



CS261L Data Structures and Algorithms (Pr) Lab Manual (Week 5)



Instructor:

- Mr. Nazeef Ul Haq

Registration No. _____

Name: _____

Guide Lines/Instructions:

You may talk with your fellow CS261-ers about the problems. However:

- Try the problems on your own *before* collaborating.
- Write up your answers yourself, in your own words. You should never share your typed-up solutions with your collaborators.
- If you collaborated, list the names of the students you collaborated with at the beginning of each problem.

Today's Task:

- Quick Sort Implementation
- CRUD operations in Python
- Learn to write formal reports.

Part 1: Quick Sort Pseudo Code

QUICKSORT(A, p, r)

```
1 if  $p < r$ 
2   // Partition the subarray around the pivot, which ends up in  $A[q]$ .
3    $q = \text{PARTITION}(A, p, r)$ 
4   QUICKSORT( $A, p, q - 1$ )    // recursively sort the low side
5   QUICKSORT( $A, q + 1, r$ )    // recursively sort the high side
```

PARTITION(A, p, r)

```
1  $x = A[r]$                 // the pivot
2  $i = p - 1$                 // highest index into the low side
3 for  $j = p$  to  $r - 1$       // process each element other than the
                           // pivot
4   if  $A[j] \leq x$            // does this element belong on the low
                           // side?
5      $i = i + 1$              // index of a new slot in the low side
6     exchange  $A[i]$  with  $A[j]$  // put this element there
7 exchange  $A[i + 1]$  with  $A[r]$  // pivot goes just to the right of the low
                           // side
8 return  $i + 1$              // new index of the pivot
```

Part 2: CRUD using PyQt in Python

Installation Guide:

- First Install PyQt5 by running the following command in the cmd.



```
Command Prompt
C:\Users\Awais Computer>pip install pyqt5
```

- To check if PyQt5 is installed, you can run the command '**pip show pyqt5**' in the cmd.
- Secondly to install QT Designer to designing GUI for python, you need to run following command and after complete installation you can find the QT Designer in the following path of your PC:
<Base Path to user folder>\AppData\Local\Programs\Python\Python310\Lib\site-packages



```
Command Prompt
Microsoft Windows [Version 10.0.19044.1889]
(c) Microsoft Corporation. All rights reserved.
C:\Users\Awais Computer>pip install pyqt5-tools
```

- In case of error in installation process, you can also download it directly from <https://build-system.fman.io/static/public/files/Qt%20Designer%20Setup.exe>
- After completing the installation, download the sample project containing from the following link: <https://bit.ly/3e1qDok>
This project contain a basic program illustrating the CRUD Operations using Graphical User Interface (GUI) in python.
- Play with the provided code and have fun.

Your Turn:

- Replicate the following page UI, and save the data in a csv file <https://bit.ly/3SuMKTh>
You have your choice how to create functions and save the data in csv file.
- Create an Index page which shows all form submissions, and an option to edit and delete the form submission.
- When application reloads, all the changes should persist in the system.

Part 3: Learning Latex

LaTeX is a software for typesetting documents. In other words, it's a document preparation system. For now, let's continue by looking at how we can make the best use of it.

To learn more about LaTeX: [https://www.overleaf.com/learn/latex/Learn LaTeX in 30 minutes](https://www.overleaf.com/learn/latex/Learn_LaTeX_in_30_minutes)

We will take the first example and insert some commands that will produce a nice-looking title.

Titling your document

We will take the first example and insert some commands that will produce a nice-looking title. Type the following code in the editor.

| Document | View |
|--|------|
| <pre>\documentclass{article} \begin{document} \title{Example 1} \author{My name} \date{January 5, 2011} \maketitle \section{What's this?} This is our first document. It contains a title and a section with text.</pre> | |

Let's have a closer look at what each part of our code does.

The first line of code, `\documentclass{article}`, declares the document type as its class, which controls the overall appearance of the document. After setting the document class, our content known as the body of the document, is written between the `\begin{document}` and `\end{document}` tags.

we've used the command `\maketitle` that prints the title, author, and date in a nicely formatted manner. By the `\section` command, we produced a heading, bigger and bolder than normal text. Then we let some text follow.

