



ಕೆ. ವಿ. ಜಿ. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ, ಸುಲ್ಲಿ, ದ.ಕೆ -574 327

k.v.g college of engineering, sullia, d.k. – 574 327

(affiliated to visvesvaraya technological university, belagavi)



DEPARTMENT COMPUTER SCIENCE AND ENG(AI & ML)



MANUAL FOR

Technical Writing using LaTeX (skill enhancement course)

COURSE CODE:- BCS456D

4TH SEMESTER

ACADEMIC YEAR:- 2023-24

STUDENT NAME -- USN

SHARATH 4KV23CI401



ಕೆ. ವಿ. ಜಿ. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ, ಸುಲ್ಲಿ, ದ.ಕೆ - 574 327

k.v.g college of engineering, sullia, d.k. – 574 327

(affiliated to visvesvaraya technological university, belagavi)



DEPARTMENT COMPUTER SCIENCE AND ENG (AI & ML)



www.kvgengg.com

CERTIFICATE

This is to certify that Mrs./Mr. Sharath,
USN- 4KV23CI401 has satisfactorily completed the
practical component of skill enhancement course-
BCS456D, Computer Science & Eng(AI & ML) for the
4th semester B.E Program during the academic year
2023-24.

Sessional Marks

Max. Marks:	Marks Awarded:

Signature of Staff

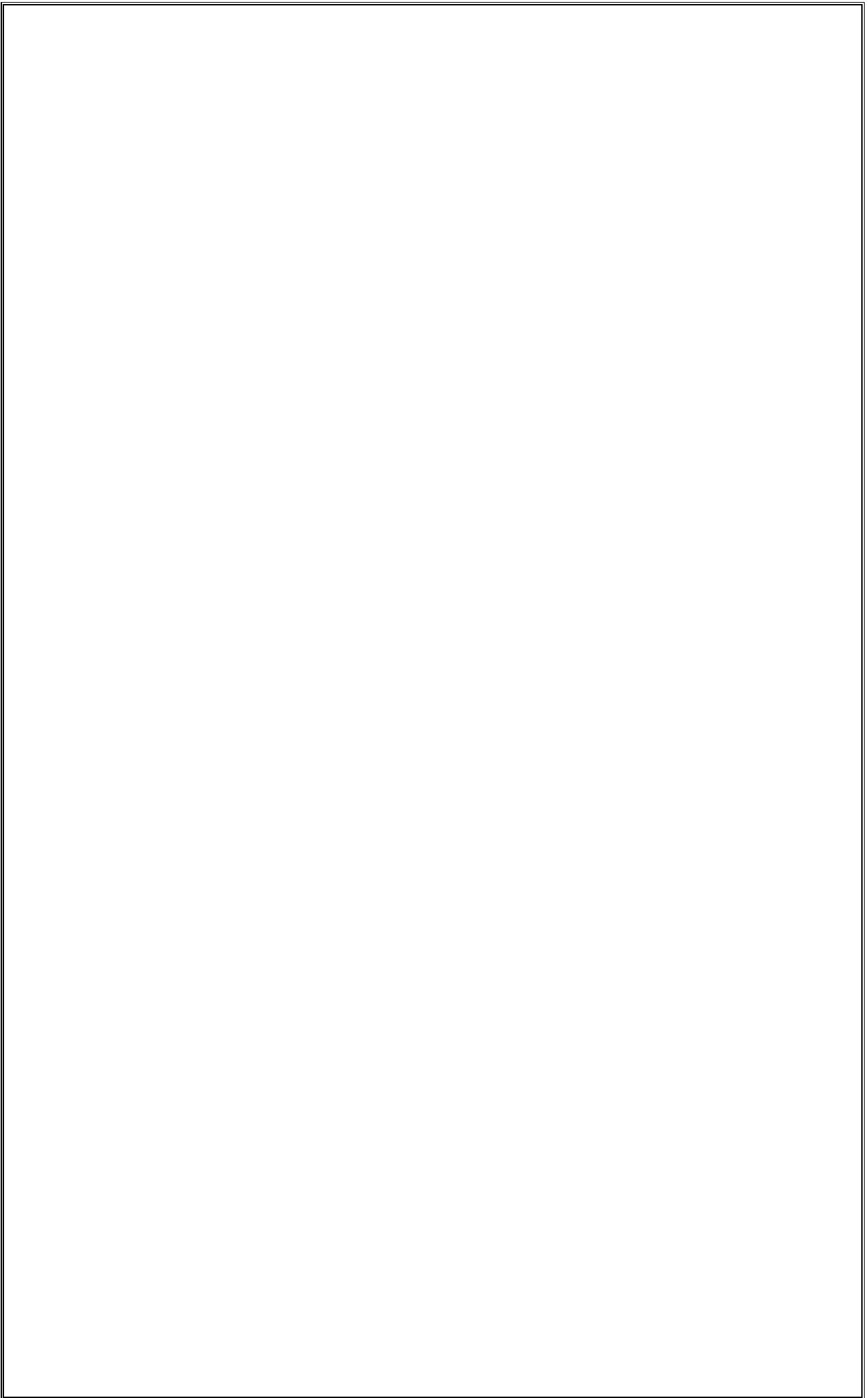
Signature of HOD

LIST OF EXPERIMENTS

SI. No	Experiments	Page.No	Marks Awarded	Staff signature																											
1.	Develop a LaTeX script to create a simple document that consists of 2 sections [Section1, Section2], and a paragraph with dummy text in each section. And also include header [title of document] and footer [institute name, page number] in the document.	1 - 5																													
2.	Develop a LaTeX script to create a document that displays the sample Abstract/Summary.	6 - 8																													
3.	Develop a LaTeX script to create a simple title page of the VTU project Report .[Use suitable Logos and text formatting]	9 - 10																													
4.	Develop a LaTeX script to create the Certificate Page of the Report. [Use suitable commands to leave the blank spaces for user entry]	11 - 13																													
5.	Develop a LaTeX script to create a document that contains the following table with proper labels. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2">SI.NO</th> <th rowspan="2">USN</th> <th rowspan="2">Student Name</th> <th colspan="3">Marks</th> </tr> <tr> <th>Sub 1</th> <th>Sub 2</th> <th>Sub 3</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>4KV22CI001</td> <td>Name 1</td> <td>89</td> <td>60</td> <td>90</td> </tr> <tr> <td>2.</td> <td>4KV22CI002</td> <td>Name 2</td> <td>78</td> <td>45</td> <td>98</td> </tr> <tr> <td>3.</td> <td>4KV22CI003</td> <td>Name 3</td> <td>67</td> <td>55</td> <td>59</td> </tr> </tbody> </table>	SI.NO	USN	Student Name	Marks			Sub 1	Sub 2	Sub 3	1.	4KV22CI001	Name 1	89	60	90	2.	4KV22CI002	Name 2	78	45	98	3.	4KV22CI003	Name 3	67	55	59	14 - 15		
SI.NO	USN				Student Name	Marks																									
		Sub 1	Sub 2	Sub 3																											
1.	4KV22CI001	Name 1	89	60	90																										
2.	4KV22CI002	Name 2	78	45	98																										
3.	4KV22CI003	Name 3	67	55	59																										
6.	Develop a LaTeX script to include the side-by-side graphics/pictures/figures in the document by using the sub graph concept.	16 - 17																													

7.	<p>Develop a LaTeX script to create a document that consists of the following two mathematical equations.</p> $\begin{aligned}\varphi_{\sigma}^{\lambda} A_t &= \sum_{\pi \in C_t} \operatorname{sgn}(\pi) \varphi_{\sigma}^{\lambda} \varphi_{\pi}^{\lambda} \\ &= \sum_{\tau \in C_{\sigma t}} \operatorname{sgn}(\sigma^{-1} \tau \sigma) \varphi_{\sigma}^{\lambda} \varphi_{\sigma^{-1} \tau \sigma}^{\lambda} \\ &= A_{\sigma t} \varphi_{\sigma}^{\lambda}\end{aligned}$ $\begin{aligned}x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-2 \pm \sqrt{2^2 - 4 * (1) * (-8)}}{2 * 1} \\ &= \frac{-2 \pm \sqrt{4 + 32}}{2}\end{aligned}$	18 - 19			
8.	Develop a LaTeX script to demonstrate the presentation of Numbered theorems, definitions, corollaries, and lemmas in the document.	20 - 22			
9.	Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section.	23 - 25			
10.	Develop a LaTeX script to design a simple tree diagram or hierarchical structure in the document with appropriate labels using the Tikz library.	26 - 27			
11.	Develop a LaTeX script to present an algorithm in the document using algorithm /algorithmic/ algorithm2e Library .	28 - 29			
12.	Develop a LaTeX script to create a simple report and article by using suitable commands and formats of user choice.	30 - 42			

Marks Distribution	Max.Mark	Marks awarded
Average Marks Scaled Up		
Lab Test Marks		
Total Marks in the Practical Component of the Course		
Signature of the Staff with date		



EXPERIMENT 1:

Develop a LaTeX script to create a simple document that consists of 2 sections [Section1, Section2], and a paragraph with dummy text in each section. And also include header [title of document] and footer [institute name, page number] in the document.

```
\documentclass[12pt,a4paper]{article}

\usepackage[left=2cm,right=2cm,top=2cm,bottom=2cm]{geometry}

\usepackage{fancyhdr}

\begin{document}

\pagestyle{fancy}

\title{GNU Project}

\fancyhf{ }

\fancyhead{ }

\fancyhead[R]{GNU Project}

\fancyfoot{ }

\fancyfoot[LO,CE]{K.V.G College of Engineering }

\fancyfoot[R]{\thepage}

\maketitle

\section{What is GNU?}
```

GNU is an operating system that is free software—that is, it respects users' freedom. The GNU operating system consists of GNU packages (programs specifically released by the GNU Project) as well as free software released by third parties. The development of GNU made it possible to use a computer without software that would trample your freedom.

```
\section{More about GNU}
```

GNU is a Unix-like operating system. That means it is a collection of many programs: applications, libraries, developer tools, even games. The development of GNU, started in January 1984, is known as the GNU Project. Many of the programs in GNU are released under the auspices of the GNU Project; those we call GNU packages. \\

The name "GNU" is a recursive acronym for "GNU's Not Unix." "GNU" is pronounced g'noo, as one syllable, like saying "grew" but replacing the r with n. \\

The program in a Unix-like system that allocates machine resources and talks to the hardware is called the "kernel." GNU is typically used with a kernel called Linux. This combination is the GNU/Linux operating system. GNU/Linux is used by millions, though many call it "Linux" by mistake.

