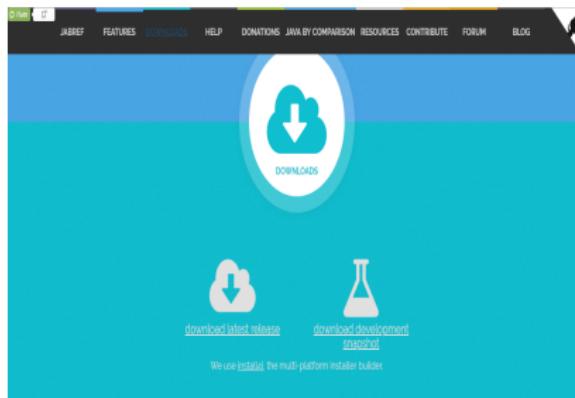
- Insert following two commands at the end of document, before `\end{document}`
- Simplest way to make bibliography file is by using **JabRef**

`\bibliographystyle{plain}`

`\bibliography{references}`



## JabRef on Windows



(a) Step 1: Download the JabRef:  
<http://www.jabref.org/>.

## JabRef on Windows

- Step 2: Install/update Java Runtime Environment

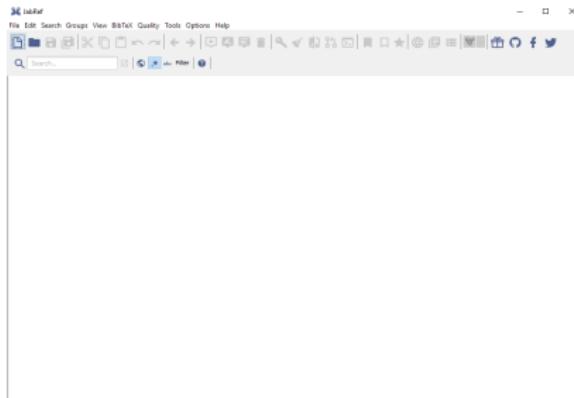


## JabRef on Windows



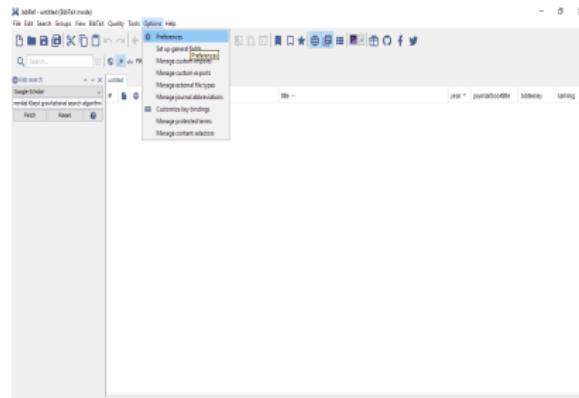
(b) Step 3: Install the JabRef.

## JabRef on Windows



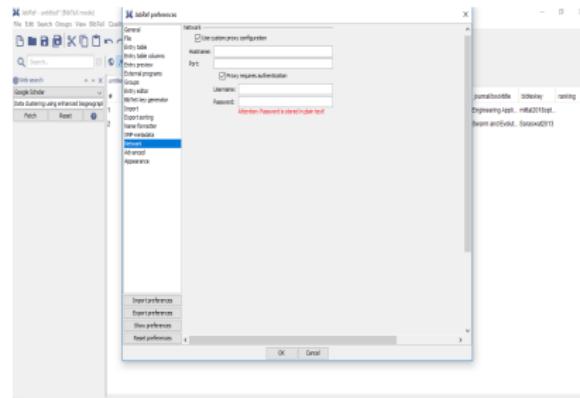
(c) Step 4: Open the JabRef and create new JabRef file by clicking the top-left symbol.

## JabRef on Windows



(d) Step 5: If on network, setup the connection settings by selecting the preferences.

