Project Work Book

Fourth Year Computer Engineering

Year 2024-25

Group/Project Id: 4026-14

Team Members:
1. Ankit Pawar
2. Aniket Sinhasane
3. Hrishikesh Rapte
4. Swapnil Parande

Project Title: AI Assisted Waste Verification using Gemini AI , TypeScript , Next.JS , TailwindCSS.

Project Guide: Prof. S.V.Shinde

Area/ Domain of the Project:

Artificial Intelligence & Web Development

DEPARTMENT OF COMPUTER ENGINEERING

PUNE DISTRICT EDUCATION ASSOCIATION

COLLEGE OF ENGINEERING,

MANJARI, PUNE-41230

Prologue

Project work is one of the most important components of the curriculum for the Engineering Graduates. From conceiving the idea to the materialization of it is a journey that has to be systematized, well defined and well documented to enjoy the full benefits of the efforts undertaken.

Every activity of the project development has its own importance and typical activities are like: Team formation, conceiving the idea, preparing the hypothesis, reporting the progress / development to the guide/ mentor, Interactions, suggestions and improvements, relevant documentations in proper format, schedule plans and visit logs.

Every institute is following their own best methods and techniques as per the guidelines and curriculum at the affiliated university. To bring the uniformity and standardization for the project work there is a need to come together and prepare the comprehensive guidelines regarding it.

This work book for the project work will serve the purpose and facilitate the job of students, guide and project coordinator. This document will reflect accountability, punctuality, technical writing ability and work flow of the work undertaken.

This document will definitely support the work undertaken.

General Instructions

1. Students should enter the correct information in the work book.
2. Get all entries verified by respective project guide. No changes are to be made without project guide permission.
3. Students should report to their respective guides as per the schedule and its log is to be maintained in the work book.
4. Follow all deadlines and submit all documents strictly as per prescribed formats.
5. The work book should be produced at the time of all discussions, presentations and examinations.
6. The work book must be submitted to project coordinator/ guide/ department / College after successful examination at the end of year.
7. Submit hard as well as soft copy. Maintain one copy with each member.

his booklet is supportive document to rules and a regulation provided by affiliated university curriculum providing recommendations, guidelines and is record of all related activities associated with project. This booklet is provided with the genuine intent to bring uniformity and to systematize the project work and to keep the audit of the work undergone by team members.

<u>Work Book Development Project</u>

Project Institution	PDEA's COEM,Manjari(BK),Pune
Support & Guidance	<u>Prof. S.V.Shinde</u>
Concept & Design	AI Assisted Waste Verification using Gemini AI , TypeScript , Next.JS , TailwindCSS..
Project Co-ordinator	Prof. S.P.Gade
Technical Committee Members	
Date	
Version No.	
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Savitribai Phule Pune University, Pune
Computer Engineering
Program Educational Objective

1. To prepare globally competent graduates having strong fundamentals, domain knowledge, updated with modern technology to provide the effective solutions for engineering problems.

2. To prepare the graduates to work as a committed professional with strong professional ethics and values, sense of responsibilities, understanding of legal, safety, health, societal, cultural and environmental issues.

3. To prepare committed and motivated graduates with research attitude, lifelong learning, investigative approach, and multidisciplinary thinking.

4. To prepare the graduates with strong managerial and communication skills to work effectively as individual as well as in teams.

Program Outcomes

Students are expected to know and be able –

1. To apply knowledge of mathematics, science, engineering fundamentals, problem solving skills, algorithmic analysis and mathematical modeling to the solution of complex engineering problems.

2. To analyze the problem by finding its domain and applying domain specific skills

3. To understand the design issues of the product/software and develop effective solutions with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.

4. To find solutions of complex problems by conducting investigations applying suitable techniques.

5. To adapt the usage of modern tools and recent software.

6. To contribute towards the society by understanding the impact of Engineering on global aspect.

7. To understand environment issues and design a sustainable system.

8. To understand and follow professional ethics.

9. To function effectively as an individual and as member or leader in diverse teams and interdisciplinary settings.

10. To demonstrate effective communication at various levels.

11. To apply the knowledge of Computer Engineering for development of projects, and its finance and management.

12. To keep in touch with current technologies and inculcate the practice of lifelong learning.

Table of Contents

Sr.No	Description	PageNo.
	Prologue	1
	General Instructions	2
	Work Book Development Project	3
	Computer Engineering PEO's and PO's	4
1.	About Project work (Objectives and Outcomes, Guidelines for Selection of Project Work and Evaluation)	6
2.	University Syllabus	7
3.	Circular Regarding Malpractices in Project Work from DTE	8
4.	Undertaking by Students	11
5.	Instruction Regarding Project Proposal and Finalization	12
6.	Schedule of Project Work	13
7.	Copy of Project Proposal / Synopsis	
8.	Review for Semester I	
	a. Problem Statement, Motivation, Objectives and Literature Review	
	b. Feasibility and Scope	
	c. Requirements Analysis	
	d. Design	
9.	Internal Evaluation Sheet for Semester I	
10.	Bibliography and Annexure	

