CS699 LaTeX Advanced Lab

Ajeeta Shakeet and Sobha Singh

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Problem Statement

Read this section carefully before you start. Do ask questions if you need clarifications.

Final Goal: You have to produce two pdf files, a report file and a presentation file. The presentation is to be made after the report file is made. The presentation will make use of the same content in the report file.

What do we cover? This time we will explore a few additional/advanced features. The features that you have to cover today are listed in the table of contents on the next page.

Choice of text matter You have to cover all these features unless specified as optional. But the actual matter must be of your own choice in the case of features in Sections 1, 3, 6 and 7. For Sections 2, 4 and 5 use the same content (mathematical formulae and algorithm code) as given in those sections, i.e. you are required to reproduce exactly the same set of mathematical formulae layouts and pseudo code layouts as given here. You may make it better, but do not change the matter for Sections 2, 4 and 5.

For use in Section 3/7, one .bib file is given to you for your reference. You can use the template of this file to add your content.

Additionally, Section 6 lists some additional features, which you may try optionally. You are welcome to explore any other features on your own.

What to submit:-

One tarball (use the method described in the previous lab) with name as **<rollno>-lab3.tar.gz** including the following files:

.tex two source files; one for pdf and one for presentation
.pdf two output files; one for pdf and one for presentation
.dia the figure made
.eps/.png/.jpg the figure used in .tex file
.bib for biblography

Happy Learning !!

Contents

1 Itemize, Enumerate and Description

1.1 Itemize

- L^AT_EX typesets a file of text using the TEX program.

- L^AT_EX is widely used in academia for the communication and publication of scientific documents in many fields, including mathematics, physics, computer science, statistics, economics and political science.[?]

- L^AT_EX can be used as a standalone document preparation system or as an intermediate format.

- LaTeX is intended to provide a high-level language that accesses the power of TeX in an easier way for writers.

1.2 Enumerate

1. L^AT_EX typesets a file of text using the TEX program.[?]

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3. L^AT_EX can be used as a standalone document preparation system or as an intermediate format.

4. LaTeX is intended to provide a high-level language that accesses the power of TeX in an easier way for writers.
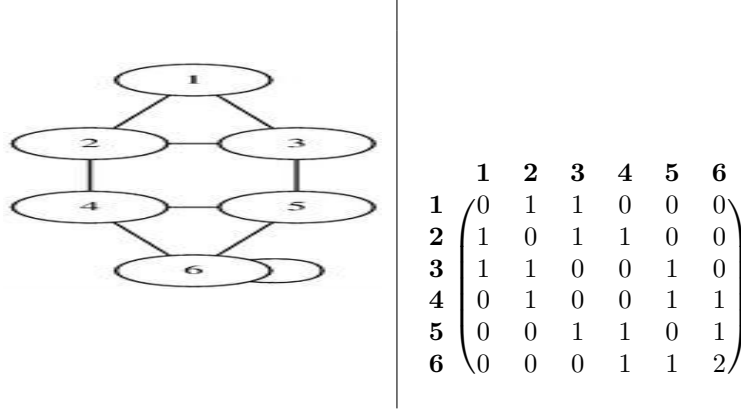
1.3 Description

- **Red** A colour at the end of the spectrum next to orange and opposite violet, as of blood, fire, or rubies. program.

- **Blue** A colour intermediate between green and violet, as of the sky or sea on a sunny day.

- **White** The colour of milk or fresh snow, due to the reflection of all visible rays of light; the opposite of black.

- **Black** The darkest colour owing to the absence of or complete absorption of light; the opposite of white.