## JabRef on Windows



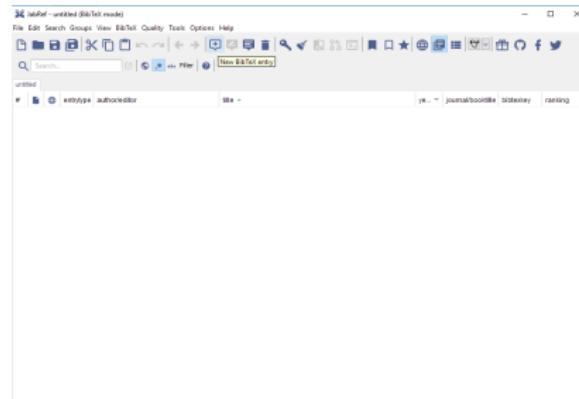
(e) Step 6: Select 'Network 'option and the required details.

## JabRef on Windows

- Generally, BibTex key of paper can be generated in three ways:
  - Manually
  - Using DOI
  - Using Paper name

## JabRef on Windows

1<sup>st</sup> way: Manual

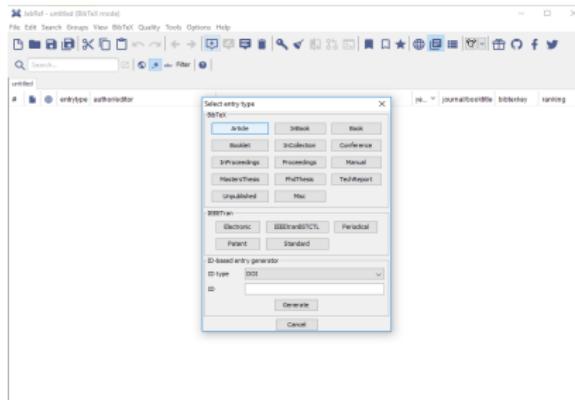


(f) Step 1: Click on + symbol.

Figure:

# JabRef on Windows

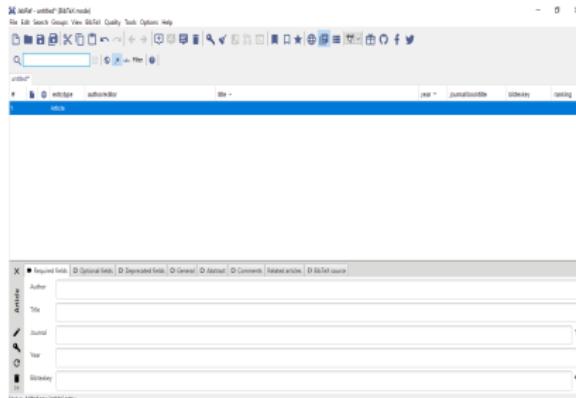
## 1<sup>st</sup> way: Manual



(a) Step 2: Select 'Article 'on the popup window.

## JabRef on Windows

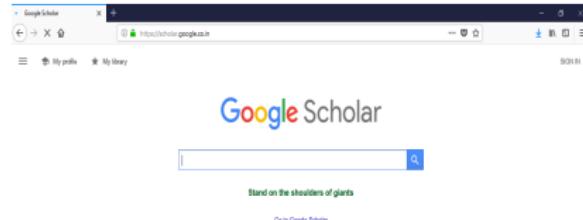
1<sup>st</sup> way: Manual



(b) Step 3: Window will be like this.

# JabRef on Windows

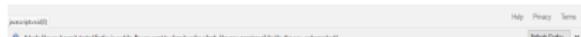
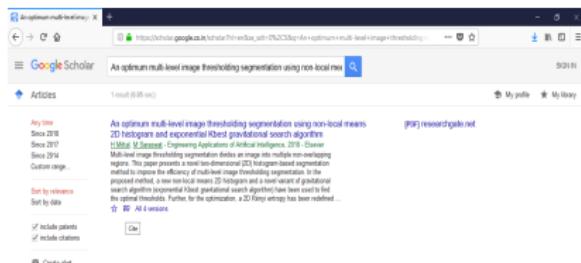
## 1<sup>st</sup> way: Manual



(c) Step 4: Fetch the BibTex key online.

