University of Reading

Department of Computer Science

# Report for E-Learning Web Pages for Computer science students

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the University of Reading for the degree of
Bachelor of Science in *Computer Science*

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# Declaration

I, Roshan Magan, of the Department of Computer Science, University of Reading, confirm that this is my own work and figures, tables, equations, code snippets, artworks, and illustrations in this report are original and have not been taken from any other person's work, except where the works of others have been explicitly acknowledged, quoted, and referenced. I understand that if failing to do so will be considered a case of plagiarism. Plagiarism is a form of academic misconduct and will be penalised accordingly.

I give consent to a copy of my report being shared with future students as an exemplar.

I give consent for my work to be made available more widely to members of UoR and the public with an interest in teaching, learning, and research.

Roshan Magan
April 20, 2023

# Abstract

The aim of this project is to design and develop an e-learning website that provides an interactive and user-friendly platform for learners to access educational materials online. The website will utilize the latest web technologies to offer a range of educational resources such as interactive quizzes, discussion forums, and other multimedia content to enhance the learning experience of users.

The website will be designed with a responsive user interface that adapts to different screen sizes and devices, allowing users to access educational materials on desktop computers, laptops, tablets, and smartphones. The website will also include a secure user authentication system to protect user data and ensure privacy.

The e-learning website will be developed using the latest web development technologies such as HTML5, CSS3, JavaScript, PHP, and MySQL. These technologies will enable the development of dynamic and interactive web pages that can be accessed by learners from anywhere in the world. The website will be deployed on a secure and reliable web server to ensure maximum uptime and availability.

Overall, this e-learning website will provide an innovative and effective approach to learning, allowing users to access educational materials anytime, anywhere, and at their own pace. It has the potential to revolutionize the way education is delivered and accessed, making learning more accessible and engaging for all.

**Keywords:** a maximum of five keywords/keyphrase separated by commas

**Report's total word count:** we expect a maximum of 20,000 words (excluding reference and appendices) and about 50 - 60 pages. [A good project report can also be written in approximately 10,000 words.]

# Acknowledgements

An acknowledgements section is optional. You may like to acknowledge the support and help of your supervisor(s), friends, or any other person(s), department(s), institute(s), etc. If you have been provided specific facility from department/school acknowledged so.

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# List of Abbreviations

SMPCS         School of Mathematical, Physical and Computational Sciences

# Chapter 1

# Introduction

In recent years, e-learning has emerged as a popular and effective approach to education. With the increasing availability of online resources, learners can access educational materials from anywhere, at any time. However, designing and developing e-learning websites that provide a high-quality and engaging user experience remains a challenge.

This project aims to address this challenge by designing and developing an e-learning website with three pages covering topics in virtual reality, matrix multiplication, and graph tree data structure. The website will utilize HTML, CSS, and JavaScript technologies to create a dynamic and interactive user interface. It will be designed with a responsive layout that adapts to different screen sizes and devices, making it accessible to learners from all over the world.

The virtual reality page will provide learners with an immersive experience that introduces them to the principles and applications of virtual reality technology. The matrix multiplication page will provide learners with a comprehensive understanding of matrix multiplication and the skills necessary to solve matrix problems. Finally, the graph tree data structure page will teach learners the basics of graph theory and the graph tree data structure.

This project aims to provide learners with an innovative and effective approach to learning, allowing them to access educational materials anytime, anywhere, and at their own pace. By doing so, it has the potential to revolutionize the way education is delivered and accessed, making learning more accessible and engaging for all. This report will describe the problem, the methodological approach adopted, and the significant outcomes of the project.

## 1.1   Background

The project at hand is an e-learning website that aims to provide learners with an immersive and engaging educational experience. The motivation behind this project is the increasing need for accessible and effective educational resources in today's digital age. With the widespread availability of technology and the internet, learners can now access educational materials from anywhere, at any time. However, designing and developing e-learning websites that provide a high-quality user experience remain challenging.