Lists of tables and figures

A list of tables and figures keep the information organized and provide easy access to a specific element. Let's start with a basic example:

| Document | View |
|----------|------|
|----------|------|

| | |
|--|--|
| <p>The below package is used to make the contents clickable</p> <pre>\usepackage[hidelinks]{hyperref} \begin{document} \listoffigures \listoftables \clearpage</pre> | <p>List of plots</p> <pre>1 Three dimensional graph. 1 2 Second 3D plot. 1 3 Scatter plot. 2</pre> <p>Tables</p> <pre>1 First table. 2 2 Dummy table. 3 3 Third table. 3</pre> |
|--|--|

Writing special characters in our text

By putting a backslash before such a special symbol, we turned it into a LaTeX command.

Enter the following line in your document:

| Document | View |
|---|--|
| <pre>\documentclass{article} \begin{document} Statement \#1: 50\% of \\$100 makes \\$50. More special symbols are \&, _, \{ and \}. \end{document}</pre> | <p>Statement #1: 50% of \$100 makes \$50. More special symbols are &, _ { and }.</p> |

Paragraphs and New Lines

To start a new paragraph in LaTeX, look at the following code below.

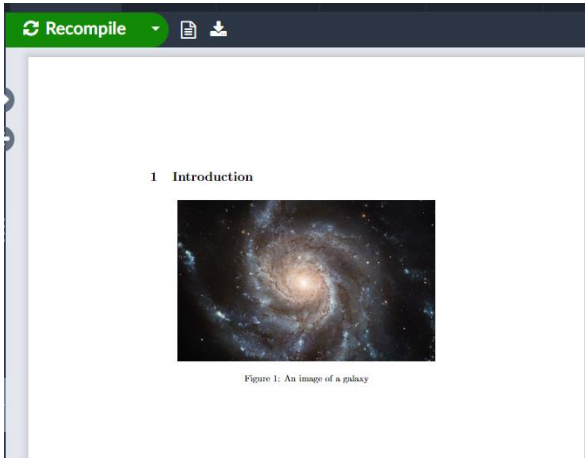
| Document | View |
|--|---|
| <pre>\documentclass{article} \begin{document} This is the text in the first paragraph. This is the text in the first paragraph. This is the text in the first paragraph. \par This is the text in the second paragraph. This is the text in the second paragraph. This is the text in the second paragraph. \end{document}</pre> | <p>This is the text in the first paragraph. This is the text in the first paragraph. This is the text in the first paragraph. This is the text in the second paragraph. This is the text in the second paragraph. This is the text in the second paragraph.</p> |

\par command starts a new paragraph. You can align the paragraphs using commands \centering, \raggedleft, \raggedright and \justifying present in the ragged2e package.

\newline command breaks the line right after where it is. It can be used only in paragraph mode. Latex also provides many other commands like **\newpage** requests a new page, **** start a new paragraph or line. To learn more about the paragraph's alignment, latex line and page breaking, check latex documentation.

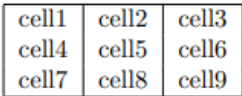
Including Images

Including images in your LaTeX document requires adding package: `\usepackage{graphicx}` before the beginning of your document.

| Document | View |
|--|--|
| <pre> \documentclass{article} \usepackage{graphicx} \begin{document} \section{Introduction} \begin{figure}[!ht] \centering \includegraphics[width=4cm]{check} \caption{An image of a galaxy} \label{fig:galaxy} \end{figure} \end{document} </pre> |  |

Including Tables

Creating a simple table in latex:

| Document | View |
|--|--|
| <pre> \begin{center} \begin{tabular}{ c c c } \hline cell1 & cell2 & cell3 \\ cell4 & cell5 & cell6 \\ cell7 & cell8 & cell9 \\ \hline \end{tabular} \end{center} </pre> |  |

The tabular environment is the default LATEX method to create tables. You must specify a parameter to this environment; here we use `{c c c}` which tells LaTeX that there are three columns and the text inside each one of them must be centered.

To learn more about the Tables, check latex documentation

Your Turn(Individual Task):

Download the following template

<https://www.overleaf.com/read/sgzpmxsvjgfd>

using this template submit the document which contains the following Text

- Problem 1-1 of CLRS
- Problem 4-6 of CLRS
- Problem 13-1 of CLRS

What to Submit:

1. For Part 1, submit .py or .ipynb file
2. For Part 2, submit Gitlab repository link on eduko
3. For Part 1, Submit Tex files and pdf file on eduko.