2 Mathematical formulas and notations

2.1 Matrix

Adjacency matrix of corresponding graph.

$$\begin{array}{c}\begin{array}{cccccc}\mathbf{1} & \mathbf{2} & \mathbf{3} & \mathbf{4} & \mathbf{5} & \mathbf{6}\end{array}\\\begin{array}{c}\mathbf{1}\\\mathbf{2}\\\mathbf{3}\\\mathbf{4}\\\mathbf{5}\\\mathbf{6}\end{array}\begin{pmatrix}0 & 1 & 1 & 0 & 0 & 0\\1 & 0 & 1 & 1 & 0 & 0\\1 & 1 & 0 & 0 & 1 & 0\\0 & 1 & 0 & 0 & 1 & 1\\0 & 0 & 1 & 1 & 0 & 1\\0 & 0 & 0 & 1 & 1 & 2\end{pmatrix}\end{array}$$

2.2 Equation array

$$
\begin{aligned}
\cos 2\theta &= \cos^2\theta - \sin^2\theta & (1)\\
&= 2\cos^2\theta - 1. & (2)\\
\cos^3\theta + \sin^3\theta &= (\cos\theta + \sin\theta)(\cos 2\theta - \cos\theta\sin\theta) & (3)\\
&= (\cos\theta + \sin\theta)(1 - \cos\theta\sin\theta) & (4)\\
&= (\cos\theta + \sin\theta)(1/2)(2 - 2\cos\theta\sin\theta)(3) & (5)\\
&= (1/2)(\cos\theta + \sin\theta)(2 - \sin(2\theta)) & (6)
\end{aligned}
$$

2.3 Prepositional formulae using various operators

$\neg(\forall x)(\varphi(x)) \longleftrightarrow (\exists x)\neg\varphi(x)$

$(\forall x)(\psi(x)\Lambda\psi(x)) \longleftrightarrow ((\forall x)\varphi(x)\Lambda(\forall x)\varphi(x))$

$(\exists x)(\varphi(x)\Lambda\psi(x)) \longleftrightarrow ((\exists x)\varphi(x)\Lambda(\exists x)\psi(x))$

$((\forall x)\varphi(x)\Lambda(\forall x)\psi(x)) \longrightarrow (\forall x)(\varphi(x)\Lambda\psi(x))$

$(\exists x)(\varphi(x)\Lambda\psi(x)) \longrightarrow ((\exists x)\varphi(x)\Lambda(\exists x)\varphi(x)\Lambda(\exists x)\psi(x))$

2.4 Alphabets

Greek letters:	$\alpha A \ \ \beta B \ \ \gamma \Gamma \ \ \rho \varrho P \ \ \sigma \Sigma \ \ \delta \Delta \ \ \epsilon \varepsilon E$
Binary operators:	$\times \ \otimes \ \oplus \ \cup \ \cap$
Relation operators:	$\subset \ \supset \ \subseteq \ \supseteq \ < \ >$
Others:	$\int \ \oint \ \sum \ \prod$

2.5 Mathematical Formulas

1. $\frac{\pi}{4} = \sum\limits_{n=0}^{\infty} \frac{(-1)^n * \overbrace{(1 + 1 + \cdots + 1)}^{n}}{(2n+1)*n}$

2. $\int_a^b x^3 \, \mathrm{d}x = \frac{1}{4} x^4 \Big|_a^b$

3. $\frac{\pi}{4} = 4 \sum\limits_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)5^{2n+1}} - \sum\limits_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)239^{2n+1}}$

4. $\pi = \frac{3\sqrt{3}}{4} - 24 \sum\limits_{n=0}^{\infty} \frac{\frac{(2n)!}{(n)!}}{2n+1(2n-1)4^{2n+1}}$

5. $\frac{1}{\pi} = \frac{2\sqrt{2}}{9801} \sum\limits_{n=0}^{\infty} \frac{(4n)!(1103+26390n)}{(n)!^4 396^{4n}}$

6. $\sum\limits_{i=1}^{\left[\frac{n}{2}\right]} \binom{x_{i,i+1}^{i^2}}{\left[\frac{i+3}{3}\right]} \frac{\sqrt{\mu(i)^{\frac{3}{2}}(i^2-1)}}{\sqrt[3]{\rho(i)-2}+\sqrt[3]{\rho(i)-1}}$

7. $\lim_{(v,v')\to(0,0)} \frac{H(z+v)-H(z+v')-BH(z)(v-v')}{\|v-v'\|} = 0$

8. $\det \mathbf{K}(t=1,t_1,\ldots,t_n) = \sum_{I\in\mathbf{n}}(-1)^{|I|} \prod_{i\in I} t_i \prod_{j\in I}(D_j+\lambda_j t_j) \det \mathbf{A}^{(\lambda)}(\overline{I}|\overline{I}) = 0$

3 Quote, Quotation and Citation

3.1 Quotation

The margins of the quotation environment are indented on both the left and the right. The text is justified at both margins. Leaving a blank line between text produces a new paragraph.The package **csquotes** offers a multilingual solution to quotations, with integration to citation mechanisms offered by BibTeX.

