FOUR WEEK TRAINING REPORT

at

ICE Technology Lab,Patna,Bihar

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE OF

BACHELOR OF TECHNOLOGY

in Computer Science and Engineering

JUNE–JULY 2025

SUBMITTED BY:

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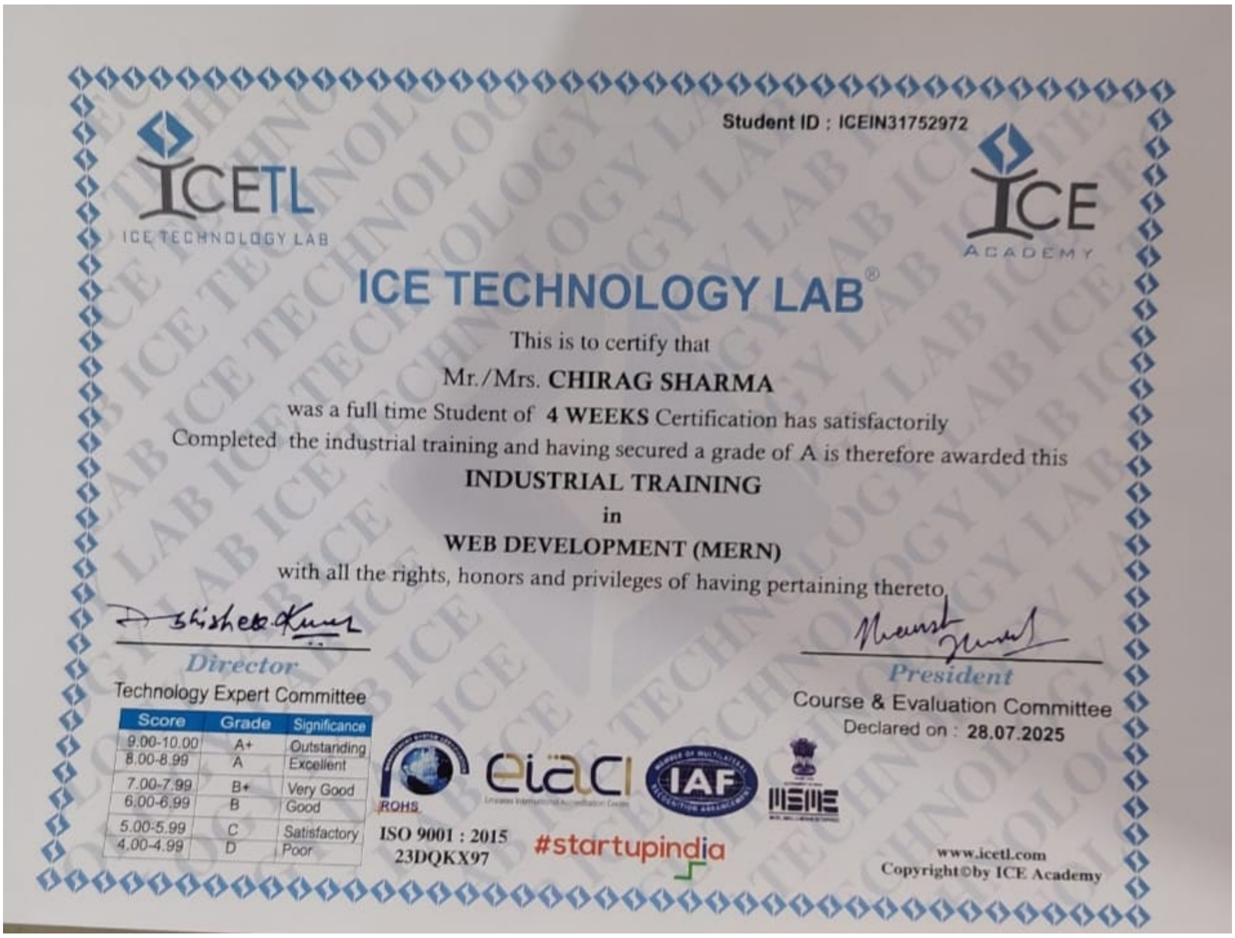

Student ID : ICEIN31752972

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This is to certify that

Mr./Mrs. **CHIRAG SHARMA**

was a full time Student of **4 WEEKS** Certification has satisfactorily Completed the industrial training and having secured a grade of A is therefore awarded this