\section{What is the Free Software Movement?}

The free software movement campaigns to win for the users of computing the freedom that comes from free software. Free software puts its users in control of their own computing. Nonfree software puts its users under the power of the software's developer. \\

\section{What is Free Software?}

\textbf{Free software means the users have the freedom to run, copy, distribute, study, change and improve the software.}

Free software is a matter of liberty, not price. To understand the concept, you should think of "free" as in "free speech," not as in "free beer". More precisely, free software means users of a program have the four essential freedoms:

\begin{itemize}

\item The freedom to run the program as you wish, for any purpose (freedom 0).

\item The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.

\item The freedom to redistribute copies so you can help others (freedom 2).

\item The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

Developments in technology and network use have made these freedoms even more important now than they were in 1983. Nowadays the free software movement goes far beyond developing the GNU system.

```
\end{itemize}
```

```
\end{document}
```

OUTPUT:

GNU Project

May 29, 2024

1 What is GNU?

GNU is an operating system that is free software—that is, it respects users' freedom. The GNU operating system consists of GNU packages (programs specifically released by the GNU Project) as well as free software released by third parties. The development of GNU made it possible to use a computer without software that would trample your freedom.

2 More about GNU

GNU is a Unix-like operating system. That means it is a collection of many programs: applications, libraries, developer tools, even games. The development of GNU, started in January 1984, is known as the GNU Project. Many of the programs in GNU are released under the auspices of the GNU Project; those we call GNU packages.

The name "GNU" is a recursive acronym for "GNU's Not Unix." "GNU" is pronounced g'noo, as one syllable, like saying "grew" but replacing the r with n.

The program in a Unix-like system that allocates machine resources and talks to the hardware is called the "kernel." GNU is typically used with a kernel called Linux. This combination is the GNU/Linux operating system. GNU/Linux is used by millions, though many call it "Linux" by mistake.

3 What is the Free Software Movement?

The free software movement campaigns to win for the users of computing the freedom that comes from free software. Free software puts its users in control of their own computing. Non-free software puts its users under the power of the software's developer.

4 What is Free Software?

Free software means the users have the freedom to run, copy, distribute, study, change and improve the software.

Free software is a matter of liberty, not price. To understand the concept, you should think of "free" as in "free speech," not as in "free beer". More precisely, free software means users of a program have the four essential freedoms:

- The freedom to run the program as you wish, for any purpose (freedom 0).

[GNU Project](#)

- The freedom to study how the program works, and change it so it does your computing as you wish (freedom 1). Access to the source code is a precondition for this.
- The freedom to redistribute copies so you can help others (freedom 2).
- The freedom to distribute copies of your modified versions to others (freedom 3). By doing this you can give the whole community a chance to benefit from your changes. Access to the source code is a precondition for this.

Developments in technology and network use have made these freedoms even more important now than they were in 1983. Nowadays the free software movement goes far beyond developing the GNU system.

EXPERIMENT 2:

Develop a LaTeX script to create a document that displays the sample Abstract/Summary.

```
\documentclass[10pt,a4paper]{article}

\usepackage[utf8]{inputenc}
\usepackage{amsmath}
\usepackage{amsfonts}
\usepackage{amssymb}
\usepackage[left=3cm,right=3cm,top=2cm,bottom=2cm]{geometry}
% \usepackage{lipsum}

\begin{document}
\thispagestyle{plain}

\begin{center}
\Large
\textbf{Social Media}

\vspace{0.4cm}
\large
Raising Awareness on Social Media Fake News

\vspace{0.4cm}
\textbf{Sharath}
\end{center}
```

```
\vspace{0.9cm}  
\textbf{Abstract}  
\end{center}  
\lipsum[1]
```

The proliferation of fake news on social media platforms has become a pressing concern in contemporary society. This abstract delves into the multifaceted issue of fake news dissemination through social media and proposes strategies for enhancing awareness among users.

Firstly, it examines the mechanisms through which fake news spreads virally, exploiting the interconnected nature of social media networks. It elucidates how algorithms, echo chambers, and confirmation bias contribute to the rapid dissemination of misinformation.

Secondly, the abstract highlights the detrimental consequences of fake news, including its impact on public opinion, political discourse, and societal trust. By distorting reality and fostering polarization, fake news undermines the foundations of democracy and exacerbates social divisions.

Furthermore, it discusses existing efforts to combat fake news, such as fact-checking initiatives and platform interventions. While these measures are crucial, they often fall short in addressing the root causes of misinformation and in reaching diverse audiences.

To effectively raise awareness about social media fake news, the abstract suggests a holistic approach that combines education, media literacy, and technological innovations. It advocates for comprehensive media literacy programs in schools and communities, empowering individuals to critically evaluate online content and discern credible sources.

Moreover, the abstract underscores the importance of collaboration between tech companies, policymakers, and civil society in developing innovative solutions. This entails implementing transparency measures, enhancing algorithmic accountability, and promoting ethical design principles to mitigate the spread of fake news.

In conclusion, the abstract emphasizes the urgent need for collective action to combat the scourge of social media fake news. By fostering a culture of skepticism, critical thinking, and digital responsibility, society can fortify its defenses against misinformation and safeguard the integrity of public discourse in the digital age.

```
\end{document}
```

OUTPUT:

Social Media

Raising Awareness on Social Media Fake News

Sharath

Abstract

The proliferation of fake news on social media platforms has become a pressing concern in contemporary society. This abstract delves into the multifaceted issue of fake news dissemination through social media and proposes strategies for enhancing awareness among users.

Firstly, it examines the mechanisms through which fake news spreads virally, exploiting the interconnected nature of social media networks. It elucidates how algorithms, echo chambers, and confirmation bias contribute to the rapid dissemination of misinformation.

Secondly, the abstract highlights the detrimental consequences of fake news, including its impact on public opinion, political discourse, and societal trust. By distorting reality and fostering polarization, fake news undermines the foundations of democracy and exacerbates social divisions.

Furthermore, it discusses existing efforts to combat fake news, such as fact-checking initiatives and platform interventions. While these measures are crucial, they often fall short in addressing the root causes of misinformation and in reaching diverse audiences.

To effectively raise awareness about social media fake news, the abstract suggests a holistic approach that combines education, media literacy, and technological innovations. It advocates for comprehensive media literacy programs in schools and communities, empowering individuals to critically evaluate online content and discern credible sources.

Moreover, the abstract underscores the importance of collaboration between tech companies, policymakers, and civil society in developing innovative solutions. This entails implementing transparency measures, enhancing algorithmic accountability, and promoting ethical design principles to mitigate the spread of fake news.

In conclusion, the abstract emphasizes the urgent need for collective action to combat the scourge of social media fake news. By fostering a culture of skepticism, critical thinking, and digital responsibility, society can fortify its defenses against misinformation and safeguard the integrity of public discourse in the digital age.