This package allows one for example to switch languages and quotation styles according to babel language selections.

> "Unlike the quote environment, each paragraph is indented normally. It's important to remark that even if you are typing quotes on English there are different quotation marks used in English (UK) and English (US)."

3.2 Quote

The margins of the quote environment are indented on both the left and the right. The text is justified at both margins. Leaving a blank line between text produces a new paragraph.The package **csquotes** offers a multilingual solution to quotations, with integration to citation mechanisms offered by BibTeX. This package allows one for example to switch languages and quotation styles according to babel language selections.

> "Unlike the quotation environment, paragraphs are not indented. It's important to remark that even if you are typing quotes on English there are different quotation marks used in English (UK) and English (US)."

3.3 Citation

Latex[1] is a document preparation system for typesetting program. It is used to create different types of document structures. A Latex file (.tex) is created using any text editor (vim, emacs, gedit, etc.). There are also many LaTeX IDEs like Kile, TexStudio, etc.. The Latex code is then compiled which creates a standard (.pdf) file. Thus, the presentation of the document does not change on different machines.

Type style[4] is used to indicate logical structure. Emphasized text appears in italic style type and input in typewriter style. Type style is specified by three components: shape, series, and family.

There are two ways of producing a bibliography[3]. You can either produce a bibliography by manually listing the entries of the bibliography or producing it automatically using the BibTeX program of LaTeX. The bibliography style can be declared with

bibliographystyle command, which may be issued anywhere after the preamble. The style is a file with .bst extension that determines how bibliography entries will appear at the output, such as if they are sorted or not, or how they are labeled etc. The extension .bib is not written explicitly. There are many standard bibliography style files. Two of them that are compatible with IIT thesis manual are plain.bst and alpha.bst. They are part of the LaTeX package; a student does not need to download it. The plain.bst and alpha.bst styles are explained below.

The symbols in a math formula fall into different classes that correspond more

or less to the part of speech each symbol would have if the formula were expressed in words. Certain spacing and positioning cues are traditionally used for the different symbol classes to increase the readability of formulas. [2]

4   Algorithm and Pseudo code

4.1   Tabbing

```
//Breadth First Search Function
void BFS(list<longlong int> queue,long long int length){
    long long int v;
    if(queue.empty())
        return;
    list<long long int>::iterator i;
    list<long long int> queue_temp;
    while(!queue.empty()){
        v=queue.front();
        queue.pop_front();
        for(i=adj[v].begin();i!=adj[v].end();i++){
            if(!pro_ver[*i]){
                result[*i]=length;
                queue_temp.push_back(*i);
                pro_ver[*i]=true;
                adj[*i].remove(v);
            }
        }
    }
    BFS(queue_temp,length+6);
}
```

4.2   Listing

```
//Breadth First Search Function
void BFS(list<long long int> queue,long long int length){
    long long int v;
    if(queue.empty())
        return;
    list<long long int>::iterator i;
    list<long long int> queue_temp;
    while(!queue.empty()){
        v=queue.front();
        queue.pop_front();
```

```
        for(i=adj[v].begin();i!=adj[v].end();i++){
            if(!pro_ver[*i]){
                result[*i]=length;
                queue_temp.push_back(*i);
                pro_ver[*i]=true;
                adj[*i].remove(v);
            }
        }
    }
    BFS(queue_temp,length+1);
}
```