# JabRef on Windows

## 1<sup>st</sup> way: Manual



(d) Step 5: Click on the 'Cite'.

# JabRef on Windows

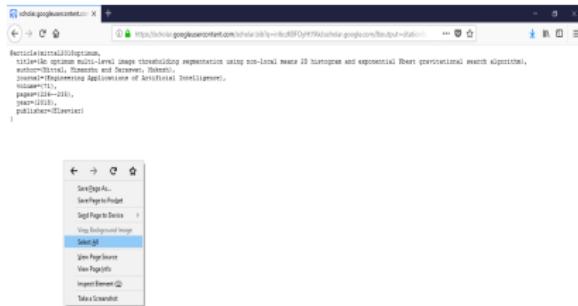
## 1<sup>st</sup> way: Manual



(e) Step 6: Click on the 'BibTex'.

# JabRef on Windows

## 1<sup>st</sup> way: Manual



It looks like you haven't started reading it yet. Do you want to clean it up for a fresh, line-new experience? And by the way, welcome back!

Right|Ref...

(f) Step 7a: Select the BibTex content.



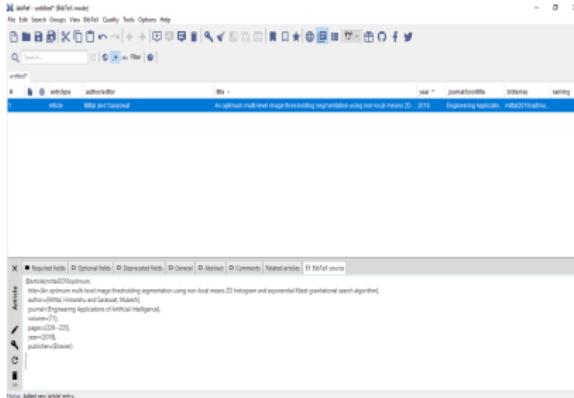
It looks like you haven't started reading it yet. Do you want to clean it up for a fresh, line-new experience? And by the way, welcome back!

Right|Ref...

(g) Step 7b: Copy the BibTex content.

## JabRef on Windows

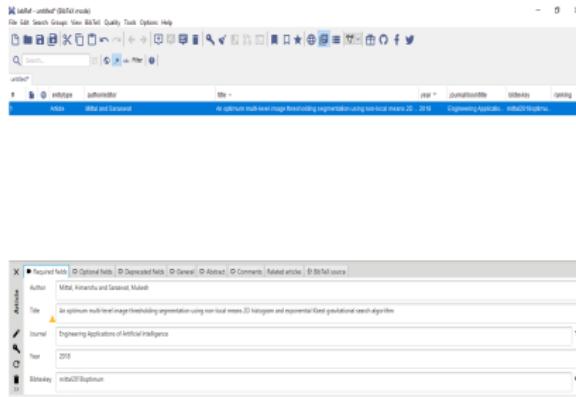
1<sup>st</sup> way: Manual



(h) Step 8: Go to JabRef window, click the 'Bib-Tex source' tab, and paste the copied text.

# JabRef on Windows

## 1<sup>st</sup> way: Manual

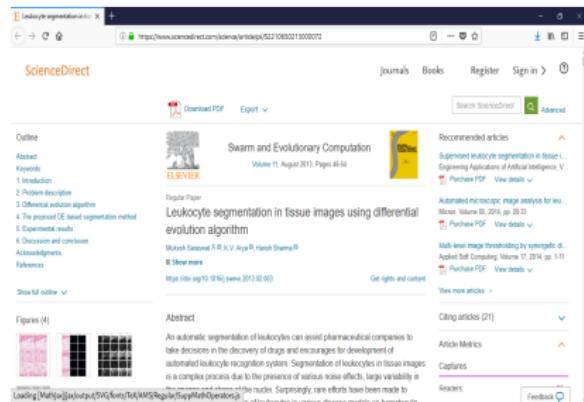


(i) Step 9: Check the entries, if required to.