EXPERIMENT 3:

Develop a LaTeX script to create a simple title page of the VTU project Report [Use suitable Logos and text formatting]

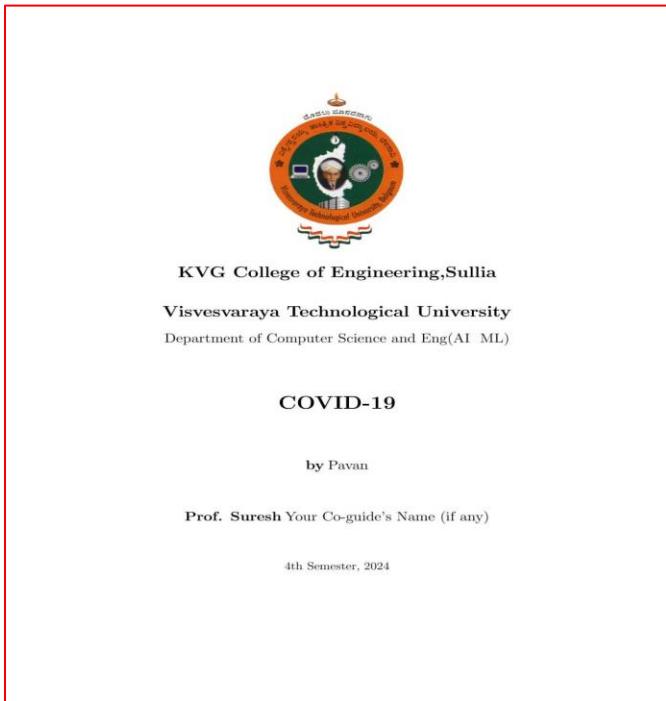
```
\documentclass{report}

\usepackage{graphicx}
\usepackage{setspace}
\usepackage{geometry}

\newcommand{\titlepageVTU}{%
\begin{titlepage}
\begin{center}
\textbf{\LARGE KVG College of Engineering,Sullia} \\
\begin{figure}
\centering
\includegraphics[width=0.3\linewidth]{vtu logo.png}
\end{figure}
\vspace*{1cm}
\textbf{\LARGE Visvesvaraya Technological University}\\
\vspace{0.5cm}
{\Large Department of Computer Science and Eng(AI & ML)} \% Replace with your department name
\vspace{2cm}
{\huge\textbf{COVID-19}} \% Replace with your project title
\vspace{2cm}
\textbf{\Large by}
\vspace{0.5cm}
{\Large Pavan} \% Replace with your name
\end{center}
\end{titlepage}
}
```

```
\vfill  
\textbf{\Large Prof. Suresh} % Replace with your guide's name  
\vspace{0.5cm}  
\Large Your Co-guide's Name (if any) % Replace with your co-guide's name, if any  
\vfill  
\large 4th Semester, 2024} % Replace with semester and year  
\end{center}  
\end{titlepage}  
}  
\begin{document}  
\titlepageVTU % Insert custom title page  
\end{document}
```

OUTPUT:



EXPERIMENT 4:

Develop a LaTeX script to create the Certificate Page of the Report [Use suitable commands to leave the blank spaces for user entry]

```
\documentclass{report}
\usepackage{graphicx}
\begin{document}
\begin{center}
\textbf{KVG COLLEGE OF ENGINEERING,SULLIA(D.K)}\\
\small{Affiliated To Visvesaraya Technological University,Belagavi}\\
\textbf{DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING}
\begin{figure}[h]
\centering
\includegraphics[height=2cm]{images/kvg.jpg}
\end{figure}
\LARGE\textbf{CERTIFICATE}\\
\end{center}
Certified that project entitled \textbf{Hand Gesture Recognition} carried out by:\\
\begin{table}[h!]
\begin{center}
\begin{tabular}{ll}
4KV23CI401 & Sharath\\
4KV22CI001 & Abhinav.P S\\
4KV22CI023 & Keerthan\\
4KV22CI006 & Ankith
\end{tabular}
\end{center}
\end{table}
```

```
\end{center}
```

```
\end{table}}
```

in partial fulfillment of the requirements for the award of the degree of \textbf{Bachelor Of Engineering} in \textbf{Computer Science with Artificial Intelligence \& Engineering} of the \textbf{Visvesvaraya Technological University, Belagavi} during the year 2023-24. It is certified that all corrections/suggestions indicated for the internal assessment have been incorporated into the report. The project report has been approved as it satisfies the academic requirements in respect of project work prescribed for the Bachelor of Engineering Degree.

```
\begin{table}[h!]
```

```
\begin{center}
```

```
\begin{tabular}{|l|l|l|}
```

```
{ } & { } & { } \\
```

```
----- & ----- & -----
```

```
----- \\
```

\textbf{Prof.KISHORE KUMAR K} & \textbf{Dr. SMITHA M L} &
\textbf{Prof. VENKATESH U C} \\

Assistant Professor& Professor& Assistant Professor\\

Project Guide & Project Co-ordinator & Project Co-ordinator\\

```
{ } & { } & { } \\
```

```
{ } & { } & { } \\
```

```
{ } & { } & { } \\
```

```
----- & { } & ----- \\
```

\textbf{Dr.UJWAL.U.J} & { } & \textbf{Dr. SURESHA V} \\

Head of the Department & { } & Principal \\

```
\end{tabular}
```

```
\end{center}
```

```
\end{table}
```

```
\begin{table}[h!]
```

```
\begin{tabular}{llll}
    Name of the Examiners: & 1._____ & Signature with Date:  

& _____ ||  

& ||  

& 2._____ &  

& _____  

\end{tabular}

\end{table}

\end{document}
```

OUTPUT:

KVG COLLEGE OF ENGINEERING,SULLIA(D.K)
Affiliated To Visvesvaraya Technological University,Belagavi
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING



CERTIFICATE

Certified that project entitled **Hand Gesture Recognition** carried out by:
in partial fulfillment of the requirements for the award of the degree of **Bach-**

4KV23CI401 Sharath
4KV22CI001 Abhinav.P S
4KV22CI023 Keerthan
4KV22CI006 Ankith

elor Of Engineering in Computer Science with Artificial Intelligence
& Engineering of the Visvesvaraya Technological University, Belagavi
during the year 2023-24. It is certified that all corrections/suggestions indicated
for the internal assessment have been incorporated into the report. The project
report has been approved as it satisfies the academic requirements in respect of
project work prescribed for the Bachelor of Engineering Degree.

Prof.KISHORE KUMAR K
Assistant Professor
Project Guide

Dr. SMITHA M L
Professor
Project Co-ordinator

Prof. VENKATESH U C
Assistant Professor
Project Co-ordinator

Dr.UJWAL.U.J
Head of the Department

Dr. SURESHA V
Principal

Name of the Examiners: 1._____ Signature with Date: _____

2._____ _____

EXPERIMENT 5:

Develop a LaTeX script to create a document that contains the following table with proper labels.

```
\documentclass{article}
\usepackage{multirow}
\begin{document}
\begin{table}[h!]
\centering
\caption{Table with student data}
\label{tab:table}
\begin{tabular}{|c|c|c|c|c|c|}
\hline
\multirow{2}{*}{S. No} & \multirow{2}{*}{USN} & \multirow{2}{*}{Student Name} & \multicolumn{3}{c}{Marks} \\
\cline{4-6}
& & & Subject 1 & Subject 2 & Subject 3 \\
\hline
1 & kv107 & Sharath & 89 & 87 & 90 \\
\hline
2 & kv108 & Abhinav & 79 & 89 & 95 \\
\hline
3 & kv109 & Krishna & 77 & 90 & 97 \\
\hline
\end{tabular}
\end{table}

```

\end{document}

OUTPUT:

Table 1: Table with student data

S. No	USN	Student Name	Marks		
			Subject 1	Subject 2	Subject 3
1	kv107	Sharath	89	87	90
2	kv108	Abhinav	79	89	95
3	kv109	Krishna	77	90	97

EXPERIMENT 6:

Develop a LaTeX script to include the side-by-side graphics/pictures/figures in the document by using the subgraph concept.

```
\documentclass{article}
\usepackage{graphicx}
\usepackage{subcaption}% For side-by-side
\begin{document}
\textbf{\huge Side-by-Side Subgraph}
\begin{figure}[ht]
\subfloat[First Dataset Accuracy]{
\begin{minipage}[c][1\width]{0.3\textwidth}
\centering
\includegraphics[width=1\textwidth]{Fig3.jpeg}
\end{minipage}}
\hfill
\subfloat[Second Dataset Accuracy]{
\begin{minipage}[c][1\width]{0.3\textwidth}
\centering
\includegraphics[width=1.1\textwidth]{Fig11.jpeg}
\end{minipage}}
\hfill
\subfloat[Comparison]{
\begin{minipage}[c][1\width]{}

```

```

0.3\textwidth}

\centering

\includegraphics[width=1.2\textwidth]{Fig15.jpeg}

\end{minipage} }

\caption{Performance Analysis}

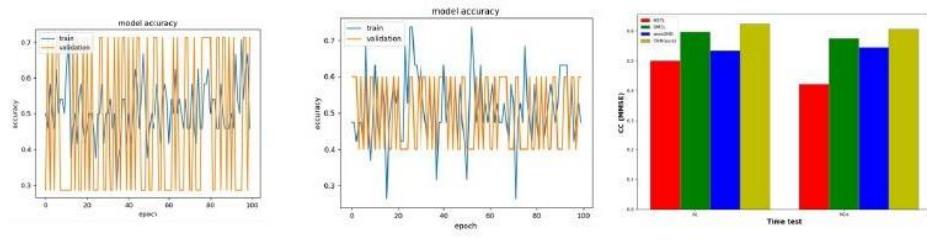
\end{figure}

\end{document}

```

OUTPUT:

Side-by-Side Subgraph



(a) First Dataset Accuracy

(b) Second Dataset Accuracy

(c) Comparison

Figure 1: Performance Analysis

EXPERIMENT 7:

Develop a LaTeX script to create a document that consists of the following two mathematical equations.