4.3   Verbatim

```
//Breadth First Search Function
void BFS(list<long long int> queue,long long int length){
    long long int v;
    if(queue.empty())
        return;
    list<long long int>::iterator i;
    list<long long int> queue_temp;
    while(!queue.empty()){
        v=queue.front();
        queue.pop_front();

        for(i=adj[v].begin();i!=adj[v].end();i++){
            if(!pro_ver[*i]){
                result[*i]=length;
                queue_temp.push_back(*i);
                pro_ver[*i]=true;
                adj[*i].remove(v);
            }
        }
    }
    BFS(queue_temp,length+1);
}
```
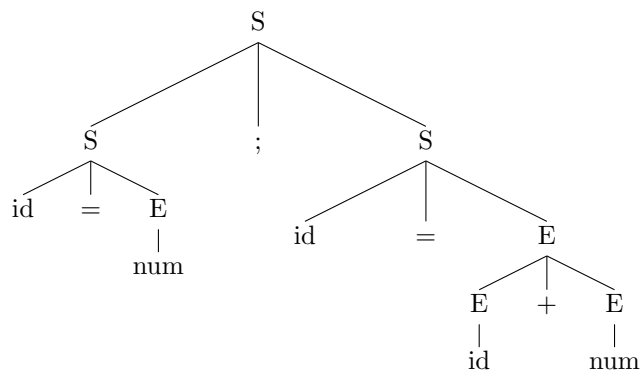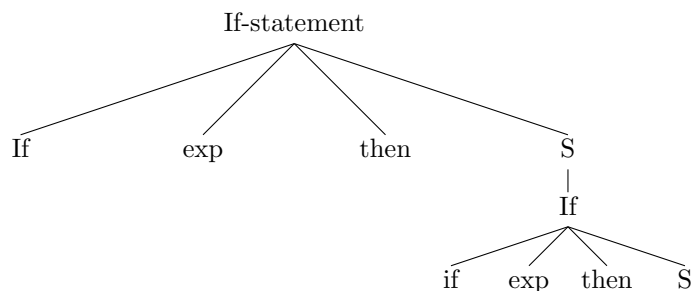
4.4 Algorithmic

Input: A graph *Graph* and a starting vertex *root* of *Graph*
Output: All vertices's reachable from *root* labeled as explored.
1 Breadth-First-Search(Graph, root):
2 **for** *each node n in Graph:* **do**
3   n.**distance** = INFINITY
4   n.**parent** = NIL
5 **end**
6 create empty **queue** Q
7 root.**distance** = 0
8 Q.**enqueue**(root)
9 **while** *Q is not empty:* **do**
10   current = Q.dequeue()
11   **for** *each node n that is adjacent to current* **do**
12   **if** *n.**distance** == INFINITY* **then**
13   n.**distance** = current.**distance** + 1 n.**parent** = current
             Q.**enqueue**(n)
14   **end**
15   **end**
16 **end**

Algorithm 1: Breadth-first search

5 Tree

```
                    If-statement
        /          /        \            \
      If         exp       then           S
                                          |
                                          If
                                      /  /   \   \
                                    if  exp then  S
```

6 Exotic features: TA's choice

6.1 Epigraph style

Chapter 1: Theory of life

> *"failure will never overtake me if my determination to succeed is strong enough."*
>
> *og mandino*

6.2 Minipage

$L^A T_E X$ typesets a file of text using the TEX program and the $L^A T_E X$ "macro package" for TEX. That is, it processes an input file containing the text of a document with interspersed commands that describe how the text should be formatted. $L^A T_E X$ files are plain text that can be written in any reasonable editor.

In the $L^A T_E X$ input file, a command name starts with a   followed by either (a) a string of letters or (b) a single non-letter. Arguments contained in square brackets, [], are optional while arguments contained in braces, {}, are required. $L^A T_E X$ is case sensitive. Enter all commands in lower case unless explicitly directed to do otherwise.

7 Biblography

References

[1] Firuza Aibara. LaTeX - Fundamental Research Group - IIT Bombay. http://www.it.iitb.ac.in/frg/wiki/index.php/LaTeX/, 2016.

[2] Michael Downes. *Short math guide for LATEX*. American Mathematical Society, 2002.

[3] Helmut Kopka and Patrick W Daly. A guide to latex, 1995.

[4] Leslie Lamport. *Latex*. Addison-Wesley, 1994.