To address this challenge, the website will be designed using HTML, CSS, and JavaScript technologies to create a dynamic and interactive user interface. The website will be responsive and adaptive, allowing learners to access it from various devices, including desktops, laptops, tablets, and smartphones. Virtual reality technology has rapidly evolved over the past few years, and it has numerous applications in various fields, including education. By using virtual reality technology in education, learners can experience immersive and interactive simulations that help them better understand complex concepts. The virtual reality page of the e-learning

website aims to introduce learners to the principles and applications of virtual reality technology and provide them with an immersive learning experience.

Matrix multiplication is a fundamental mathematical concept with numerous applications in various fields, including computer science, physics, and economics. The matrix multiplication page of the e-learning website aims to provide learners with a comprehensive understanding of matrix multiplication and the skills necessary to solve matrix problems. Graph theory is a branch of mathematics that studies graphs, which are mathematical structures used to model pairwise relations between objects. Graph theory has numerous applications in various fields, including computer science, physics, and social network analysis. The graph tree data structure page of the e-learning website aims to teach learners the basics of graph theory and the graph tree data structure.

By providing learners with an innovative and effective approach to learning, this project aims to revolutionize how education is delivered and accessed, making learning more accessible and engaging for all.

## 1.2 Problem statement

While e-learning has become increasingly popular in recent years, there is still a need for accessible and practical educational resources that provide a high-quality user experience. Designing and developing e-learning websites that engage learners and provide them with an immersive educational experience remain a challenge. In addition, the widespread availability of technology and the internet has made it easier for learners to access educational materials. Still, it has also created a need for responsive and adaptive websites, allowing learners to access them from various devices.

To address these challenges, this project aims to design and develop an e-learning website with three pages covering topics in virtual reality, matrix multiplication, and graph tree data structure.

The problem this project aims to solve is the lack of accessible and practical e-learning resources that provide a high-quality user experience. By designing and developing an e-learning website that engages learners and provides them with an immersive educational experience, this project aims to provide learners with an innovative and practical approach to learning. Additionally, by designing the website with a responsive layout, it seeks to address the need for websites that are accessible from a variety of devices.

**key problems:**

1. Limited accessibility: Traditional classroom-based learning requires learners to be physically present in a specific location at a specific time, which can limit access for those who are geographically distant, physically disabled, or have other commitments that prevent them from attending classes in person.

2. Limited flexibility: Traditional classroom-based learning often follows a rigid schedule with set class times and deadlines. This can limit the ability of learners to progress at their own pace and work on the material when it is most convenient for them.

3. Limited interactivity: Traditional classroom-based learning can be passive, with learners primarily listening to lectures or reading materials without much interaction. This can limit the ability of learners to engage with the material and deepen their understanding.

4. Limited engagement: Traditional classroom-based learning can be less engaging and motivating for learners, leading to lower retention of material and decreased motivation to continue learning.

5. Limited customization: Traditional classroom-based learning often follows a one-size-fits-all approach, with all learners progressing through the material simultaneously. This can limit the ability of learners to customize their learning experience to their individual needs and interests.

## 1.3   Aims and objectives

**Aims:** This project aims to provide web pages to teach computer science concepts to students. These web pages will allow students to understand these topics or concepts in a fun and interactive way, rather than the traditional classroom style. This will enable students to learn computer science concepts such as Matrices, virtual reality, and graph data structure faster by engaging with the content rather than reading the ideas from the textbooks or articles. This will also enable students to test their knowledge through online quizzes. There will be one quiz on every topic web page to test your knowledge. There also will be a login system in place for security reasons. Students can create an account and log into the website using their credentials. Apart from security, another essential reason is that I will be hosting this website on my homemade server, which will not be as powerful as the cloud-based services, which have more bandwidth than my homemade server. That's the reason I want to limit the users of my website.

**Objectives:** The objective of e-learning web pages (website) is to provide users with web pages which are interactive and engaging for the students to learn a specific topic in computer science. This project will use HTML5, CSS3 and javascript for the front end and PHP, SQL, and MySql for the back end will be used to create web pages.

To get user feedback will use a feedback form to collect feedback from the users. It will have its page for getting feedback.

## 1.4   Solution approach

Briefly describe the solution approach and the methodology applied in solving the set aims and objectives.

Depending on the project, you may like to alter the "heading" of this section. Check with you supervisor. Also, check what subsection or any other section that can be added in or removed from this template.