1. **About Project Work**

The **Waste Recognition Web App** is an intelligent, user-friendly web application designed to help users identify and classify waste types using image recognition technology. Leveraging the power of **Gemini AI** for machine learning and modern web development tools like **Next.js**, **TypeScript**, and **Tailwind CSS**, this app provides a quick and efficient way to determine how different types of waste should be categorized for recycling or disposal.

The primary goal of the project is to promote environmental sustainability by simplifying waste management. By allowing users to upload photos of waste items, the app processes the image through a machine learning model to provide an accurate classification, helping users dispose of or recycle the waste appropriately

a. **Objectives and Outcomes:**

Objectives -

- **Simplify Waste Classification**: Automate the process of recognizing different waste types using image recognition technology to provide instant feedback on waste disposal or recycling options.
- **Promote Environmental Sustainability**: Encourage eco-friendly waste management practices by educating users about the proper disposal of waste, reducing the risk of recyclable items ending up in landfills.
- **Provide a User-Friendly Interface**: Ensure that the app is accessible to all types of users, with a responsive, mobile-friendly design built using Tailwind CSS and an intuitive interface powered by Next.js.
- **Enhance AI Integration in Web Development**: Demonstrate the effectiveness of integrating machine learning models (Gemini AI) into web applications to solve real-world problems.
- **Create a Scalable, Modern Application**: Use modern web development technologies (Next.js, TypeScript) to build a highly scalable, performant, and maintainable application.

Outcomes –
- **Accurate Waste Recognition**: Users can upload images to receive instant waste classification (e.g., recyclable, compostable, landfill).
- **Improved Environmental Awareness**: Educates users on proper waste disposal, promoting sustainable practices.
- **User-Friendly Interface**: Provides a responsive, mobile-friendly design using Tailwind CSS for seamless interaction.
- **Real-Time AI-Powered Feedback**: Integrates Gemini AI for real-time image recognition and classification.
- **Scalability and Expandability**: Built with Next.js and TypeScript, the app is scalable for future enhancements like new waste categories and user profiles.

Guidelines for Selection of Project Work:

Project is one of the significant contributory team works that has to be completed with distinct impression. It is really very difficult to explore the domain of interest / research/ thirst area/ society need. In Toto one cannot figuratively define best project but still there are certain parameters on which we can gauge the quality of project work done. It will be better suited to go for well-defined and relatively safe projects that provide scope for demonstrating proficiency with a low risk of failure especially at Under Graduate level.

General guidelines:

Identifying domain, feasibility and usability of work.

> ➢ Project work is expected to involve a combination of sound background research (thorough study/ follow a line of investigation), and methodical implementation.

> ➢ Instead of fancied and driven behind the gaudy and ostentatious ideas, the utility has to be emphasized. It is also acceptable to identify the discrepancies/ flaws in the existing system and work accordingly to rectify or improve.

> ➢ It is irrational to select the IDE and the software/ tools before the idea is not yet finalized.

Understanding the way project will be materialized and progressed.

b. Guidelines for Project Evaluation:

Project work is to be evaluated by both Internal and External examiners jointly, unanimously agreeing the following parameters among many others.

1. Problem definition and scope of the project
2. Through Literature Survey
3. Appropriate Software Engineering approach
4. Exhaustive and Rational Requirement Analysis
5. Comprehensive Implementation- Design, platform, coding, documentation
6. Optimization considerations (Memory, time, Resources, Costing)
7. Thorough Testing of all modules and integration of modules
8. Project Presentation and Demonstration (User Interface, ease of use, usability)
9. Presentation of work in the form of Project Report(s)
10. Understanding individual capacity, Role & involvement in the project
11. Team Work (Distribution of work, intra-team communication and togetherness)
12. Participation in various contests, Publications and IPR
13. Documents /Manuals (Project Report, Quick reference, System, Installation guide)
14. Outcomes / Usability / commercial value /product conversion of Work