$$\begin{aligned}x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\&= \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot (-8)}}{2 \cdot 1} \\&= \frac{-2 \pm \sqrt{4 + 32}}{2}\end{aligned}$$

$$\begin{aligned}\varphi_\sigma^\lambda A_t &= \sum_{\pi \in C_t} \operatorname{sgn}(\pi) \varphi_\sigma^\lambda \varphi_\pi^\lambda \\&= \sum_{\tau \in C_{\sigma t}} \operatorname{sgn}(\pi^{-1} \tau \sigma) \varphi_\sigma^\lambda \varphi_{\pi^{-1} \tau \sigma}^\lambda \\&= A_{\sigma t} \varphi_\sigma^\lambda\end{aligned}$$

```
\documentclass{article}
\usepackage{amsmath} % This package is required for the 'aligned' environment
\begin{document}
\title{Following Two Mathematical Equations}
\date{ }
\maketitle
% Use the 'align' environment to align equations properly
\[
\begin{aligned}
&\begin{aligned}
&\begin{aligned}
&\begin{aligned}
&x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
&&= \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot (-8)}}{2 \cdot 1} \\
&&= \frac{-2 \pm \sqrt{4 + 32}}{2}
\end{aligned}
&\varphi_\sigma^\lambda A_t &= \sum_{\pi \in C_t} \operatorname{sgn}(\pi) \varphi_\sigma^\lambda \varphi_\pi^\lambda \\
&&= \sum_{\tau \in C_{\sigma t}} \operatorname{sgn}(\pi^{-1} \tau \sigma) \varphi_\sigma^\lambda \varphi_{\pi^{-1} \tau \sigma}^\lambda \\
&&= A_{\sigma t} \varphi_\sigma^\lambda
\end{aligned}
\end{aligned}
\end{aligned}
\end{aligned}
```

&

```
% Right side: equations about 'phi_{\sigma}^{\lambda} A_t'
\begin{aligned}
\varphi_{\sigma}^{\lambda} A_t &= \sum_{\pi \in C_t} \operatorname{sgn}(\pi) \\
&\varphi_{\sigma}^{\lambda} \varphi_{\pi}^{\lambda} \notag \\
&= \sum_{\tau \in C_{\sigma t}} \operatorname{sgn}(\pi^{-1} \tau \sigma) \varphi_{\sigma}^{\lambda} \varphi_{\pi^{-1} \tau \sigma}^{\lambda} \notag \\
&\varphi_{\sigma}^{\lambda} \varphi_{\pi}^{\lambda} \notag \\
&= A_{\sigma t} \varphi_{\sigma}^{\lambda}
\end{aligned}
\end{aligned}
```

\end{aligned}

\end{aligned}]

\end{document}

OUTPUT:

Following Two Mathematical Equations

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\ &= \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot (-8)}}{2 \cdot 1} \\ &= \frac{-2 \pm \sqrt{4 + 32}}{2} \end{aligned}$$

$$\begin{aligned} \varphi_{\sigma}^{\lambda} A_t &= \sum_{\pi \in C_t} \operatorname{sgn}(\pi) \varphi_{\sigma}^{\lambda} \varphi_{\pi}^{\lambda} \\ &= \sum_{\tau \in C_{\sigma t}} \operatorname{sgn}(\pi^{-1} \tau \sigma) \varphi_{\sigma}^{\lambda} \varphi_{\pi^{-1} \tau \sigma}^{\lambda} \\ &= A_{\sigma t} \varphi_{\sigma}^{\lambda} \end{aligned}$$

EXPERIMENT 8:

Develop a LaTeX script to demonstrate the presentation of Numbered theorems, definitions, corollaries, and lemmas in the document.

```
\documentclass{article}
\usepackage{amsthm}

% Define theorem-like environments
\newtheorem{theorem}{Theorem}
\newtheorem{definition}{Definition}
\newtheorem{corollary}{Corollary}
\newtheorem{lemma}{Lemma}

\begin{document}
\title{Numbered Theorems, Definitions, Corollaries, and Lemmas in the Document}
\date{}

\maketitle

\begin{theorem}
(Pythagorean Theorem) In a right-angled triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the other two sides.
a^2 + b^2 = c^2
\end{theorem}

\begin{definition}
% Presenting a definition with an example
\begin{definition}
(Prime Number) A prime number is a natural number greater than 1 that is not divisible by any number other than 1 and itself.
a^2 + b^2 = c^2
\end{definition}
a^2 + b^2 = c^2

```

```
\begin{itemize}
\item Example: 2, 3, 5, and 7 are prime numbers.
\end{itemize}
\end{definition}

% Presenting a corollary with an example

\begin{corollary}
(Euclid's Corollary) There are infinitely many prime numbers.

\begin{itemize}
\item Proof: Assume there are finitely many primes. Let them be  $p_1, p_2, \dots, p_n$ . Consider the number  $N = p_1 \cdot p_2 \cdot \dots \cdot p_n + 1$ . This number is not divisible by any of the primes  $p_1$  through  $p_n$ . Therefore, there must be a prime factor not in the list, contradicting the assumption that there are only finitely many primes.
\end{itemize}
\end{corollary}

% Presenting a lemma with an example

\begin{lemma}
(Basic Arithmetic Identity) For any real numbers  $a$  and  $b$ , we have:

\begin{equation}
(a + b)^2 = a^2 + 2ab + b^2.
\end{equation}
\end{lemma}
\end{document}
```

OUTPUT:

Numbered Theorems, Definitions, Corollaries,
and Lemmas in the Document

Theorem 1. (*Pythagorean Theorem*) In a right-angled triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the other two sides.

$$a^2 + b^2 = c^2 \quad (1)$$

Definition 1. (*Prime Number*) A prime number is a natural number greater than 1 that is not divisible by any number other than 1 and itself.

- Example: 2, 3, 5, and 7 are prime numbers.

Corollary 1. (*Euclid's Corollary*) There are infinitely many prime numbers.

- Proof: Assume there are finitely many primes. Let them be p_1, p_2, \dots, p_n . Consider the number $N = p_1 \cdot p_2 \cdots p_n + 1$. This number is not divisible by any of the primes p_1 through p_n . Therefore, there must be a prime factor not in the list, contradicting the assumption that there are only finitely many primes.

Lemma 1. (*Basic Arithmetic Identity*) For any real numbers a and b , we have:

$$(a + b)^2 = a^2 + 2ab + b^2. \quad (2)$$

EXPERIMENT 9:

Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section.

```
\documentclass{article}

\usepackage[numbers]{natbib} % Use the 'natbib' package for citation management

\begin{document}

\title{Document that Consists of Two Paragraphs with a minimum of 10 Citations in it and Displaying the References in the Section}

\date{ }

\maketitle

% Write two paragraphs with at least 10 citations

\paragraph{Paragraph 1}

The theory of relativity has been explored extensively in various scientific papers \citep{author1, author2, author3}. Einstein's contributions to physics are profound and have paved the way for many modern discoveries \citep{author4, author5}. Researchers continue to investigate the complexities of spacetime and the universe \citep{author6, author7}. These advancements have led to new methods of measurement and analysis in cosmology \citep{author8}.

\paragraph{Paragraph 2}

Recent studies have focused on the impact of climate change on various ecosystems \citep{author9, author10}. Scientists are examining how rising temperatures and changing weather patterns affect biodiversity and human health \citep{author11, author12}. Furthermore, interdisciplinary research has brought about innovative solutions for sustainable development \citep{author13}. Collaboration among experts from different fields is essential to address the challenges of global warming \citep{author14}.

% Add a references section

\newpage % Optional: Start the references on a new page

\begin{thebibliography}{99}
```

\bibitem{author1} Author One. \textit{Title of Article One}. Journal Name, vol. 10, no. 1, pp. 1--10, 2022.

\bibitem{author2} Author Two. \textit{Title of Book Two}. Publisher Name, 2021.

\bibitem{author3} Author Three. \textit{Title of Conference Paper Three}. In: Proceedings of Conference, pp. 100--110, 2020.

\bibitem{author4} Author Four. \textit{Title of Article Four}. Journal Name, vol. 9, no. 2, pp. 15--25, 2019.

\bibitem{author5} Author Five. \textit{Title of Book Five}. Publisher Name, 2018.

\bibitem{author6} Author Six. \textit{Title of Conference Paper Six}. In: Proceedings of Conference, pp. 200--210, 2017.

\bibitem{author7} Author Seven. \textit{Title of Article Seven}. Journal Name, vol. 8, no. 3, pp. 30--40, 2016.

\bibitem{author8} Author Eight. \textit{Title of Book Eight}. Publisher Name, 2015.

\bibitem{author9} Author Nine. \textit{Title of Conference Paper Nine}. In: Proceedings of Conference, pp. 300--310, 2014.

\bibitem{author10} Author Ten. \textit{Title of Article Ten}. Journal Name, vol. 7, no. 4, pp. 50--60, 2013.

\bibitem{author11} Author Eleven. \textit{Title of Article Eleven}. Journal Name, vol. 6, no. 5, pp. 70--80, 2012.

\bibitem{author12} Author Twelve. \textit{Title of Article Twelve}. Journal Name, vol. 5, no. 6, pp. 90--100, 2011.

\bibitem{author13} Author Thirteen. \textit{Title of Book Thirteen}. Publisher Name, 2010.

\bibitem{author14} Author Fourteen. \textit{Title of Conference Paper Fourteen}. In: Proceedings of Conference, pp. 400--410, 2009.

\end{thebibliography}

\end{document}

OUTPUT:

Document that Consists of Two Paragraphs with a minimum of 10 Citations in it and Displaying the References in the Section

Paragraph 1 The theory of relativity has been explored extensively in various scientific papers [1, 2, 3]. Einstein's contributions to physics are profound and have paved the way for many modern discoveries [4, 5]. Researchers continue to investigate the complexities of spacetime and the universe [6, 7]. These advancements have led to new methods of measurement and analysis in cosmology [8].