Figure:

# JabRef on Windows

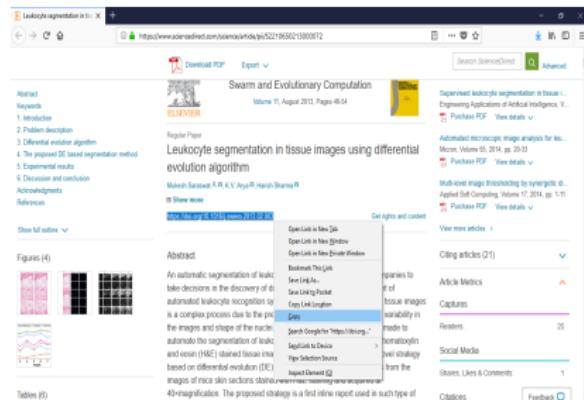
2<sup>nd</sup> way: DOI



(a) Step 1: Go to the paper online.

# JabRef on Windows

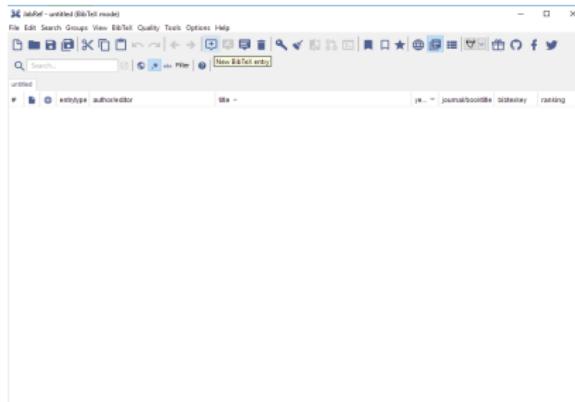
## 2<sup>nd</sup> way: DOI



(b) Step 2: Copy the 'DOI 'of the paper.

## JabRef on Windows

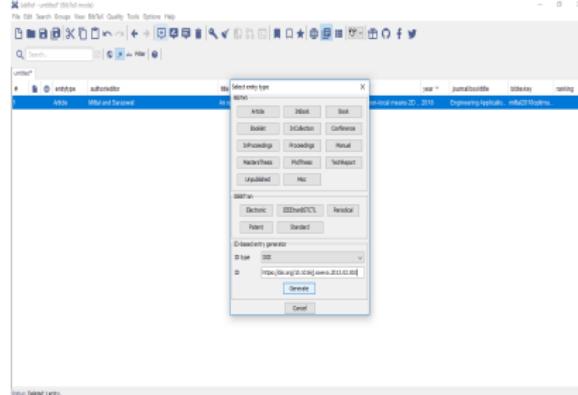
2<sup>nd</sup> way: DOI



(c) Step 3: Click on + symbol.

## JabRef on Windows

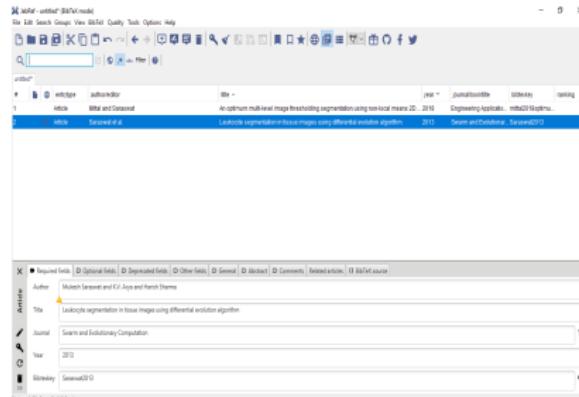
2<sup>nd</sup> way: DOI



(d) Step 4: Entry the 'DOI 'of the paper at the bottom of the popup window.