INDUSTRIAL TRAINING

in

WEB DEVELOPMENT (MERN)

with all the rights, honors and privileges of having pertaining thereto

Director
Technology Expert Committee

President
Course & Evaluation Committee
Declared on : **28.07.2025**

Score	Grade	Significance
9.00-10.00	A+	Outstanding
8.00-8.99	A	Excellent
7.00-7.99	B+	Very Good
6.00-6.99	B	Good
5.00-5.99	C	Satisfactory
4.00-4.99	D	Poor

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CANDIDATE'S DECLARATION

I, **Chirag Sharma**, hereby declare that I have undertaken four-week Web Development training from **ICE Technology Lab,Patna,Bihar** during the period from 26 June 2025 to 26 July 2025 in partial fulfillment of the requirements for the award of the degree of **B.Tech. (Computer Science and Engineering)** at **Guru Nanak Dev Engineering College, Ludhiana**. The work presented in this training report is an authentic record of my training.

(Chirag Sharma)
Roll No.: 2302503

The four week industrial training Viva–Voce Examination of ____________________ has been held on _______________ and accepted.

Signature of External Examiner **Signature of Internal Examiner**

ABSTRACT

This report summarizes the four-week industrial training in Web Development undertaken at **ICE Technology Lab, Patna, Bihar**. The training primarily focused on mastering the **MERN stack—MongoDB**, **Express.js**, **React.js**, and **Node.js**—encompassing both front-end and back-end development for creating modern web applications.

As a beginner to full-stack development, this training provided me with a comprehensive foundation in building structured, interactive, and scalable web applications. The sessions covered in-depth concepts including API design, database modeling, routing, and responsive user interfaces, enabling a thorough understanding of how various components of a MERN-based application interact seamlessly.

Towards the end of the training, I developed a capstone project—**Dream2Design**—a full-stack platform designed to help users transform creative ideas into monetizable designs. This project allowed me to apply the core concepts and technologies acquired during the training. Although challenging, it served as a practical exercise that consolidated my learning outcomes, bringing together all aspects of MERN development, including authentication, asset management, and deployment. Overall, the training proved to be an invaluable starting point for my journey into full-stack web development, equipping me with both the confidence and skills needed to engineer robust, real-world applications.

ACKNOWLEDGEMENT

I express my deepest sense of gratitude to **Dr. Sehijpal Singh**, Principal, Guru Nanak Dev Engineering College, Ludhiana, for providing the necessary facilities and environment for carrying out the training successfully. I am equally thankful to **Dr. Kiran Jyoti**, Head, Department of Computer Science and Engineering, for her valuable support, motivation, and guidance during the course of the training.

I am sincerely thankful to **Mr. Jaswant Singh** and **Ms. Kuljit Kaur**, Training Coordinators, Department of Computer Science and Engineering, for their constant guidance, encouragement, and for providing valuable instructions regarding the preparation of this report and the training documentation.

I would also like to express my heartfelt thanks to the management and staff of **ICE Technology Lab,Patna.** for providing me the opportunity to undergo industrial training. I extend my sincere appreciation to **Ms. Payal Karn** for her continuous guidance, insightful lectures, and support throughout the training period. I am also thankful to **Mr. Rajeev**, Director of Technology, ICE Technology Lab,Patna, for facilitating the overall training program, and to **Ms. Harpreet Kaur**, Senior Manager (Human Resources), ICE, for her assistance in administrative and certification matters.

Lastly, I extend my gratitude to all my faculty members, friends, and family who directly or indirectly helped me during this training and in preparing this report.

(Chirag Sharma)

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CHAPTER 1

INTRODUCTION

1.1 Background

The MERN stack is a leading full-stack development framework comprised of four core technologies: MongoDB, Express.js, React.js, and Node.js. These technologies work together to enable developers to create modern, robust, and scalable web applications entirely using JavaScript.

MongoDB, a NoSQL database, stores data in flexible, JSON-like documents, making it ideal for handling large amounts of dynamic information. Its native use of BSON (Binary JSON) allows for seamless integration with the rest of the stack, eliminating the need for complex transformations between the database and application logic.

Express.js functions as the back-end web application framework running atop Node.js. It simplifies the process of handling HTTP requests, routing, and middleware integration, thus streamlining the development of RESTful APIs and server-side functionality.