### 1.4.1   A subsection 1

You may or may not need subsections here. Depending on your project's needs, add two or more subsection(s). A section takes at least two subsections.

### 1.4.2   A subsection 2

Depending on your project's needs, add more section(s) and subsection(s).

**A subsection 1 of a subsection**

The command \subsubsection{} creates a paragraph heading in LATEX.

**A subsection 2 of a subsection**

Write your text here...

## 1.5   Summary of contributions and achievements

Describe clearly what you have done/created/achieved and what the major results and their implications are.

## 1.6   Organization of the report

Describe the outline of the rest of the report here. Let the reader know what to expect ahead in the report. Describe how you have organized your report.

**Example: how to refer a chapter, section, subsection**. This report is organised into seven chapters. Chapter 2 details the literature review of this project. In Section 3...

**Note:** Take care of the word like "Chapter," "Section," "Figure" etc. before the LaTeXcommand \ref{}. Otherwise, a sentence will be confusing. For example, In 2 literature review is described. In this sentence, the word "Chapter" is missing. Therefore, a reader would not know whether 2 is for a Chapter or a Section or a Figure.

# Chapter 2

# Literature Review

## 2.1  Introduction:

The field of education has experienced a significant shift towards e-learning in recent years, with technology enabling students to access educational materials and resources online. E-learning has proven to be an effective approach to delivering educational content and has been widely adopted across various institutions. In this literature review, we will discuss the state-of-the-art in e-learning and examine the existing literature and products/systems related to our project.

## 2.2  State-of-the-Art:

E-learning has become increasingly popular over the years, with technological advancements allowing for greater accessibility and flexibility. According to a report by Ambient Insight, the global e-learning market is expected to reach $325 billion by 2025 (Kaurav, Rahul, Sneha Rajput, and Ruturaj Baber, 2019). The report also indicates that the demand for online courses has increased due to the COVID-19 pandemic. This shift towards e-learning has created new opportunities for educators to provide engaging and interactive content to students.

## 2.3  Existing Literature and Systems:

There are several e-learning platforms and systems available today that offer a range of educational content. One such platform is Coursera, which provides online courses from top universities and organizations. Another platform is Udemy, which offers a variety of courses created by industry professionals. These platforms have proven effective in delivering educational content to students and have gained a significant following. Regarding e-learning systems for computer science, there are several popular platforms, such as Codecademy, FutureLearn, and Khan Academy. These platforms offer a range of courses in programming, web development, data science, and other related topics. The use of virtual reality in e-learning has also gained attention in recent years, with platforms like Google Expeditions providing immersive educational experiences.

## 2.4  Relevance to Intended Application:

This project aims to provide web pages for teaching computer science concepts to students in a fun and interactive way. The existing literature and products/systems in e-learning have

shown the potential for providing engaging educational content, and this project aims to build on these concepts. The focus on virtual reality and gamification in e-learning seeks to provide students with a unique and memorable learning experience.

## 2.5    Critique of Existing Work:

While there are several effective e-learning platforms and systems available, there are also challenges that need to be addressed. One challenge is more interaction between students and teachers in online courses. Another challenge is the quality of educational content, which can vary significantly across platforms. This project aims to address these challenges by providing interactive and engaging content and incorporating a quiz system for testing students' knowledge.

## 2.6    Summary:

In conclusion, e-learning has become a popular approach to delivering educational content, and there are several effective platforms and systems available today. Our project aims to build on these concepts by providing unique and engaging content for teaching computer science concepts. By incorporating virtual reality and gamification, we aim to provide students with a memorable and effective learning experience.

# Chapter 3

# Methodology

## 3.1 My project report text structure

Table 3.1: Example of a software engineering-type report structure

| | | |
|---|---|---|
| Chapter 1 | Introduction | |
| Chapter 2 | Literature Review | |
| Chapter 3 | Methodology | |
| | | Requirements specifications |
| | | Analysis |
| | | Design |
| | | Implementations |
| Chapter 4 | Testing and Validation | |
| Chapter 5 | Results and Discussion | |
| Chapter 6 | Conclusions and Future Work | |
| Chapter 7 | Reflection | |

### 3.1.1 Requirements specification

1. Functional Requirements

   - The website should have separate webpages for different topics such as virtual reality, matrix multiplication, and graph tree data structure.