Paragraph 2 Recent studies have focused on the impact of climate change on various ecosystems [9, 10]. Scientists are examining how rising temperatures and changing weather patterns affect biodiversity and human health [11, 12]. Furthermore, interdisciplinary research has brought about innovative solutions for sustainable development [13]. Collaboration among experts from different fields is essential to address the challenges of global warming [14].

% Page 1

References

- [1] Author One. *Title of Article One*. Journal Name, vol. 10, no. 1, pp. 1–10, 2022.
- [2] Author Two. *Title of Book Two*. Publisher Name, 2021.
- [3] Author Three. *Title of Conference Paper Three*. In: Proceedings of Conference, pp. 100–110, 2020.
- [4] Author Four. *Title of Article Four*. Journal Name, vol. 9, no. 2, pp. 15–25, 2019.
- [5] Author Five. *Title of Book Five*. Publisher Name, 2018.
- [6] Author Six. *Title of Conference Paper Six*. In: Proceedings of Conference, pp. 200–210, 2017.
- [7] Author Seven. *Title of Article Seven*. Journal Name, vol. 8, no. 3, pp. 30–40, 2016.
- [8] Author Eight. *Title of Book Eight*. Publisher Name, 2015.
- [9] Author Nine. *Title of Conference Paper Nine*. In: Proceedings of Conference, pp. 300–310, 2014.
- [10] Author Ten. *Title of Article Ten*. Journal Name, vol. 7, no. 4, pp. 50–60, 2013.
- [11] Author Eleven. *Title of Article Eleven*. Journal Name, vol. 6, no. 5, pp. 70–80, 2012.
- [12] Author Twelve. *Title of Article Twelve*. Journal Name, vol. 5, no. 6, pp. 90–100, 2011.
- [13] Author Thirteen. *Title of Book Thirteen*. Publisher Name, 2010.
- [14] Author Fourteen. *Title of Conference Paper Fourteen*. In: Proceedings of Conference, pp. 400–410, 2009.

% Page 2

EXPERIMENT 10:

10. Develop a LaTeX script to design a simple tree diagram or hierarchical structure in the document with appropriate labels using the Tikz library.

```
\documentclass{article}

% Import the 'tikz' package for creating diagrams
\usepackage{tikz}
\usetikzlibrary{trees}

\begin{document}

\title{Simple Tree Diagram or Hierarchical Structure in the Document with appropriate Labels using the Tikz Library}

\date{ }

\maketitle

% Create a tree diagram

% Wrap the TikZ picture in a 'center' environment to center the diagram
\begin{center}

\begin{tikzpicture}[
    level 1/.style={sibling distance=7cm},
    level 2/.style={sibling distance=4cm},
    level distance=2cm,
    every node/.style={font=\large} % Increase font size here (e.g. \large, \Large)
]

% Root node
\node {Root}
    child { node {Child 1}
        child { node {Child 1.1}}
        child { node {Child 1.2}}
    }
    child { node {Child 2}
        child { node {Child 2.1}}
        child { node {Child 2.2}}
    }
    child { node {Child 3}
        child { node {Child 3.1}}
        child { node {Child 3.2}}
    }
}

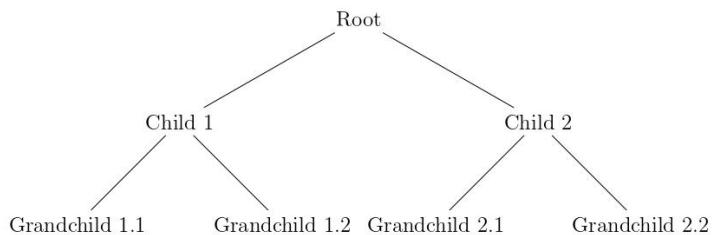
\end{tikzpicture}
\end{center}

```

```
% Level 2 nodes  
child { node {Grandchild 1.1} }  
child { node {Grandchild 1.2} }  
}  
  
child { node {Child 2}  
  
% Level 2 nodes  
child { node {Grandchild 2.1} }  
child { node {Grandchild 2.2} }  
};  
  
\end{tikzpicture}  
\end{center}  
\end{document}
```

OUTPUT:

Simple Tree Diagram or Hierarchical Structure in the Document with appropriate Labels using the Tikz Library



EXPERIMENT 11:

Develop a LaTeX script to present an algorithm in the document using Algorithm/algorithmic/algorithm2e library.

```
\documentclass{article}
\usepackage[ruled, linesnumbered]{algorithm2e}
\begin{document}
\begin{algorithm}[H]
\SetAlgoLined
\SetKwFunction{Dijkstra}{Dijkstra}
\SetKwProg{Fn}{Function}{}{::}
\Fn{\Dijkstra{$G$, $s$}}{
    $d[s] \gets 0$;
    \ForEach{$v \in V$} {
        $d[v] \gets \infty$;
        $prev[v] \gets \text{undefined}$;
    }
    $Q \gets V$;
    \While{$Q$ is not empty} {
        $u \gets$ vertex in $Q$ with minimum $d[u]$;
        Remove $u$ from $Q$;
        \ForEach{$v \in$ neighbors of $u$} {
            $\text{alt} \gets d[u] + \text{weight}(u, v)$;
            \If{$\text{alt} < d[v]$} {
                $d[v] \gets \text{alt}$;
                $prev[v] \gets u$;
            }
        }
    }
}
}
```

```

}

}

}

\KwRet{$d[], prev[]$};

}

\caption{Dijkstra's Algorithm}

\label{algo:dijkstra}

\end{algorithm}

\end{document}

```

OUTPUT:

Algorithm 1: Dijkstra's Algorithm

```

1 Function Dijkstra( $G, s$ ):
2    $d[s] \leftarrow 0;$ 
3   foreach  $v \in V$  do
4      $d[v] \leftarrow \infty;$ 
5      $prev[v] \leftarrow \text{undefined};$ 
6   end
7    $Q \leftarrow V;$ 
8   while  $Q$  is not empty do
9      $u \leftarrow \text{vertex in } Q \text{ with minimum } d[u];$ 
10    Remove  $u$  from  $Q$ ;
11    foreach  $v \in \text{neighbors of } u$  do
12       $alt \leftarrow d[u] + \text{weight}(u, v);$ 
13      if  $alt < d[v]$  then
14         $d[v] \leftarrow alt;$ 
15         $prev[v] \leftarrow u;$ 
16      end
17    end
18  end
19  return  $d[], prev[];$ 

```

EXPERIMENT 12:

Develop a LaTeX script to create a simple report and article by using suitable commands and formats of user choice.

```
\documentclass[conference]{IEEEtran}

\IEEEoverridecommandlockouts

\usepackage{cite}

\usepackage{url}

\usepackage{amsmath,amssymb,amsfonts}

\usepackage{algorithmic}

\usepackage{graphicx}

\usepackage{textcomp}

\usepackage{xcolor}

\usepackage{stfloats}

\usepackage{multicol}

\def\BibTeX{{\rm B}\kern-.05em{\rm \i{TeX}}{\rm B}\kern-.05em{\rm \i{sc}}{\rm i}\kern-.025em{\rm b}\kern-.08em{\rm T}\kern-.1667em{\rm lower}.7ex{\rm \i{hbox}}{\rm E}\kern-.125em{\rm X}}{\rm \{}{\rm \} }

\begin{document}

\title{COVID-19 and Comorbidities Pandemic Effects: A Review \\}

\author{\IEEEauthorblockN{Pavan.M,Sairam}{\rm Department of Computer Science and Eng(AI & ML), KVGCE, SULLIA} }

\maketitle

\begin{abstract}

%COVID-19 is a contagious disease caused by a virus,the Severe Acute Repository Syndrome coronavirus -2 (SARS-CoV-2). The first known case was identified in Wuhan, China, in December 2019.The co-existence of two or more illness or disorders in a single patient. This study received the Comorbidities and vulnerability among people pre and post COVID-19. An advanced database search is

```

made related to modern technology towards COVID-19, In recent year, many health cares have increased and attracted attention, to make the issue serious by limited data healthy many techniques like Machine Learning and modern computational intelligence are applied to provide the disease. Many biomarkers are used to identify the condition of the patients. In this paper, COVID-19 was detected by different methods like Deep Learning Network Chest X-ray images and by applying a proposed weighted as arranging method which gives importance to different sensitivities of Deep Learning (DL) models on different class types

A virus known as Severe Acute Repository Syndrome Coronavirus-2 (SARS-CoV-2) is the source of the infectious disease COVID-19. The first case of COVID – 19 is recorded in Wuhan, China, in December 2019. If a person had COVID-19 and another disease or condition, then COVID-19 and other diseases would be considered comorbidities. Researchers began studying the link between people with certain comorbidities and the COVID-19 disease after the start of the pandemic. This paper gives reviews on the effects of COVID-19 and its

comorbidities. Machine learning and Deep learning techniques are used to detect the severity of COVID-19 and the comorbidities from the existing literature work.

\end{abstract}

\begin{IEEEkeywords}

COVID-19, Comorbidity, Deep Learning, Machine Learning, SARS-CoV-2.