Savitribai Phule Pune University
Semester I

Teaching Scheme Examination Scheme
Tutorial: 2 Hrs/Week   Term Work Assessment: 50

Course Objectives:
| | To Apply the knowledge for solving realistic problem
| | To develop problem solving ability
| | To Organize, sustain and report on a substantial piece of team work over a period of several months
| | To Evaluate alternative approaches, and justify the use of selected tools and methods
| | To Reflect upon the experience gained and lessons learned
| | To Consider relevant social, ethical and legal issues
| | To find information for yourself from appropriate sources such as manuals, books, research journals
and from other sources, and in turn increase analytical skills.
☐ To Work in Team and learn professionalism

Course Outcomes:
On completion of the course, student will be able to–
| | Solve real life problems by applying knowledge.
| | Analyze alternative approaches, apply and use most appropriate one for feasible solution.
| | Write precise reports and technical documents in a nutshell.
| | Participate effectively in multi-disciplinary and heterogeneous teams exhibiting team work
☐ Inter-personal relationships, conflict management and leadership quality.

P.D.E.A'S COLLEGE OF ENGINEERING MANJARI(BK') PUNE

UNDERTAKING BY STUDENT

We, the students of B.E. Computer hereby assure that we will follow all the rules and regulations related to project activity for the academic year 2024-25.

The Project entitled- **AI Assisted Waste Verification using Gemini AI , TypeScript , Next.JS , TailwindCSS**

will be fully designed/ developed by us and every part of the project will be original work and will notbe copied/ purchased from any source.

Name of Students.   **Signatures.**

1. Ankit Pawar

2. Aniket Sinhasane

3. Swapnil Parande

4. Hrishikesh Rapte

5. <u>**Instructions Regarding Project Proposal and Finalization**</u>

1. The project work may involve the designing a system/subsystem or upgrading / improving an existing system. The design is to be implemented into a working model (software or hardware or both) with necessary software interface as an executable package (installable package or hardware model) along with User & system manual and quick reference guide. A project report including all necessary documents.

2. Group may come up with sponsored project. Sponsorship may not be in terms of money or resources. It might be in terms of just suggesting problem definition and associated guidance. Students may collect the letter required for applying the Institute/Industries for the project sponsorship from project coordinator

3. List of suggested projects, prominent domains and respective expert, whom you may contact for guidance, with Project Coordinator. Students may contact respective staff along with synopsis for the guidance. Students may contact respective staff for projects suggested by them in the respective areas.

4. Meet Project Coordinator for project title registration.

5. Synopsis must include project title, group members, sponsor details (if any), detailed problem definition, area, abstract, details of existing similar systems if any, scope of the project and software-hardware requirements. Sponsorship details include name of sponsoring authority, address, name of guide, sponsorship terms & conditions and respective documents certifying the same from authorities.

6. A Panel of experts will approve the project group and title only after presentation as per schedule. Presentation will cover details mentioned in the synopsis as above.

6. <u>Schedule of Project Work</u>

Semester I

Sr. No.	Activity Scheduled	Date
1.	Registration of Project groups	
2.	Submission of Project Synopsis	
3.	Project presentations	
4.	Finalization of projects & allotment of guide	
5.	Submission of final synopsis	
6.	First presentation about progress of project work (Review I)	
7.	Second presentation about progress of project work (Review II)	
8.	Third Presentation (Review III)	
9.	Fourth presentation about progress of project work (Review III)	
10.	Submission of partial project report	
11.	Project work Examination	As per SPPU Notification

7. <u>Copy of Proposal / Synopsis as per format (Annexure I)</u>

Project Domain: Artificial Intelligence & Web Dvelopment

Project Title: AI Assisted Waste Verification using Gemini AI , TypeScript , Next.JS , TailwindCSS

Abstract of Project: The Waste Recognition Web App is an innovative web-based application designed to streamline waste classification using image recognition technology powered by Gemini AI. Built with Next.js**,** TypeScript, and styled using Tailwind CSS, the app enables users to easily upload images of waste items and receive instant feedback on how to properly dispose of or recycle them. By providing real-time, AI-driven waste classification, the app aims to enhance environmental awareness and promote sustainable waste management practices.

This application not only simplifies the process of identifying various waste types but also encourages users to adopt eco-friendly habits by educating them about proper disposal methods. Its responsive design ensures a seamless user experience across all devices, while the scalable architecture allows for future expansions, including additional waste categories, localization features, and user analytics.