   - Each webpage should contain interactive content such as text, images, interactive features, and animations to help students understand the concepts.

   - Each webpage should have an online quiz at the end to test the students' understanding of the topic.

   - website should have a login system for students to create accounts and track their progress.

   - The website should have an administrator account to manage user accounts and content.

   - The website should have a feedback system for users to provide comments and suggestions for improvement.

2. Non-functional Requirements

- The website should be responsive and work seamlessly on different devices such as desktops, laptops, tablets, and smartphones.

- The website should be optimized for fast loading speeds to ensure a smooth user experience.

- The website should be secure and protect user data through encryption and other security measures.

- The website should be easily maintainable and scalable for future updates and additions to the content.

- The website should adhere to web accessibility standards to ensure that users with disabilities can access the content.

3. Technical Requirements

- The website should be built using HTML, CSS, and JavaScript.  The website should use a backend programming language such as PHP or Python for server-side scripting.

- The website should use a database management system such as MySQL or MongoDB to store user data and content.

- The website should use a web server such as Apache or Nginx to serve the web pages.

- The website should use version control software such as Git for code management and collaboration.

### 3.1.2   Analysis

The e-learning website aims to provide an interactive and engaging platform for students to learn computer science concepts such as Matrices, Virtual Reality, and Graph Data Structure. The website will allow students to access content, take online quizzes, and test their knowledge in a fun and interactive way.  To achieve these goals, the project will need to fulfil the following requirements:

1. User Authentication: The website should have a secure user authentication system that allows students to create an account, log in, and access content specific to their account. This feature will ensure that only registered students can access the learning materials and online quizzes.

2. Quizzes:  The website should have an online quiz system that allows students to test their knowledge of the different computer science concepts. Each topic webpage should have a quiz related to that topic, and students should be able to view their scores and track their progress.

3. Virtual Reality:  The virtual reality page should have a simulation system that allows students to experience computer science concepts in a virtual environment.  The system should be interactive and provide students with a realistic experience that enhances their learning, Such as using WebXR.

4. Matrix Multiplication:  The Matrix Multiplication page should provide an interactive way for students to learn the concept of matrix multiplication, addition, inverse matrix, subtraction etc.; this can be done creating a matrix calculator.

5. Graph Tree Data Structure: The Graph Tree Data Structure page should provide an interactive way for students to learn about graph data structure. The page should have a simulation system that allows students to create, modify and traverse a graph data structure.

6. Compatibility: The website should be compatible with different browsers and devices to ensure students can access the content from any device or location.