\end{IEEEkeywords}

\section{Introduction}

\IEEPEPARstart{T}he disease known as COVID-19 is mostly caused by the SARS-CoV-2 virus, which was discovered in China in December 2019. As a result, it spread fast around the world. COVID-19 spreads through air-borne patients containing the virus or the droplets. The

Transmission can occur through the contaminated fluids in the eyes, nose or mouth, and, rarely, via contaminated surfaces. COVID-19 affects different people in different ways. Most infected people will develop mild

to moderate illness and recover without hospitalization. The symptoms of this disease can be categorized into three types such as most common, less common, and serious problems. The most common symptoms of the COVID -19 are fever, cough, tiredness, and loss of taste or smell. The less common symptoms are sore throat, headache, aches, and pains, diarrhoea, a rash on the skin, or discoloration of fingers or toes, and red or irritated eyes. The Serious symptoms are difficulty in breathing or shortness of breath, loss of speech or mobility, or confusion and chest pain. Fig. 1 shows the three categories of symptoms of COVID-19 disease. The Covid-19 patient seeks immediate medical attention if he has serious symptoms. People with mild symptoms who are otherwise healthy should manage their symptoms at home. On average, it takes 5–6 days from when someone is infected with the virus for symptoms to show,

however it can take up to 14 days.

This disease weakens the body's functions, making it more challenging for the body to fight off invaders like viruses and bacteria and to get rid of the disease's main cause. It may be

extremely stressful on the body to have two or more diseases present at once, and the affected individual may take longer to recover than someone without comorbidity.

COVID-19 spreads through, air-borne patients containing the virus or the droplets. Transmission can occur through the contaminated surface.

The Transmission can occur through the contaminated fluids in the eyes, nose or mouth, and, rarely, via contaminated surfaces. COVID-19 testing through swab as well as rRT-PCR and CT scan methods.

The Table 1 is the COVID cases (43452164)and Death cases (525116) in India (March 2020 to October 2022).

```
\begin{table*}
\caption{COVID cases in States / Union Territories}
\label{tab:t1}
\centering
\begin{tabular}{p{0.10\linewidth}p{0.10\linewidth}p{0.10\linewidth}p{0.10\linewidth}p{0.10\linewidth}p{0.10\linewidth}}
\hline
\textbf{Sl.No.} & \textbf{COVID Cases} & \textbf{Death Cases} & \textbf{Result}\\
\hline
Yamaç \emph{et al.} \cite{yamac2021convolutional} 2021 &
SVM, KNN, and CRC & X-ray images of QaTa-Cov19 & Sensitivity: 98\%
\\
\nothing
Specificity:95\%
\end{tabular}
\end{table*}
```

```
\begin{figure}[htp]
\centering
\includegraphics[width=8cm,height=9
cm]{Sym.JPG} \caption{Symptoms of COVID-19 Effects}
\label{fig:f1}
\end{figure}
```

26

\subsection*{A. COMORBIDITIES}

Comorbidities are the presence of two or more diseases in the same person. In the case of COVID-19, if a person had COVID-19 and another disease, then COVID-19 and the other condition would be comorbidities. So, for example, if a person had diabetes and then developed COVID-19, they would have two diseases—or comorbidities.

\newline

Table 2 is existing diagnosis algorithm for comorbidities are incorporated.

```
\begin{figure*}[htp]
\centering
\includegraphics[width=14cm,height=8cm]{Suresh_2.png}
\caption{Death Rate by Comorbidities diseases}
\label{fig:f2}
\end{figure*}
```

\subsection*{B. DIAGNOSIS ALGORITHMS}

Table 3 is existing diagnosis algorithm for diseases are incorporated.

```
\begin{table*}
\caption{Existing diagnosis algorithm for comorbidities}
\label{tab:t1}
\centering
\begin{tabular}{p{0.20\linewidth} p{0.15\linewidth}p{0.20\linewidth}p{0.20\linewidth}p{0.20\linewidth}}

```

\hline

\textbf{Author [Reference] Year} & \textbf{Model / Classifier} & \textbf{Dataset} &

\textbf{Result}\% \textbf{Age in Years} &

\hline

Yamaç \emph{et al.} \cite{yamac2021convolutional} 2021 &

SVM, KNN, and CRC & X-ray images of QaTa-Cov19 & Sensitivity: 98\%

\newline

Specificity:95\%

\|\|\\

Wanyan \emph{et al.} \cite{wanyan2020relational} 2021 & DL/ML - Heterogeneous Graph

model and LSTM & Electronic Health Records & Training set Accuracy:0.935

\newline

Test set Accuracy:0.847

\|\|\\

Liu \emph{et al.} \cite{liu2020risk} 2020 & Risk factors of infection in COVID-19: RT-PCR

& 11580 of persons & RR: 5.29, 95\%CI: 3.76-7.46

\|\|\\

Gammulle \emph{et al.} \cite{gammulle2021multi} 2021 &

DL-SE-ResNet-50 & 307 patients of radiomics & Accuracy:86.63\%

\|\|\\

Pathak \emph{et al.} \cite{pathak2020deep} 2020 & AI- CNN, ANN & 2842 CT Scan images

& Accuracy:1.79, AUC:1.53

\newline f-measure:1.84, Sensitivity:1.93

\newline

Specificity:0.44, recall:1.64

\newline

Precision:1.53

\\\|

Han \emph{et al.} \cite{han2020accurate} 2020 &

27

DL/ML - CatBoost / SVM / NB / LR & EMRs: Test 1 (753)

Test 2(2123)

& Accuracy:97.6, AUC:99

\newline f1 score:97.9,Precision:97.9

\newline

Cohen Kappa:95.7, recall:97.9

\\\|

\hline

\end{tabular}

\end{table*}

\begin{table*}

\caption{Existing diagnosis algorithm for Diseases}

\label{tab:t2}

\centering

\begin{tabular}

{p{0.20\linewidth} p{0.15\linewidth}p{0.20\linewidth}p{0.20\linewidth}p{0.20\linewidth}}

\hline

\textbf{Author [Reference]} Year & \textbf{Model / Classifier} & \textbf{Dataset} &

\textbf{Result}\% \textbf{Age in Years} &

\hline

Mehrabadi \emph{et al.} \cite{mehrabadi2021detection} 2021&

DL – CNN / LSTM & 77972 samples of Age & ACU: 0.81

\|\|

Singh \emph{et al.} \cite {singh2021ediapredict} 2021 & ML - XGBoost, Decision Tree, Random Forest, NN & PIMA Indian Diabetes Data 9 attributes & Accuracy:92.21\%

\|\|

Karboub \emph{et al.} \cite {karboub2020automated} 2022 & AI-CNN, SVM, KNN, NB & 72000 ECG Beats & Accuracy:99.2\%

\|\|

Handy \emph{et al.} \cite {Handy923} 2022 & logistic and Cox Regression & 972971 Female and CHA samples & Odds Ratio:95\%

\|\|

Aburuz \emph{et al.} \cite {aburuz2022clinical} 2022 & logistic Regression Analysis & 3296 patients Age & Odds Ratio:2.87

\|\|

Yu \emph{et al.} \cite {yu2020role} 2021 & AI - CatBoost / SVM / NB / LR & EMRs: Test 1 (753)

\newline

Test 2(2123)

& T1-Accuracy: 84.7\%

\newline

T2-Accuracy:96.7\%

\|\|

\hline

\end{tabular}

\end{table*}

\section{ Literature Review }

In literature reviews severity of COVID-19 and comorbid effects and diagnosis algorithms are reviewed and explained.

\newline

Devarajan \emph{et al.} \cite{devarajan2021healthcare} investigated on the effect of the COVID-19 flare-up on medical services tasks and creates AI based anticipating models utilizing time series information to predict the movement of COVID-19 and further utilizing prescient examination to all the more likely oversee medical care activities.

Gu \emph{et al.} \cite{gu2021epidemic} proposed novel plague risk evaluation technique in light of the granular information gathered by correspondence stations. The calculation scourge hazard of the correspondence stations in various stretches by consolidating the quantity of tainted people and the manner in which they go through the stations has been examined.

Li \emph{et al.} \cite{li2021rapid} the component determination strategy in view of stepwise relapse is utilized to handle the COVID-19 pandemic informational index from January 13,2020 to January 16, 2021 in the United States. After measurable testing, the Auto Regressive Integrated Moving Average (ARIMA) model and the better ARIMAX model in the view of element determination rapidly settles the improvement pattern of the COVID-19 pestilence in the US.

Elahraf \emph{et al.} \cite{elahraf2021service} proposed a help situated structure that permits dynamic piece and the executives of such quiet consideration plans expecting a fitting Information base and accessibility of web administrations points of interaction of the fundamental frameworks of guardians and specialist organizations.

Feil-Seifer \emph{et al.} \cite{feil2020next} propose Human-Robot Interaction Research (HRI) research acted before long will be changed in essentially various ways; the powerlessness to perform or expect the future presentation of in-person human subjects research, particularly research including material or multiparty cooperation, will change both

the prevailing systemic methods utilized by HRI specialists and the very research questions that the field decides to and can address.

Khan \emph{et al.} \cite{khan2020prediction} foresee whether the cesarean segment is important with the assistance of information mining and subsequently, expanding the security of the mother and infant during and after labor by keeping away from superfluous cesarean area has been tended to. To accomplish the goal, three unique gathering forecast models in view of XGBoost, AdaBoost and Catboost have been created.

Jokinen \emph{et al.} \cite{jokinen2021detection} utilized atomic elements reproductions in combined solvents as one with virtual screening to distinguish little particles that could be possible inhibitors of S protein in turn ACE2 collaboration. Likewise, an original conformity of the S protein was found that could be balanced out by little particles to restrain connection to ACE2.