React.js is a powerful JavaScript library dedicated to building user interfaces on the client side. By leveraging its component-based architecture and virtual DOM, React makes it easy to design interactive, efficient, and reusable UI elements that respond dynamically to user input.

Node.js serves as the runtime environment for executing server-side JavaScript code. It empowers developers to build back-end services with high concurrency and performance, using a single language throughout the application stack.

One of the key benefits of the MERN stack is the use of JavaScript as the sole programming language across all tiers of the application, which significantly reduces complexity and accelerates development. The stack's open-source nature ensures a vibrant community, continuous innovation, and widespread adoption in enterprise and startup environments alike.

MERN applications typically follow a three-tier architectural pattern: the front-end display layer powered by React.js, the application layer built with Express.js and Node.js, and the database layer managed by MongoDB. This separation of concerns allows for scalable application design, maintainable codebases, and flexible deployment options on various cloud platforms.

The MERN stack excels in developing interactive web applications that must efficiently handle substantial traffic volumes and grow rapidly over time. Its architecture supports fast prototyping, advanced data management, and seamless syncing between user interfaces and data sources. As a result, MERN remains a top choice for developers aspiring to build modern, full-featured web applications.

1.2 Objective of the training

The main objective of the MERN Stack training was to gain practical knowledge of full-stack web development using modern technologies — MongoDB, Express.js, React.js, and Node.js. The training aimed to bridge the gap between theoretical learning and real-world application by developing hands-on experience in building dynamic and responsive web applications.

The key objectives of the training were as follows:

- To understand the fundamentals of full-stack development and how the front-end and back-end communicate.
- To learn the core concepts of MongoDB, Express.js, React.js, and Node.js for building modern web applications.
- To design and develop dynamic, responsive, and user-friendly web interfaces using React.js and CSS.
- To create and manage RESTful APIs using Express.js and Node.js for seamless communication between client and server.
- To handle and manipulate data efficiently using MongoDB as a NoSQL database.
- To gain practical experience in integrating all MERN components into a single functional project.

- To use Git and GitHub for version control and collaborative project development.
- To build and deploy a full-stack web application as a final project, demonstrating the complete MERN development workflow.

The training was conducted in a structured, progressive manner—beginning with the basics of markup and styling and culminating in interactive page design and scripting. This approach helped bridge the gap between conceptual understanding and practical application.

1.3 Overview of Web Development Training

The MERN Stack training provided a comprehensive learning experience focused on developing full-stack web applications using modern technologies — MongoDB, Express.js, React.js, and Node.js. The training emphasized both theoretical understanding and practical implementation, helping participants build real-world applications from scratch.

Throughout the training, participants learned how to structure web projects, design interactive front-end interfaces using React.js, and develop efficient back-end servers with Express.js and Node.js. They also gained hands-on experience in connecting these applications to MongoDB databases for effective data management.

In addition to core technical learning, the training included sessions on version control with Git and GitHub, API integration, and deployment techniques, ensuring a complete understanding of the web development lifecycle. By the end of the program, participants were capable of building and deploying fully functional, database-driven web applications independently

Throughout the training, emphasis was placed on clean, semantic coding practices and the use of external style sheets for maintainability. Responsive design techniques, accessibility considerations, and code validation were also highlighted.

In the final phase of training, the concepts were integrated through the creation of a **Dream2Design** project. This project demonstrated the application of HTML structure, CSS styling, and JavaScript functionality to create a practical and interactive web-based tool.

1.4 Importance of MERN Development in the Modern Era

Importance of MERN Development in the Modern Era

In today's digital age, web applications play a vital role in almost every sector — from education and business to healthcare and entertainment. The MERN Stack (MongoDB, Express.js, React.js, Node.js) has emerged as one of the most powerful and popular technologies for developing modern web applications due to its efficiency, scalability, and flexibility.

MERN development enables developers to use JavaScript across both the front-end and back-end, creating a unified and faster development process. It supports real-time data handling, cross-platform compatibility, and seamless API integration, which are essential for building high-performance applications.

Moreover, the open-source nature of the MERN stack makes it cost-effective and community-driven, providing continuous updates, libraries, and tools that simplify complex development tasks. As businesses and industries increasingly move toward digital transformation, professionals skilled in MERN stack development are in high demand.