By fulfilling these requirements, the e-learning website will provide an engaging and interactive platform for students to learn computer science concepts in a fun and interactive way.
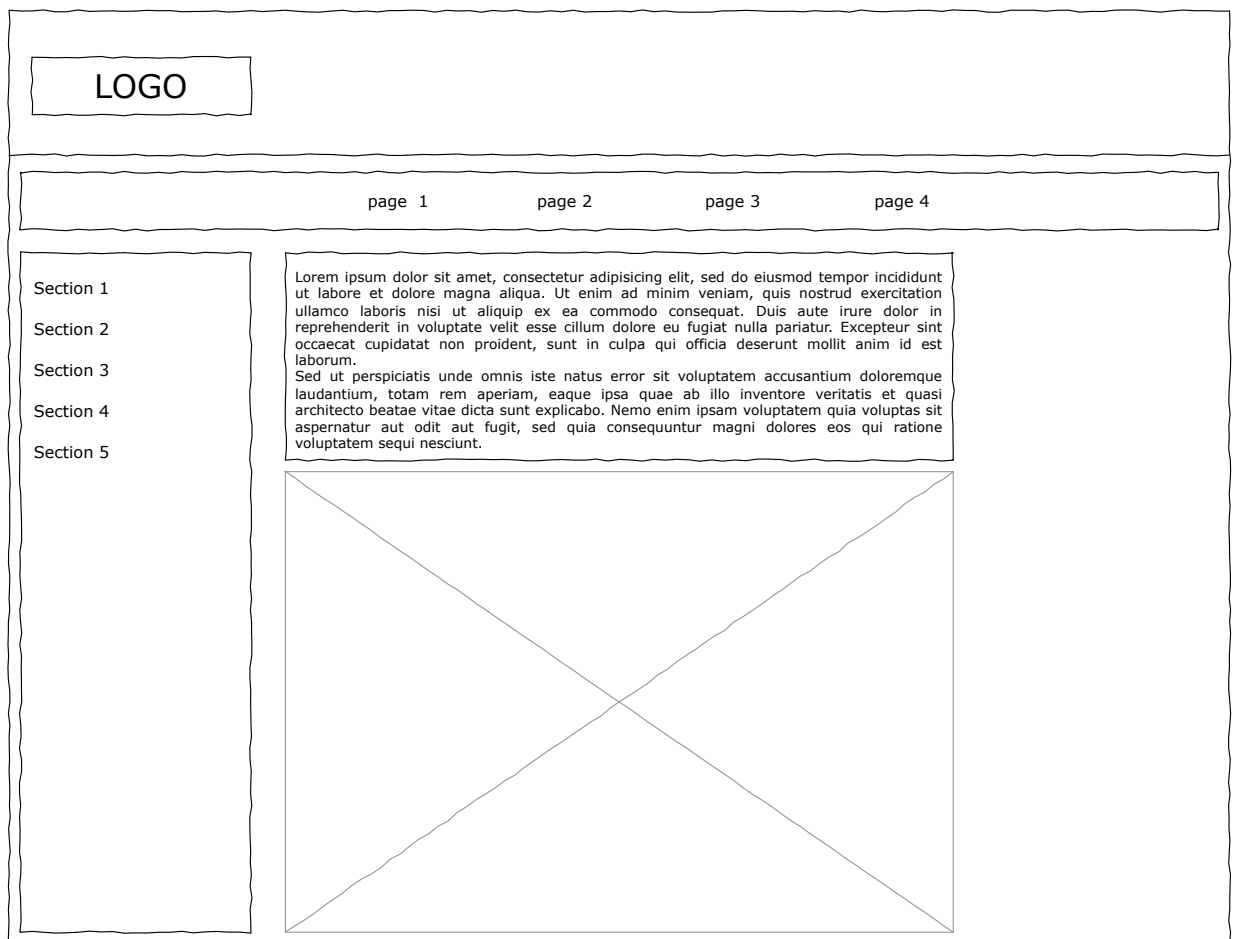
### 3.1.3 Design



Figure 3.1: Example figure in LaTeX.

### 3.1.4 Implementation

# Chapter 4

# Results

The results chapter tells a reader about your findings based on the methodology you have used to solve the investigated problem. For example:

- If your project aims to develop a software/web application, the results may be the developed software/system/performance of the system, etc., obtained using a relevant methodological approach in software engineering.

- If your project aims to implement an algorithm for its analysis, the results may be the performance of the algorithm obtained using a relevant experiment design.

- If your project aims to solve some problems/research questions over a collected dataset, the results may be the findings obtained using the applied tools/algorithms/etc.

Arrange your results and findings in a logical sequence.

## 4.1   A section

...

## 4.2   Example of a Table in LaTeX

Table 4.1 is an example of a table created using the package LaTeX "booktabs." do check the link: wikibooks.org/wiki/LaTeX/Tables for more details. A table should be clean and readable. Unnecessary horizontal lines and vertical lines in tables make them unreadable and messy. The example in Table 4.1 uses a minimum number of liens (only necessary ones). Make sure that the top rule and bottom rule (top and bottom horizontal lines) of a table are present.

Table 4.1: Example of a table in LaTeX

| Bike | | |
|---|---|---|
| Type | Color | Price (£) |
| Electric | black | 700 |
| Hybrid | blue | 500 |
| Road | blue | 300 |
| Mountain | red | 300 |
| Folding | black | 500 |

## 4.3   Example of captions style

- The **caption of a Figure (artwork) goes below** the artwork (Figure/Graphics/illustration). See example artwork in Figure 3.1.

- The **caption of a Table goes above** the table. See the example in Table 4.1.