## JabRef on Windows

2<sup>nd</sup> way: DOI

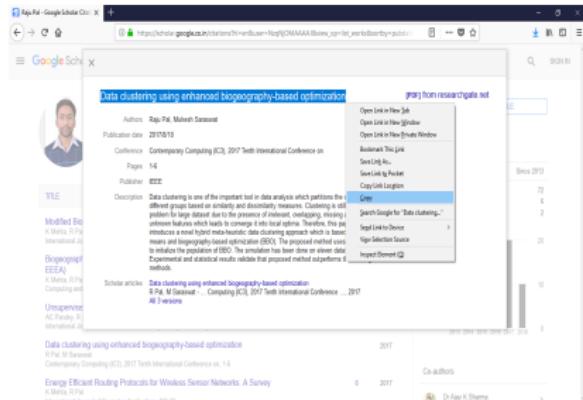


(e) Step 5: JafRef will have the entry like this.

Figure:

# JabRef on Windows

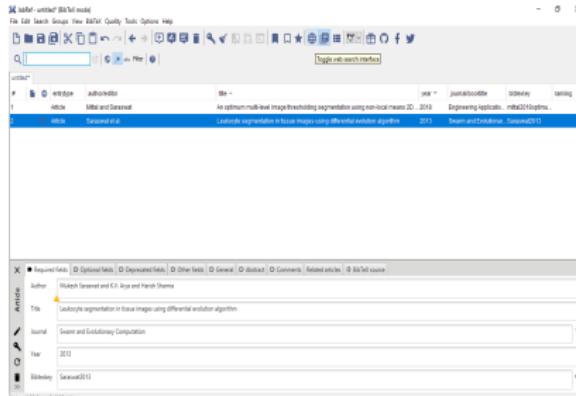
3<sup>rd</sup> way: DOI



(a) Step 1: Copy the paper name

## JabRef on Windows

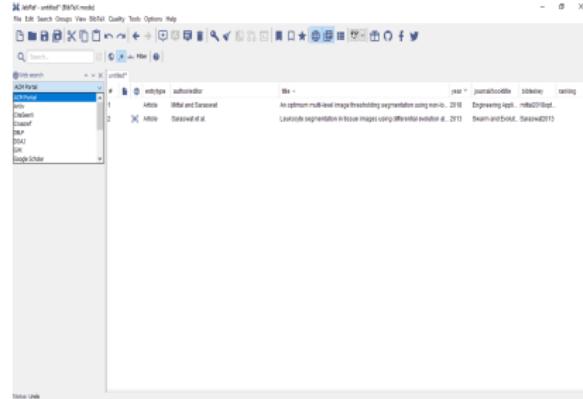
3<sup>rd</sup> way: DOI



(b) Step 2: Click on the web search option.

## JabRef on Windows

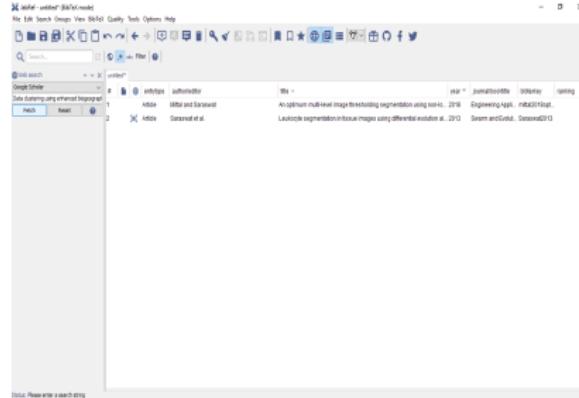
3<sup>rd</sup> way: DOI



(c) Step 3: Select the appropriate web source.