Kyono \emph{et al.} \cite{kyono2021exploiting} propose a model determination strategy for utilizing model expectations on an objective space without names by taking advantage of the area invariance of causal design. We expect or gain a causal chart from the source space and select models that produce anticipated disseminations in the objective space that have the most elevated probability of accommodating our causal diagram.

\section{Conclusions}

Our meta- analysis showed that diabetes increases the mortality of patients with COVID-19. Even since COVIS-19 had occur in environment may her infected by SAR-COV-2. The rate of infection is detected by virus health data and cough detectors and even by long health detectors. The heart disease caused due to cardiovascular infection affects many severe maybe causing pandemic and cardiovascular compliance and leading death computer addiction and human robot interaction have experienced the detection of disease, to main the issue serious by limited

data health many techniques like, ML modern continuous intelligence are applied to predict the diseases. Many biomarkers are used to identify the condition of the patients. In this paper, COVID-19 was detected by different methods like Deep Learning Network Chest X-ray images and by applying a proposed weighted as arranging method which gives importance to different sensitivities of DL models on different class types.

\bibliographystyle{ieeetr}

\bibliography{reference}

\end{document}

OUTPUT:

COVID-19 and Comorbidities Pandemic Effects: A Review

Suresh Kumar H S, C N Pushpa, Thriveni J, Venugopal K R
 Department of Computer Science and Engineering, UVCE, Bengaluru

Abstract—A virus known as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) is the source of the infectious disease COVID-19. The first case of COVID – 19 is recorded in Wuhan, China, in December 2019. If a person had COVID-19 and another disease or condition, then COVID-19 and other diseases would be considered comorbidities. Researchers began studying the link between people with certain comorbidities and the COVID-19 disease after the start of the pandemic. This paper gives reviews on the effects of COVID-19 and its comorbidities. Machine learning and Deep learning techniques are used to detect the severity of COVID-19 and the comorbidities from the existing literature work.

Index Terms—COVID-19, Comorbidity, Deep Learning, Machine Learning, SARS-CoV-2.

I. INTRODUCTION

The disease known as COVID-19 is mostly caused by the SARS-CoV-2 virus, which was discovered in China in December 2019. As a result, it spread fast around the world. COVID-19 spreads through air-borne patients containing the virus or the droplets. The Transmission can occur through the contaminated fluids in the eyes, nose or mouth, and, rarely, via contaminated surfaces. COVID-19 affects different people in different ways. Most infected people will develop mild to moderate illness and recover without hospitalization. The symptoms of this disease can be categorized into three types such as most common, less common, and serious problems. The most common symptoms of the COVID -19 are fever, cough, tiredness, and loss of taste or smell. The less common symptoms are sore throat, headache, aches, and pains, diarrhoea, a rash on the skin, or discolouration of fingers or toes, and red or irritated eyes. The Serious symptoms are difficulty in breathing or shortness of breath, loss of speech or mobility, or confusion and chest pain. Fig. 1 shows the three categories of symptoms of COVID-19 disease. The Covid-19 patient seeks immediate medical attention if he has serious symptoms. People with mild symptoms who are otherwise healthy should manage their symptoms at home. On average it takes 5–6 days from when someone is infected with the virus for symptoms to show, however it can take up to 14 days.

This disease weakens the body's functions, making it more challenging for the body to fight off invaders like viruses and bacteria and to get rid of the disease's main cause. It may be extremely stressful on the body to have two or more diseases present at once, and the affected individual may take longer to recover than someone without comorbidity.

COVID-19 spreads through, air-borne patients containing the virus or the droplets. Transmission can occur through the

contaminated surface. The Transmission can occur through the contaminated fluids in the eyes, nose or mouth, and, rarely, via contaminated surfaces. COVID-19 testing through swab as well as rRT-PCR and CT scan methods. The Table 1 is the COVID cases (43452164) and Death cases (525116) in India (March 2020 to October 2022).

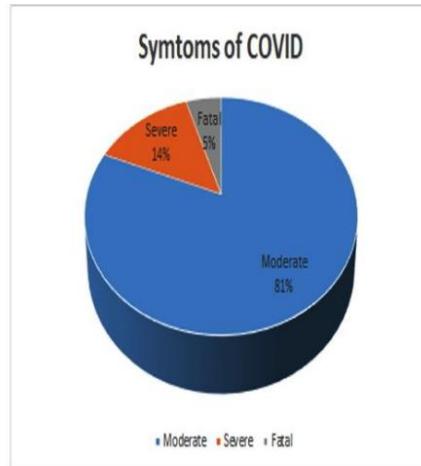


Fig. 1. Symptoms of COVID-19 Effects

A. COMORBIDITIES

Comorbidities are the presence of two or more diseases in the same person. In the case of COVID-19, if a person had COVID-19 and another disease, then COVID-19 and the other condition would be comorbidities. So, for example, if a person had diabetes and then developed COVID-19, they would have two diseases—or comorbidities. The fig. 2 is illustrate the comorbidities diseases

Table 2 is existing diagnosis algorithm for comorbidities are incorporated.

B. DIAGNOSIS ALGORITHMS

Table 3 is existing diagnosis algorithm for diseases are incorporated.

TABLE I
COVID CASES IN STATES / UNION TERRITORIES

Yamaç *et al.* [1] 2021 SVM, KNN, and CRC X-ray images of QaTa-Cov19 Sensitivity: 98% Specificity: 95%

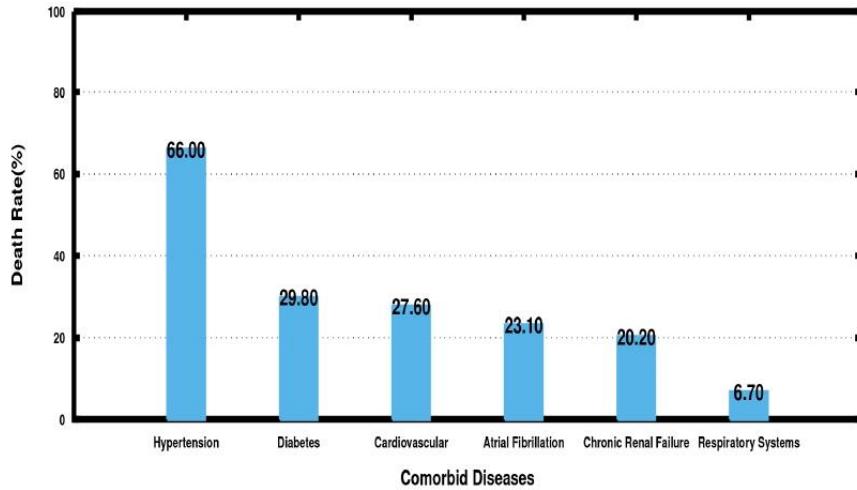


Fig. 2. Death Rate by Comorbidities diseases

TABLE II
EXISTING DIAGNOSIS ALGORITHM FOR COMORBIDITIES

Author [Reference]	Year	Model / Classifier	Dataset	Result
Yamaç <i>et al.</i> [1] 2021		SVM, KNN, and CRC	X-ray images of QaTa-Cov19	Sensitivity: 98% Specificity: 95%
Wanyan <i>et al.</i> [2] 2021		DL/ML - Heterogeneous Graph model and LSTM	Electronic Health Records	Training set Accuracy: 0.935 Test set Accuracy: 0.847
Liu <i>et al.</i> [3] 2020		Risk factors of infection in COVID-19: RT-PCR	11580 of persons	RR: 5.29, 95%CI: 3.76-7.46
Gammulle <i>et al.</i> [4] 2021		DL-SE-ResNet-50	307 patients of radiomics	Accuracy: 86.63%
Pathak <i>et al.</i> [5] 2020		AI- CNN, ANN	2842 CT Scan images	Accuracy: 1.79, AUC: 1.53 f-measure: 1.84, Sensitivity: 1.93 Specificity: 0.44, recall: 1.64 Precision: 1.53
Han <i>et al.</i> [6] 2020		DL/ML - CatBoost / SVM / NB / LR	EMRs: Test 1 (753) Test 2(2123)	Accuracy: 97.6, AUC: 99 f1 score: 97.9, Precision: 97.9 Cohen Kappa: 95.7, recall: 97.9

TABLE III
EXISTING DIAGNOSIS ALGORITHM FOR DISEASES

Author [Reference]	Year	Model / Classifier	Dataset	Result
Mehrabadi <i>et al.</i> [7]	2021	DL – CNN / LSTM	77972 samples of Age	ACU: 0.81
Singh <i>et al.</i> [8]	2021	ML - XGBoost, Decision Tree, Random Forest, NN	PIMA Indian Diabetes Data 9 attributes	Accuracy:92.21%
Karboub <i>et al.</i> [9]	2022	AI-CNN, SVM, KNN, NB	72000 ECG Beats	Accuracy:99.2%
Handy <i>et al.</i> [10]	2022	logistic and Cox Regression	972971 Female and CHA samples	Odds Ratio:95%
Aburuz <i>et al.</i> [11]	2022	logistic Analysis	3296 patients Age	Odds Ratio:2.87
Yu <i>et al.</i> [12]	2021	AI - CatBoost / SVM / NB / LR	EMRs: Test 1 (753) Test 2(2123)	T1-Accuracy: 84.7% T2-Accuracy:96.7%

II. LITERATURE REVIEW

In literature reviews severity of COVID-19 and comorbid effects and diagnosis algorithms are reviewed and explained.

