Abstract

This is the abstract. Here is how you put in a paragraph of blind text. Be sure to remove all blind text from your final paper. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

1 Introduction

This document is produced by the TeX document processing system. It uses the LaTeX system, which runs on top of TeX, and the XeLaTeX system, which runs on top of LaTeX. It is intended for students in CoSc 320, Data Structures to use as a template for the papers they write for the course. The TeX source for this paper is in the file paper-template.tex. You should create a new directory for each paper you write. Copy the .tex file to the new directory, rename it appropriately, and modify the content to create your paper.

Although this paper illustrates the LaTeX features you need to write your papers, it does not explain all the details of each feature of the LaTeX markup language. There are many LaTeX tutorials and discussion forums on the Internet that you can access to pursue the language further.
To start a new paragraph, leave a blank line in the TeX source. Here is some more blind text to fill out this section. Be sure to remove all blind text from your final paper. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

1.1 Title of first subsection

Notice the automatic numbering of the sections and subsections. The use of subsections is optional. However, you must keep the four sections as they are in this document.

1.2 Typesetting math

Here is how to typeset math. If you want to typeset an expression within a sentence, you enclose the expression between dollar signs. See the TeX source for the following sentence. Theoretically, the sort has asymptotic behavior \( \Theta(n^3 \lg n) \), which is equivalent to \( O(n^3 \lg n) \) and \( \Omega(n^3 \lg n) \). If you want to set an equation in display mode you enclose with bashes and square brackets as in the TeX source for this:

\[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]

Here is the definition of RSE.

\[
RSE = \sqrt{\frac{\sum (y_i - \hat{y}_i)^2}{d.f.}}
\]

where the sum is over all the data points, \( y_i \) is the \( y \) value of an individual data point, \( \hat{y}_i \) is the \( y \) value of the point on the curve whose \( x \) value is the same as the \( x \) value of \( y_i \), and \( d.f. \) is the degrees of freedom. Here is quadratic curve fit equation.

\[
y = An^2 + Bn + C
\]
Here is \( n \lg n \) curve fit equation.

\[
y = An \lg n + Bn + C
\]

Here is some more blind text to fill out this section. Be sure to remove all blind text from your final paper. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

2 Method

In your paper, this section will explain how you took the data and how you analyzed it for each question that your paper addresses. For this template, the Method section describes how to incorporate figures, tables, and bibliographies into your paper.

2.1 Incorporating figures

To incorporate a figure in your paper you need a PDF file containing the figure in the same directory as you TeX source file. As an example, suppose you have a file named `myFile.pdf` and you want to put it in your paper. (By the way, did you notice how the file name is in computer font? See the TeX source for how to do that. The word `verb` in the command is an abbreviation for “verbatim”. (By the way, did you notice the curly double quotes in the previous sentence? See the TeX source for how to do that.) The file should be in the same directory with your article `.tex` file.

The source code for including Figure 1 is as follows.

\begin{figure}
\hspace{-.5in}\includegraphics[scale=.75]{myFile.pdf}
\caption{A pdf figure to illustrate how to include a graphic in LaTeX.}
\label{fig:myFile}
\end{figure}

The figure has a label defined by `\label{fig:myFile}`. Although this feature is optional, you should get in the habit of always using labels for your figures. If you
ever need to insert or delete a figure the renumbering is automatic and the references to the figure numbers are changed to the new number. Sometimes when you change your TeX document the system loses the reference and puts double question marks where the reference belongs. When that happens simply typeset the document one more time to restore the references.

Notice how the above TeX code is displayed in computer font. If you want to include a code fragment in your paper use the \texttt{verbatim} environment as shown in the TeX source of this document.

Figure 2 shows how to put two figures side by side. This placement requires the use of packages \texttt{caption} and \texttt{subcaption}.

Figure 3 shows the general Merritt taxonomy for sort algorithms.

2.2 Incorporating tables

In the same way that a graphic is incorporated into a figure with a caption, you should incorporate a table into a figure with a caption. Figure 4 shows one of the tables for your sort analysis project. There are some dummy values in the Insert row that you will change to match your own data.

Refer to the TeX source for this document to see the following features of the TeX markup language.
Figure 2: Two figures side by side.

(a) The left figure.  
(b) The right figure.

Figure 3: The general Merritt sort taxonomy algorithm.

Figure 4: Number of comparisons.

<table>
<thead>
<tr>
<th>Algorithm</th>
<th>200</th>
<th>400</th>
<th>800</th>
<th>1600</th>
<th>2400</th>
<th>3200</th>
<th>4000</th>
<th>4800</th>
<th>5600</th>
<th>6400</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insert</td>
<td>99999</td>
<td>99999</td>
<td>99999</td>
<td>99999</td>
<td>99999</td>
<td>99999</td>
<td>99999</td>
<td>99999</td>
<td>99999</td>
<td>99999</td>
</tr>
<tr>
<td>Select</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heap</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Merge</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quick</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 4: Number of comparisons.
<table>
<thead>
<tr>
<th>Head1</th>
<th>Data1</th>
<th>Data2</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>22</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>22</td>
<td>2 + 3</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>1 + 2</td>
</tr>
<tr>
<td>7</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Total: 9</td>
<td>(n^2)</td>
<td></td>
</tr>
</tbody>
</table>

(a) Best case.