Thus, MERN development holds great importance in the modern era as it empowers developers to build responsive, dynamic, and scalable web solutions that meet current and future technological needs

Through this training, I have gained a beginner-level yet substantial understanding of how web pages are structured, styled, and made interactive. This foundation paves the way for future exploration into advanced frameworks and backend technologies.

1.5 Scope of Training

The MERN Stack training provided wide exposure to the core and advanced areas of modern web development. The scope of this training extends beyond just learning technologies—it enables trainees to design, develop, and deploy full-fledged web applications that solve real-world problems.

The key scopes of the training included:

Frontend Development with React.js:

- Understanding the concept of components, props, and state management in React.

- Creating dynamic and responsive user interfaces using React functional components.
- Implementing routing for multi-page navigation using React Router.
- Using hooks like `useState` and `useEffect` for managing data and side effects.
- Designing visually appealing layouts with modern CSS and responsive design techniques.

Backend Development with Node.js and Express.js:

- Learning server-side programming fundamentals using Node.js.
- Setting up RESTful APIs using Express.js for handling client requests.
- Managing routes, middleware, and API endpoints for smooth server-side operations.
- Implementing data validation, error handling, and secure API communication.
- Understanding the flow of data between client and server applications.

Database Management with MongoDB:

- Learning the fundamentals of NoSQL database design and data modeling.
- Performing CRUD (Create, Read, Update, Delete) operations using MongoDB.
- Integrating MongoDB with Node.js through Mongoose for structured schema management.
- Handling and storing user-generated data efficiently.
- Understanding the relationship between collections and documents in a database.

Version Control and Deployment:

- Using Git and GitHub for version control and collaborative development.
- Managing repositories, commits, branches, and pull requests.
- Deploying full-stack applications using hosting platforms such as Netlify and Render.
- Understanding environment variables and production-level deployment setup.

Final Project: Dream2Design Website

- Designing and developing an AI-powered website named **Dream2Design**.
- Implementing user interaction where users can input their dreams to generate a slideshow story.
- Integrating AI-based emotion analysis and visual scene generation.
- Managing frontend with React.js and backend with Node.js and Express.js.
- Deploying the final website online using modern web hosting services.

Overall, the training provided in-depth knowledge of full-stack web development using the MERN stack, enabling me to design, develop, and deploy complete web applications independently.

CHAPTER 2

TRAINING WORK UNDERTAKEN

The four-week training in Web Development at **ICE Technology,Patna** was aimed at introducing the fundamental concepts and practices of modern web design and development. The training was primarily focused on the core building blocks of front-end technologies—During the MERN Stack training, various activities and practical tasks were performed to gain a strong understanding of both frontend and backend development. The work undertaken covered the complete process of building, managing, and deploying full-stack web applications..

1. Environment Setup and Tool Familiarization

- Installed and configured development tools such as Node.js, npm, Visual Studio Code, and Git.
- Set up MongoDB locally and explored MongoDB Atlas for cloud-based database management.
- Created and managed GitHub repositories for version control and code collaboration.
- Understood the basic folder structure and workflow of a MERN application.

By the end of Week 1, participants could construct and style well-structured multi-page websites using semantic HTML and basic CSS. They demonstrated proficiency in organizing content hierarchically, applying styles, and validating markup, thereby laying a strong foundation for upcoming responsive and interactive web design tasks.

2. Frontend Development using React.js

- Learned the concepts of components, props, and states for building reusable UI elements.

- Implemented routing and navigation using React Router.
- Used hooks like `useState`, `useEffect`, and `useContext` for state and data management.
- Fetched and displayed data from backend APIs using `fetch()` and `axios`.
- Designed responsive layouts and components using CSS, Flexbox, and modern design frameworks.

Through repeated hands-on exercises, learners gained confidence in designing flexible, well-structured interfaces adaptable to both desktop and mobile displays. By the end of this phase, they were proficient in combining creative design elements with responsive layout logic to produce professional-grade webpages.

3. Backend Development using Node.js and Express.js

- Created server-side applications using Express.js.
- Built RESTful APIs for data communication between frontend and backend.
- Implemented routes, middleware, and controllers to organize backend logic.
- Managed server responses, status codes, and error handling.
- Learned about authentication techniques and secure API handling.
- Understood the structure and working of NoSQL databases.
- Performed CRUD (Create, Read, Update, Delete) operations using MongoDB.
- Used Mongoose to define schemas and models for structured data handling.
- Connected MongoDB with the Node.js backend for dynamic data storage and retrieval.
- Implemented data validation and error-handling mechanisms.