Devarajan *et al.* [13] investigated on the effect of the COVID-19 flare-up on medical services tasks and creates AI based anticipating models utilizing time series information to predict the movement of COVID-19 and further utilizing prescient examination to all the more likely oversee medical care activities.

Gu *et al.* [14] proposed novel plague risk evaluation technique in light of the granular information gathered by correspondence stations. The calculation scourge hazard of the correspondence stations in various stretches by consolidating the quantity of tainted people and the manner in which they go through the stations has been examined.

Li *et al.* [15] the component determination strategy in view of stepwise relapse is utilized to handle the COVID-19 pandemic informational index from January 13,2020 to January 16, 2021 in the United States. After measurable testing, the Auto Regressive Integrated Moving Average (ARIMA) model and the better ARIMAX model in view of element determination rapidly settles the improvement pattern of the COVID-19 pestilence in the US.

Elahraf *et al.* [16] proposed a help situated structure that permits dynamic piece and the executives of such quiet consideration plans expecting a fitting information base and accessibility of web administrations points of interaction of the fundamental frameworks of guardians and specialist organizations.

Feil-Seifer *et al.* [17] propose Human-Robot Interaction Research (HRI) research acted before long will be changed in essentially various ways; the powerlessness to perform or expect the future presentation of in-person human subjects research, particularly research including material or multiparty cooperation, will change both the prevailing systemic methods

utilized by HRI specialists and the very research questions that the field decides to and can address.

Khan *et al.* [18] foresee whether the cesarean segment is important with the assistance of information mining and subsequently, expanding the security of the mother and infant during and after labor by keeping away from superfluous cesarean area has been tended to. To accomplish the goal, three unique gathering forecast models in view of XGBoost, AdaBoost and Catboost have been created.

Jokinen *et al.* [19] utilized atomic elements reproductions in combined solvents as one with virtual screening to distinguish little particles that could be possible inhibitors of S protein in turn ACE2 collaboration. Likewise, an original conformity of the S protein was found that could be balanced out by little particles to restrain connection to ACE2.

Kyono *et al.* [20] propose a model determination strategy for utilizing model expectations on an objective space without names by taking advantage of the area invariance of causal design. We expect or gain a causal chart from the source space and select models that produce anticipated disseminations in the objective space that have the most elevated probability of accommodating our causal diagram.

III. CONCLUSIONS

Our meta- analysis showed that diabetes increases the mortality of patients with COVID-19. Even since COVIS-19 had occur in environment may her infected by SAR-COV-2. The rate of infection is detected by virus health data and cough detectors and even by long health detectors. The heart disease caused due to cardiovascular infection affects many severe maybe causing pandemic and cardiovascular compliance and leading death computer addiction and human robot interaction have experienced the detection of disease, to main the issue serious by limited data health many techniques like, ML modern continuous intelligence are applied to predict the diseases. Many biomarkers are used to identify the condition of the patients. In this paper, COVID-19 was detected by different

methods like Deep Learning Network Chest X-ray images and by applying a proposed weighted as arranging method which gives importance to different sensitivities of DL models on different class types.

REFERENCES

- [1] M. Yamac, M. Ahishali, A. Degerli, S. Kiranyaz, M. E. Chowdhury, and M. Gabbour, "Convolutional sparse support estimator-based covid-19 recognition from x-ray images," *IEEE Transactions on Neural Networks and Learning Systems*, vol. 32, no. 5, pp. 1810–1820, 2021.
- [2] T. Wanyan, A. Vaid, J. H. De Freitas, S. Somani, R. Miotto, G. N. Nadkarni, A. Azad, Y. Ding, and B. S. Glicksberg, "Relational learning improves prediction of mortality in covid-19 in the intensive care unit," *IEEE transactions on big data*, vol. 7, no. 1, pp. 38–44, 2020.
- [3] T. Liu, W. Liang, H. Zhong, J. He, Z. Chen, G. He, T. Song, S. Chen, P. Wang, J. Li, et al., "Risk factors associated with covid-19 infection: a retrospective cohort study based on contacts tracing," *Emerging microbes infections*, vol. 9, no. 1, pp. 1546–1553, 2020.
- [4] H. Gammulle, T. Fernando, S. Sridharan, S. Denman, and C. Fookes, "Multi-slice net: A novel light weight framework for covid-19 diagnosis," in *2021 IEEE International Conference on Autonomous Systems (ICAS)*, pp. 1–5, IEEE, 2021.
- [5] Y. Pathak, P. K. Shukla, and K. Arya, "Deep bidirectional classification model for covid-19 disease infected patients," *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, vol. 18, no. 4, pp. 1234–1241, 2020.
- [6] Z. Han, B. Wei, Y. Hong, T. Li, J. Cong, X. Zhu, H. Wei, and W. Zhang, "Accurate screening of covid-19 using attention-based deep 3d multiple instance learning," *IEEE transactions on medical imaging*, vol. 39, no. 8, pp. 2584–2594, 2020.
- [7] M. A. Mehrabadi, S. A. H. Aqajari, I. Azimi, C. A. Downs, N. Dutt, and A. M. Rahmani, "Detection of covid-19 using heart rate and blood pressure: Lessons learned from patients with ards," in *2021 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)*, pp. 2140–2143, IEEE, 2021.
- [8] A. Singh, A. Dhillon, N. Kumar, M. S. Hossain, G. Muhammad, and M. Kumar, "edapipredict: An ensemble-based framework for diabetes prediction," *ACM Transactions on Multimedia Computing Communications and Applications*, vol. 17, no. 2s, pp. 1–26, 2021.
- [9] K. Karboub, M. Tabaa, F. Monteiro, S. Dellagi, F. Moutaouakkil, and A. Dandache, "Automated diagnosis system for outpatients and inpatients with cardiovascular diseases," *IEEE Sensors Journal*, vol. 21, no. 2, pp. 1935–1946, 2020.
- [10] A. Handy, A. Banerjee, A. M. Wood, C. Dale, C. L. M. Sudlow, C. Tomlinson, D. Bean, J. H. Thygesen, M. A. Mizani, M. Katsoulis, R. Takhar, S. Hollings, S. Denaxas, V. Walker, R. Dobson, and R. Sofat, "Evaluation of antithrombotic use and covid-19 outcomes in a nationwide atrial fibrillation cohort," *Heart*, vol. 108, no. 12, pp. 923–931, 2022.
- [11] S. AbuRuz, A. Al-Azayzih, S. ZainAlAbdin, R. Beirami, and M. Al Hajjar, "Clinical characteristics and risk factors for mortality among covid-19 hospitalized patients in uae: Does ethnic origin have an impact," *Plos one*, vol. 17, no. 3, p. e0264547, 2022.
- [12] G. Yu, Z. Li, S. Li, J. Liu, M. Sun, X. Liu, F. Sun, J. Zheng, Y. Li, Y. Yu, et al., "The role of artificial intelligence in identifying asthma in pediatric inpatient setting," *Annals of Translational Medicine*, vol. 8, no. 21, 2020.
- [13] J. P. Devarajan, A. Manimuthu, and V. R. Sreedharan, "Healthcare operations and black swan event for covid-19 pandemic: a predictive analytics," *IEEE Transactions on Engineering Management*, 2021.
- [14] Z. Gu, L. Wang, X. Chen, Y. Tang, X. Wang, X. Du, M. Guizani, and Z. Tian, "Epidemic risk assessment by a novel communication station based method," *IEEE Transactions on Network Science and Engineering*, vol. 9, no. 1, pp. 332–344, 2021.
- [15] Y. Li, S. Chu, H. Zhao, F. Rong, C. Liu, S. Zhao, Z. Wang, and Z. Xiong, "Rapid prediction and evaluation of covid-19 epidemic in the united states based on feature selection and improved arimax model," in *2021 2nd International Conference on Artificial Intelligence and Information Systems*, pp. 1–8, 2021.
- [16] A. Elahraf, A. Afzal, A. Akhtar, B. Shafiq, and J. Vaidya, "A service-oriented framework for developing personalized patient care plans for covid-19," in *DG. O2021: The 22nd Annual International Conference on Digital Government Research*, pp. 234–241, 2021.
- [17] D. Feil-Seifer, K. S. Haring, S. Rossi, A. R. Wagner, and T. Williams, "Where to next? the impact of covid-19 on human-robot interaction research," 2020.
- [18] N. I. Khan, T. Mahmud, M. N. Islam, and S. N. Mustafina, "Prediction of cesarean childbirth using ensemble machine learning methods," in *Proceedings of the 22nd international conference on information integration and web-based applications & services*, pp. 331–339, 2020.
- [19] E. M. Jokinen, K. Gopinath, S. T. Kurkinen, and O. T. Pentikäinen, "Detection of binding sites on sars-cov-2 spike protein receptor-binding domain by molecular dynamics simulations in mixed solvents," *IEEE/ACM Transactions on Computational Biology and Bioinformatics*, vol. 18, no. 4, pp. 1281–1289, 2021.
- [20] T. Kyoma and M. Van der Schaar, "Exploiting causal structure for robust model selection in unsupervised domain adaptation," *IEEE Transactions on Artificial Intelligence*, vol. 2, no. 6, pp. 494–507, 2021.