- The **caption of an Algorithm goes above** the algorithm. See the example in Algorithm **??**.

- The **caption of a Listing goes below** the Listing (Code snippet). See example listing in Listing **??**.

## 4.4   Summary

Write a summary of this chapter.

# Chapter 5

# Discussion and Analysis

Depending on the type of project you are doing, this chapter can be merged with "Results" Chapter as " Results and Discussion" as suggested by your supervisor.

In the case of software development and the standalone applications, describe the significance of the obtained results/performance of the system.

## 5.1 A section

Discussion and analysis chapter evaluates and analyses the results. It interprets the obtained results.

## 5.2 Significance of the findings

In this chapter, you should also try to discuss the significance of the results and key findings, in order to enhance the reader's understanding of the investigated problem

## 5.3 Limitations

Discuss the key limitations and potential implications or improvements of the findings.

## 5.4 Summary

Write a summary of this chapter.

# Chapter 6

# Conclusions and Future Work

## 6.1 Conclusions

Typically a conclusions chapter first summarizes the investigated problem and its aims and objectives. It summaries the critical/significant/major findings/results about the aims and objectives that have been obtained by applying the key methods/implementations/experiment set-ups. A conclusions chapter draws a picture/outline of your project's central and the most signification contributions and achievements.

A good conclusions summary could be approximately 300–500 words long, but this is just a recommendation.

A conclusions chapter followed by an abstract is the last things you write in your project report.

## 6.2 Future work

This section should refer to Chapter 4 where the author has reflected their criticality about their own solution. The future work is then sensibly proposed in this section.

**Guidance on writing future work:** While working on a project, you gain experience and learn the potential of your project and its future works. Discuss the future work of the project in technical terms. This has to be based on what has not been yet achieved in comparison to what you had initially planned and what you have learned from the project. Describe to a reader what future work(s) can be started from the things you have completed. This includes identifying what has not been achieved and what could be achieved.

A good future work summary could be approximately 300–500 words long, but this is just a recommendation.

# Chapter 7

# Reflection

Write a short paragraph on the substantial learning experience. This can include your decision-making approach in problem-solving.

**Some hints:** You obviously learned how to use different programming languages, write reports in LATEXand use other technical tools. In this section, we are more interested in what you thought about the experience. Take some time to think and reflect on your individual project as an experience, rather than just a list of technical skills and knowledge. You may describe things you have learned from the research approach and strategy, the process of identifying and solving a problem, the process research inquiry, and the understanding of the impact of the project on your learning experience and future work.

Also think in terms of:

- what knowledge and skills you have developed

- what challenges you faced, but was not able to overcome

- what you could do this project differently if the same or similar problem would come

- rationalize the divisions from your initial planed aims and objectives.

A good reflective summary could be approximately 300–500 words long, but this is just a recommendation.

# Note: The next chapter is "**References**," which will be automatically generated if you are using BibTeX referencing method. This template uses BibTeX referencing. Also, note that there is difference between "References" and "Bibliography." The list of "References" strictly only contain the list of articles, paper, and content you have cited (i.e., refereed) in the report. Whereas Bibliography is a list that contains the list of articles, paper, and content you have cited in the report plus the list of articles, paper, and content you have read in order to gain knowledge from. We recommend to use only the list of "References."

# References

Kaurav, Rahul, Sneha Rajput, and Ruturaj Baber (2019), 'Factors affecting the acceptance of e-learning by students: A study of e-learning programs in gwalior, india.'. (accessed January 04, 2023).
**URL:** *https://www.proquest.com/scholarly-journals/factors-affecting-acceptance-e-learning-students/docview/2251594754/se-2*

# Appendix A

# An Appendix Chapter (Optional)

Some lengthy tables, codes, raw data, length proofs, etc. which are **very important but not essential part** of the project report goes into an Appendix. An appendix is something a reader would consult if he/she needs extra information and a more comprehensive understating of the report. Also, note that you should use one appendix for one idea.

An appendix is optional. If you feel you do not need to include an appendix in your report, avoid including it. Sometime including irrelevant and unnecessary materials in the Appendices may unreasonably increase the total number of pages in your report and distract the reader.

# Appendix B

# An Appendix Chapter (Optional)

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