Keywords: GeminiAI , TypeScript , TailwindCSS , NeXt.JS , Image Recognition , API , Image Processing

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4	B-61	Hrishikesh Rapte	9130927731	hrishi.rapte@gmail.com

PROJECT GUIDE
Prof. S.V.Shinde

8. <u>Project Review (Semester I)</u>

The group members are expected to present their work undertaken during the semester. Journey of development has to be rationally presented with thorough literature survey.

8.1 <u>Project Review-I: Problem Statement, Motivation, Objectives and Literature Review</u>

Sr.No	Question	Date	Remark / Grade	Sign of Guide
1	Does the statement gives clear identification about what your project will accomplish?		Yes	
2	Is the statement short and concise?		Yes	
3	Can a person who is not familiar with the project understand scope of the project by reading the project problem statement?		Yes	
4	The project's objectives of study (what product, process, resource etc.) are being addressed?		Yes	
5	Is similar type of methodology / model used for existing work?		Yes	
6	Is the studied literature sufficient to decide scope of the project?		Yes	
7	Are the objectives set will help to achieve goal of the project?		Yes	
8	Does Research gap identified will lead to find motivation of project?		Yes	
9	Does your project contribute to our society by any means and will lead to find motivation?		Yes	
10	Are the objectives clearly and unambiguously listed?		Yes	
Remark and Suggestions:				

Name and Sign of Reviewers:
1.Prof.
2.Prof.

8.2 <u>Project Review-II: Feasibility and Scope</u>

Student is expected to deliver presentation covering Feasibility and Scope

Sr.No	Question	Date	Remark / Grade	Sign of Guide
1	Is the project's view point is understood?		Yes	
2	Is the project goal statement is in alignment with sponsoring organization's business goal and mission?		No	
3	Who is the project's end user?		Utility Companies	
4	What is the projected cost of producing a product?		2000	
5	Is project achievable in specified (Time, Cost Budget)?		Yes	
6	Are the requirements within the scope of the project?		Yes	
7	Is the scope properly defined?		Yes	
8	Does the problem statement clearly define the scope of the project?		Yes	
9	Do the project requirements fit into available software and hardware?		Yes	
10	Whether the milestones are stated completely and project timeline is given?		Yes	
11	Whether risks like technical risks, Operational risk, schedule risk, business risk are identified correctly or not?		Yes	
12	Whether Risk prioritization is done properly or not and any back up plan is there or not?		Yes	
Remark and Suggestions:				

Name and Sign of Reviewers:

1. Prof.S .V.Shinde

8.3 Project Review-III: Requirement Analysis

Student is expected to deliver presentation covering Requirement Analysis

Sr.No	Question	Date	Remark /Grade	Sign of Guide
1	Is Information domain analysis complete, consistent and accurate?		Yes	
2	Is problem statement categorized in identified area and targeted towards specific area there in?		Yes	
3	Is external and internal interfacing properly defined?		Yes	
4	Are Requirement consistent with schedule, resources and budget?		Yes	
5	Are all requirements traceable to system level?		Yes	
6	What is needed to make the product?		To Detect IMAGE	
7	Is there a demand for the produce?		Yes	
8	Is identification of stakeholders is done properly?		Yes	
9	Whether all requirements are captured and documented in line with scope?		Yes	
10	Whether all type of analysis classes are identified or not?		Identified	
11	Whether the Acceptance criteria is decided are not?		Decided	
Remark and Suggestions:				

Name and Sign of Reviewers:

    1. Prof S.V.Shinde

8.4 <u>Project Review-IV: Design</u>
Student is expected to deliver presentation covering Design

Sr.No	Question	Date	Remark /Grade	Sign of Guide
1	Are requirement reflected in the system architecture?		Yes	
2	Does the design support both project (product) and project goals?		Yes	
3	Does the design address all the issues form the requirement?		Yes	
4	Is effective modularity achieved and modules are functionally independent?		Yes	
5	Are structural diagrams (class, Object, etc.) are well defined?		Yes	
6	Are all class associations clearly defined and understood? ?(Is it cleat which classes provide which services)?		Yes	
7	Are the classes in the class diagram clear? (What they represent in the architecture design document?)		Clear	
8	Is inheritance appropriately used?		Yes	
9	Are the multiplicities in the use case diagram depicted in the class diagram?		Yes	
10	Are all objects used in sequence diagram?		Yes	
11	Are the symbols used in all diagrams corresponding to UML standards?		Yes	
12	Are behavioral diagrams (use case, sequence, activity, etc.) well defined and understood?		Yes	
13	Does each case have clearly defined actors and input/ output?		Yes	
14	Does the sequence diagram matches with class diagram?		Yes	
15	Is aggregation/ containment (used) clearly defined and understood?		Yes	
16	Whether State charts are capturing system's dynamic behavior correctly or not?		Correctly	
17	Related to procedural thinking whether DFDs and CFDs along with transaction and transformation flow are done correctly or not?		Correctly	
Remark and Suggestions:				