## JabRef on Windows

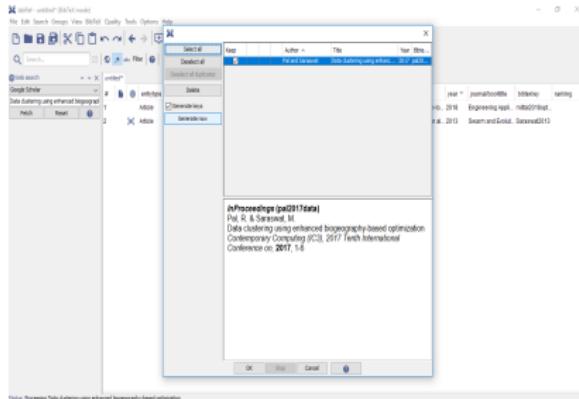
3<sup>rd</sup> way: DOI



(d) Step 4: Enter the paper name and click 'Fetch'

# JabRef on Windows

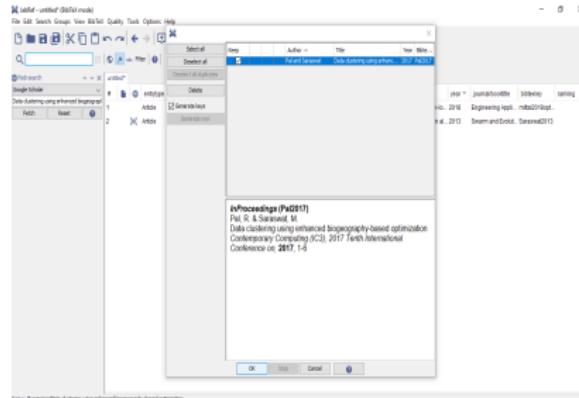
3<sup>rd</sup> way: DOI



(e) Step 5: Click 'Generate Now 'after selecting the appropriate paper.

# JabRef on Windows

3<sup>rd</sup> way: DOI



(f) Step 6: Click 'OK'.

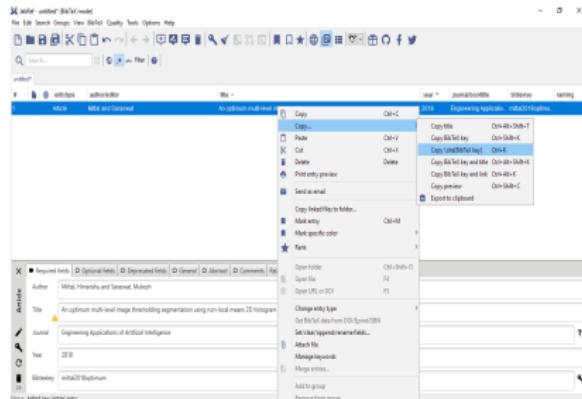
Figure:

## BibTex key in Paper

- There are two ways to enter the BibTex key in paper:
  - Manually
  - Push: Can't use with MikTex

# BibTex key in Paper

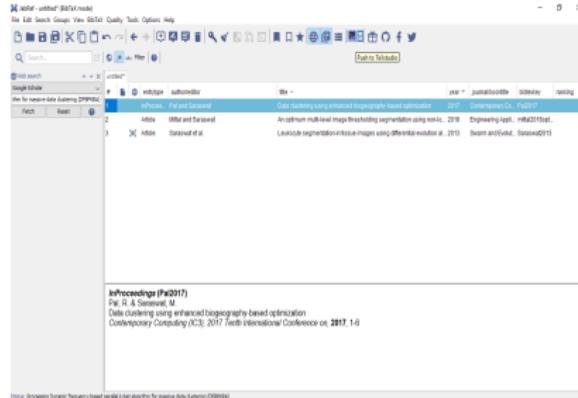
## 1<sup>st</sup> way: Manual



(a) Step 1.1: Rightclick the required entry in JabRef, select the highlighted option, and paste in the desired location in paper.

