LaTeXLecture 2

Tareq

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1 Figures

1.1 Single Figure

Figures need graphicx package.

```
\usepackage{graphicx}.

\begin{figure}[h]
\centering
\includegraphics[width=0.3\textwidth]{buetlogo.png}
\caption{Logo of BUET}
\label{fig:logobuet}
\end{figure}
```

Figure 1: Logo of BUET

1.2 Multiple Figures

You have to include subcaption package for side by side images.

```
\usepackage{subcaption}

\begin{figure}[h]
```

```
\centering
\begin{subfigure}{0.4\textwidth}
\centering
\includegraphics[width=0.8\textwidth]{ubuntulogo.png}
\caption{Ubuntu}
\end{subfigure}
~
\begin{subfigure}{0.4\textwidth}
\centering
\includegraphics[width=0.8\textwidth]{kalilogo.png}
\caption{Kali Linux}
\end{subfigure}
\caption{Linux Distributions}
\end{figure}
```

(a) Ubuntu

(b) Kali Linux

Figure 2: Linux distributions

2 Equation

2.1 Simple Equation

This is a simple equation: $a + a = 2a$
`$a + a = 2a$`
This is not math mode: a + a = 2a.

3 Superscript and Subscript

Use `_` for subscript, e.g. `$a_n$` shows a_n.
Use `^` for superscript, e.g. `$a^n$` shows a^n.
Use `{}` to group more than one characters, e.g. `$a_{in}$` shows a_{in}.

More complex equation, `$$\sum_{i=0}^n a_i$$` shows

$$\sum_{i=0}^{n} a_i$$

.

3.1 Mathematical Environments

Inline: `$\sum_{i=0}^n a_i$`
Inline with displaystyle: `$\displaystyle\sum_{i=0}^n a_i$`
Block level: `$$\sum_{i=0}^n a_i$$`
Block level with equation number:

```
\begin{equation}
\sum_{i=0}^n a_i
\end{equation}
```

Notice the difference in output.
Inline: $\sum_{i=0}^{n} a_i$
Inline with displaystyle: $\displaystyle\sum_{i=0}^{n} a_i$
Block level:

$$\sum_{i=0}^{n} a_i$$

Block level with equation number:

$$\sum_{i=0}^{n} a_i \tag{1}$$

3.2 Miscellaneous

For some of the commands, you need to include `amsmath` package.

Comparisons:
`$ < \leq $` shows, $<\leq$
`$ > \geq $` shows, $>\geq$

Set operations:

```
\forall x \in X, \exists y \leq \epsilon
```

$$\forall x \in X, \exists y \leq \epsilon$$

```
A \cap B, A \cup B
```

$$A \cap B, A \cup B$$

Limits and Infinity:
```
\lim_{x \to \infty} \exp(-x) = 0
```

$$\lim_{x \to \infty} \exp(-x) = 0$$

Fractions:
```
\frac{a}{b}
```

$$\frac{a}{b}$$

Binomials:
```
\binom{n}{k}
```

$$\binom{n}{k}$$

Times:
```
a \times b
```

$$a \times b$$

Root:
square root: $\sqrt{a}$, `\sqrt{a}`
nth root: $\sqrt[n]{a}$, `\sqrt[n]{a}`

Modular:
```
a \bmod b, a \pmod b, a \equiv b
```

$$a \bmod b, a \pmod b, a \equiv b$$

Integrals:
```
\int_a^b xdx
```

$$\int_a^b xdx$$

Plus minus:
```
a \pm 5, a \mp 5
```

$$a \pm 5, a \mp 5$$

Trigonometry:
```
\cos2\theta = \cos^2 - \sin^2
```

$$\cos 2\theta = \cos^2 - \sin^2$$

Custom operator:
```
\textrm{cos}2\theta = \textrm{cos}^2 - \textrm{sin}^2
```

$$\textrm{cos}2\theta = \textrm{cos}^2 - \textrm{sin}^2$$

3.3 Autometic Sizing of Parentheses/Braces/Brackets

```
(\frac{a}{b})
```

$$(\frac{a}{b})$$

```
\left(\frac{a}{b}\right)
```

$$\left(\frac{a}{b}\right)$$

3.4 Matrices

matrix

```
\begin{equation}
\begin{matrix}
1 & 0 & 0\\
0 & 1 & 0\\
0 & 0 & 1\\
\end{matrix}
\end{equation}
```

$$\begin{matrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{matrix} \tag{2}$$

pmatrix

```
\begin{equation}
\begin{pmatrix}
1 & 0 & 0\\
0 & 1 & 0\\
0 & 0 & 1\\
\end{pmatrix}
\end{equation}
```

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \tag{3}$$

bmatrix

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \tag{4}$$

Change the matrix environment to $pbBvV$matrix in the following equation and observe the output:

4 Bibliography

Process of compiling external bib file (assuming tex file name is doc.tex, it does not matter what the bib file name is):

```
pdflatex doc.tex
bibtex doc
pdflatex doc.tex
pdflatex doc.tex
```

Refer to a work/paper/journal by `\cite{tag}`. You can get BibTex from Google Scholar.
For example, Convolutional Neural Network (CNN) [2] has been sucessfully applied in various areas of computer vision. Large datasets like ImageNet [1] can be used in trainning a CNN.

References

[1] Jia Deng, Wei Dong, Richard Socher, Li-Jia Li, Kai Li, and Li Fei-Fei. Imagenet: A large-scale hierarchical image database. In *2009 IEEE conference on computer vision and pattern recognition*, pages 248–255. Ieee, 2009.

[2] Yann LeCun, Léon Bottou, Yoshua Bengio, Patrick Haffner, et al. Gradient-based learning applied to document recognition. *Proceedings of the IEEE*, 86(11):2278–2324, 1998.