<table>
<thead>
<tr>
<th>Head3</th>
<th>Data3</th>
<th>Data4</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4.5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5.5</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>6.5</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7.5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total: 9</td>
<td>(n^{-2})</td>
<td></td>
</tr>
</tbody>
</table>

(b) Worst case.

Figure 5: Meaningless data to show side-by-side tables.

- Use the `itemize` environment for bullet points as in this list.
- Use the `tabular` environment for tables as in Figure 4.
- In the line

\[
\begin{tabular}{ l | l l l l l l l l l l }
\end{tabular}
\]

the vertical bar | causes the vertical rule to be drawn after the first column, and the letter \(1\) causes the content of the table cell to be left justified.

- The & character separates the content of adjacent cells.
- The double slash \(\backslash\backslash\) denotes the end of a line.

Here is some more blind text to fill out the paper. Be sure to remove any blind text in your final paper. Hello, here is some text without a meaning. This text should show what a printed text will look like at this place. If you read this text, you will get no information. Really? Is there no information? Is there a difference between this text and some nonsense like “Huardest gefburn”? Kjift – not at all! A blind text like this gives you information about the selected font, how the letters are written and an impression of the look. This text should contain all letters of the alphabet and it should be written in of the original language. There is no need for special content, but the length of words should match the language.

In the same way you can put figures side-by-side, you can put tables side-by-side. Figure 5 shows the effect. See the TeX code for how to do this.
2.3 Incorporating a bibliography

All LaTeX systems provide the BibTeX tool for managing your citations to the literature. BibTeX assumes that you maintain a separate file of your bibliographic references, which could contain references for all the different TeX documents that you write. You set up a reference with a key the same way you set up a label for a figure. Then use the \cite command to cite the reference.

For example, if you set up the key to our textbook to be dp4ds in your reference file, the following TeX markup code

\begin{verbatim}
Our author shows \cite{dp4ds} that the sort is $\Theta(\lg n)$.
\end{verbatim}

produces the sentence, “Our author shows [4] that the sort is $\Theta(\lg n)$.”

This paper uses a file named myBiblio.bib with the following content.

\begin{verbatim}
@book{clrs,
edition = "3rd",
publisher = "The MIT Press",
title = "Introduction to Algorithms",
year = "2009",
isbn = "978-0-262-03384-8"
}

@book{dp4ds,
author = "Dung X. Nguyen and J. Stanley Warford",
edition = "Prepublication manuscript",
publisher = "Pepperdine",
title = "Design Patterns for Data Structures",
year = "2016",
}

@article{Gries1995145,
title = "Equational propositional logic ",
journal = "Information Processing Letters ",
volume = "53",
number = "3",
\end{verbatim}
BibTeX provides many different citation types, but the two most common are books and articles. Compare the above content with the references it produces at the end of this paper.

Here is a citation [1] for the text by Cormen, et.al. here is a citation [3] to the article by Gries, and here is a citation [2] to the book by the Gang of Four.

To setup the citation system, you specify the bibliography style and the bibliography source file at the end of your TeX source file just before \end{document}. In this paper, the specifications are

\bibliographystyle{plain}
\bibliography{myBiblio.bib}

To get the correct citations to your references the first time requires four typesetting runs. With your .tex source in the editor window,

• select LaTeX and click the Typeset button,
• select BibTeX and click the Typeset button,
• select LaTeX and click the Typeset button, and
• select LaTeX and click the Typeset button again.

After setting up your references the first time, subsequent compilations require a single typeset.

BibTeX is so common that many Internet sites provide BibTeX references. If you search for an article online you can frequently copy and paste its BibTeX reference into your .bib file.
3 Results

This section should have your raw data in table form, as well as the results of your curve fits. It should also have a discussion of the questions to be answered.

One handy feature of most recent LaTeX software packages is the link they maintain between the source markup page and the PDF document page. For example, in TeXShop if you command-click on the source markup page, the corresponding point on the PDF document page is highlighted. The reverse is also true. If you command-click on the PDF document page the corresponding point on the source markup page is highlighted. The latter case is a real time saver when you proofread your paper in the PDF page and want to make a correction.

4 Conclusion

This paper shows how to format your own papers for CoSc 320, Data Structures. It describes the LaTeX typesetting system and serves as a tutorial on how to typeset mathematical expressions and incorporate figures, tables, and bibliographies into your paper. It uses 1.5 line spacing. To see what the final paper would look like single spaced, delete or comment out the statement
\onehalfspacing % Provided by the setspace package
in the LaTeX source code.

References