# BibTex key in Paper

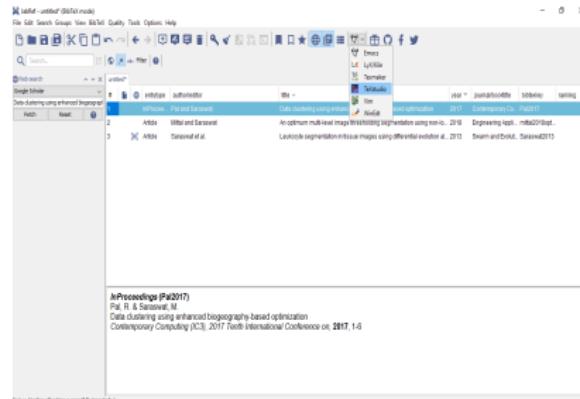
## 2<sup>nd</sup> way: Push



(b) Step 2.1: Place the mouse cursor at desired location in paper and select the 'Push ' in JabRef.

# BibTex key in Paper

## 2<sup>nd</sup> way: Push



(c) Step 2.2: In JabRef, other IDE can be selected too.

## Saving BibTex File

- Click the 'save' symbol in JabRef.
- Select the location and name of the BibTex File.
- A file of entered name with '.bib' extension will be created in the selected location.
- Remember: the \* on the name of the JabRef file means changes are not saved.



## Learning by doing

### Exercise 13:

- Using Google Scholar ([scholar.google.com](http://scholar.google.com)), search for the following: "An optimum multi-level image thresholding segmentation using non-local means 2D histogram and exponential Kbest gravitational search algorithm "
- Note the top hitting article, click on **cite** at the bottom of the entry, and click on **bibtex** at the bottom of the pop up window.
- Copy and paste the information into a new file called **mybib.bib**.

## The document class

- The *book* class is the most suitable to write thesis.
  - font size (10pt),<sup>1</sup>
  - paper size ( a4 paper or letter paper),
  - if having the text on both sides of the page (twoside) or only on the front (oneside),
  - if placing the chapter titles only on right pages (openright) or any (openany).
- It defines three commands:
  - \frontmatter: pages are numbered with lower case Roman numbers
  - \mainmatter: pages are numbered with Arabic numbers
  - \backmatter: pages are numbered as in the mainmatter (chapters are not numbered)
- for example, \documentclass[11pt,letterpaper,twoside,openright]{book}



---

<sup>1</sup>For good readability on A4 and letter paper it is advisable to use a base font size of 11 pt. ⏪ ⏴ ⏵

## Organizing the files

- To manage a complex document like book or thesis, it is better to divide it into several files.
- A main file control all other files using `\include` or `\input`.
- An inputed file may itself have many input files.
- There is also a command `\includeonly{filename1, filename2,.....}` that include some of the files only.

## Sections of the Thesis

A thesis can have the following structure:<sup>2</sup>

### frontmatter

- Title page<sup>○</sup>
- Dedication\*<sup>○</sup>
- Abstract\*<sup>○</sup>
- Acknowledgements\*<sup>○</sup>
- Table of contents and other lists<sup>○</sup>
- Table of symbols and notation\*
- Preface\*

### mainmatter

- Inner chapters
- Appendices\*

### backmatter

- Bibliography
- List of acronyms\*
- Index\*

<sup>2</sup>The symbol \* indicates optional sections and <sup>○</sup> indicates sections that should not be in the table of contents.

## Title Page

- Since the thesis layout and contents are usually defined by university requirements, the title page often needs to be created *ad hoc*.

### Task

- Make a title page for PhD thesis according to R.T.U. Guidelines.

## Abstract

The abstract is generated by the environment

```
\begin{abstract}  
....  
\end{abstract}
```

which is available for the article, report, and book classes.

## Practical session: Thesis Writing

- Go to Experiments → Thesis directory.
- Open main.tex.
- Compile and Run.

# Thank You