Name and Sign of Reviewers:

1. Prof S.V.Shinde

8.5 Internal Evaluation Sheets (Semester I)

Sr No.	Name of the students in Projects Group	Problem Statement/ Motivation / Objective / Scope (05)	Literature Survey (05)	Requirement Analysis (10)	Planning & Prototyping (05) Modelling & Designing (05) (10)	Presentation & Q A (10)	Partial Project report (10)	Total (50)
1	Ankit Pawar							
2	Aniket Sinhasane							
3	Hrishikesh Rapte							
4	Swapnil Parande							

Name and Signature of Evaluation Committee:
Prof S.V.Shinde

Examiners Feedback and Suggestions:

Signature of Guide

9. <u>Rubrics</u>

A. <u>Idea Inception</u>

Grade (Grade Point)	Excellent (10-9)	Very Good (6-8)	Fair (3-5)	Poor (1-2)
Parameter				
Problem Definition and Scope of the Project				
Literature Survey				
Software Engineering Approach				
Requirement Analysis				

B. <u>Implementation</u>

Grade (Grade Point)	Excellent (10-9)	Very Good (6-8)	Fair (3-5)	Poor (1-2)
Parameter				
Implementation- Design, platform, coding,				
Optimization considerations(Memor y, time, Resources, Costing)				
Thorough Testing of allModules				
Integration of modulesand project as whole				

C. <u>Documents</u>

Grade (Grade Point)	Excellent (10-9)	Very Good (6-8)	Fair (3-5)	Poor (1-2)
Parameter				
Synopsis				
Project Report				
Quick references				
System manual				
Installation Guide				
Work Book				

D. Demonstration

Grade (Grade Point)	Excellent (10-9)	Very Good (6-8)	Fair (3-5)	Poor (1-2)
Parameter				
Project Presentation and Demonstration(User Interface, ease of use, usability)				
Understanding individual capacity & involvement in theProject				
Team Work(Distribution of work,intra-team communication and togetherness)				
Outcomes / Usability				

E. Contest Participation / Awards, Publications and IPR

Grade (Grade Point)	Excellent (10-9)	Very Good (6-8)	Fair (3-5)	Poor (1-2)
Parameter				
Participation in various Contests				
Appreciation and Awards				
Publications				
Copyright				
Patent				
Commercial value/product conversion of Work				

Annexure : Report Documentation

<table>
<tr><td colspan="5" align="center">**Report Documentation**</td></tr>
<tr><td colspan="3">Report Code: CS-BE-Project 2024-25</td><td colspan="2">**Report No:**</td></tr>
<tr><td colspan="5" align="center">AI Assisted Waste Verificattion using Gemini AI, TypeScript , NextJS & Tailwind CSS</td></tr>
<tr><td colspan="5">**Address (Details):**
PDEA's College Of Engineering, Manjari(bk), Pune</td></tr>
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<tr><td colspan="5">**Year:**2024-25
Branch: Computer Enginnering.</td></tr>
<tr><td colspan="5">**Keywords**: Real-time data, Facial landmarks, Image processing, Eye Aspect Ratio (EAR), Real-Time Video Processing</td></tr>
<tr><td>Type of report:Midsem</td><td>Report Checked by:</td><td>Report Checked date:</td><td>**Guide Complete name:** Prof S.V.Shinde</td><td>Total Copies:5</td></tr>
<tr><td colspan="5">**Absract:** There are many applications available for detecting the electricity theft. However, only few studies compare the machine learning techniques in discovering electricity-stealing behavior. This study, therefore, compares the predictive accuracy of several machine learning methods including Optical character recognition (OCR), Sarimax method for predicting the electricity thefts in a concrete model. Electricity theft is one of the major Non-Technical Losses (NTLs) in the electricity distribution systems that has become a global concern, recently. Although the machine learning techniques are widely used for Electricity Theft Detection (ETD) in literature, some significant challenges need to be address.The consumption data is usually unlabeled, there should be proper method to label the data.The proposed method outperforms its counterparts in terms of accuracy and false detection rate.</td></tr>
</table>