By the completion of Week 3, participants were capable of combining HTML, CSS, and JavaScript to produce interactive and visually engaging web pages. They learned to create reusable components, handle user inputs, and manage DOM elements efficiently, marking the beginning of their journey into client-side application logic.

5. Integration and Full-Stack Connectivity

- Connected the React.js frontend with the Express.js and Node.js backend.
- Tested data flow between client-side and server-side through API calls.
- Implemented real-time updates and dynamic content rendering.
- Debugged and resolved integration issues using browser developer tools and console logs.
- Used Git for maintaining code versions and tracking changes.
- Pushed project code to GitHub repositories for backup and collaboration.
- Learned basic Git commands such as `clone`, `commit`, `push`, and `pull`.
- Collaborated on small projects and shared code using branches and pull requests.

By the end of Week 4, participants achieved fluency in implementing advanced JavaScript logic and manipulating the DOM dynamically. They could construct responsive and interactive applications that incorporated class-based modularity, event handling, and aesthetic UI updates—skills that form the backbone of modern front-end web development.

2.1 Tools and Technologies Used

Table 2.1. *Tools and Technologies Used*

Technology / Tool	**Purpose / Usage**
HTML5	Structuring and organizing the content of web pages
CSS3	Designing layouts, styling components, and ensuring responsiveness
JavaScript (ES6)	Adding logic, interactivity, and dynamic behavior to web applications
React.js	Building reusable UI components and managing frontend interactions
Node.js	Executing JavaScript on the server side and handling backend logic
Express.js	Creating RESTful APIs and managing server-side routes efficiently
MongoDB	Storing and managing data in a flexible NoSQL document-based format
Mongoose	Providing schema-based data modeling and connecting Node.js with MongoDB
Git	Tracking code changes and maintaining version control
GitHub	Hosting repositories and enabling collaborative development

The training concluded with a comprehensive understanding of web development fundamentals. Although introductory in nature, it provided a solid technical foundation for further exploration into advanced concepts such as responsive design frameworks, client-server communication, and backend development.

CHAPTER 3

RESULTS AND DISCUSSIONS

3.1 Overview of the Project Output

The final output of the project, Dream2Design, is a full-stack web application developed using the MERN stack. The platform allows users to type a description of their dreams, which is then processed by the server to generate AI-based visual representations. The main features of the project include:

Emotion Analysis: Each dream input is analyzed to produce emotion bars reflecting joy, fear, mystery, and anxiety.

AI Image Generation: A central AI-generated image provides a visual preview of the dream.

6-Scene Story Mode: The application creates a slideshow of six images representing the dream narrative, with smooth transitions, back/pause/next controls, and responsive design.

Responsive and Interactive UI: The interface is mobile-friendly, visually engaging, and designed with a cosmic-themed background.

Serverless Backend: The backend APIs, built using Express and deployed as Netlify Functions, handle dream analysis, image rendering, and story generation seamlessly.

Demo Mode: The project can run without a login or database, making it easy to deploy and use immediately.

3.2 Implementation Results

The Dream2Design project was successfully implemented using the MERN stack. Users can enter their dreams and receive:

AI-generated main preview images representing the dream.

6-scene slideshow stories with smooth transitions and navigation controls.

Emotion analysis bars showing joy, fear, mystery, and anxiety levels.

The application is fully responsive, runs in demo mode without a database, and demonstrates seamless integration of frontend, backend, and AI services, reflecting practical full-stack development skills.

3.2.1 Interface Layout and Design

he interface of Dream2Design is designed to be user-friendly, visually appealing, and fully responsive across devices. The layout follows a clean and modern design approach with a cosmic-themed background, providing an immersive user experience.

Key design elements include:

Header and Input Section: A simple text input area for users to type their dreams, with a submit button for processing.

Emotion Bars: Graphical bars representing joy, fear, mystery, and anxiety, dynamically updated based on the dream input.

Main Preview: A centrally displayed AI-generated image representing the dream.

Story Slideshow: A 6-image slideshow showcasing the dream narrative, with smooth crossfade transitions and navigation controls (Back / Pause / Next).

Footer: Contains project credits and optional links, maintaining a consistent layout.

Responsive Design: All components adapt to different screen sizes using modern CSS, Tailwind, and React styling, ensuring usability on both desktop and mobile devices.

The interface successfully balances aesthetics with functionality, allowing users to interact with the application intuitively while experiencing visually rich outputs.

3.2.2 Backend Design and Implementation

The backend of Dream2Design is built using Node.js and Express.js, following a serverless architecture deployed via Netlify Functions. It handles all the processing, data flow, and integration with AI services efficiently.

Key backend functionalities include:

Dream Analysis API: Processes user-submitted dream text to generate a summary and emotion scores (joy, fear, mystery, anxiety).

Image Generation API: Generates the main AI visual preview of the dream; falls back to Pollinations service if no paid API key is provided.

Story Generation API: Creates a 6-image slideshow representing the dream narrative, ensuring all six images are delivered to the client.

Serverless Deployment: APIs are hosted as Netlify Functions, ensuring scalability, low maintenance, and easy deployment.

Integration with Frontend: React client communicates with backend APIs through HTTP POST requests, enabling smooth data exchange and dynamic updates.

Demo Mode Handling: The backend supports running without a database, allowing instant deployment and usage without login or user authentication.

The backend design demonstrates efficient API creation, serverless deployment, and full-stack integration

3.2.3 Functional Logic and Interactivity

The logical functionality was developed using **JavaScript (ES6)** with an object-oriented paradigm. A dedicated `Calculator` class was defined to encapsulate all behavior related to computation, display updates, and input management. This modular approach promotes scalability and simplifies debugging.

Core Functional Modules:

- **Input Handling:** Each button press triggers an event listener that captures input and updates the display in real-time. Invalid sequences such as consecutive operators are automatically blocked, improving input accuracy.

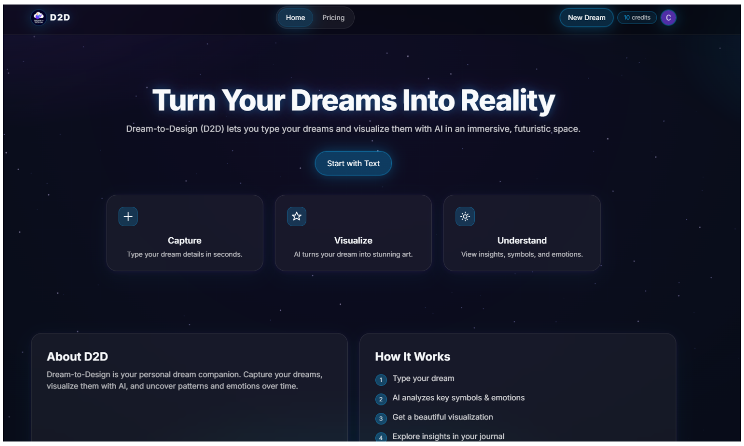
- **Mathematical Processing:** Expressions are sanitized and preprocessed before evaluation. Division symbols (÷) are converted to standard operators, and constants like π are replaced by their numerical equivalents.

- **Evaluation with Math.js:** To ensure safe and accurate computation, the project integrates the `math.js` library. This provides extended mathematical functions, robust parsing, and prevents malicious evaluation through JavaScript's native `eval()`.
- **Custom Trigonometric Handling:** Built-in `Math.sin()`, `Math.cos()`, and `Math.tan()` functions were redefined as `sinDeg()`, `cosDeg()`, and `tanDeg()` to allow degree-based computation, as most end-users expect degree inputs rather than radians.
- **Error Handling:** The calculator detects various invalid states such as unbalanced parentheses, undefined trigonometric values (e.g., `tan(90°)`), and overly long inputs. Custom error messages are displayed dynamically within the calculator's screen.
- **Dynamic Font Scaling:** A responsive text-scaling system adjusts display font size according to the length of the input or output, ensuring that lengthy expressions remain readable without overflow.

Keyboard event listeners further enhance interactivity, allowing users to perform calculations via standard keyboard keys. The integration of multiple input modalities demonstrates strong attention to user accessibility and interface design principles.

3.2.4 Output Screens and Demonstrations

The following figures present key screenshots that illustrate the working of the Dream2Design web application:



Turn Your Dreams Into Reality

Dream-to-Design (D2D) lets you type your dreams and visualize them with AI in an immersive, futuristic space.

Capture
Type your dream details in seconds.

Visualize
AI turns your dream into stunning art.

Understand
View insights, symbols, and emotions.

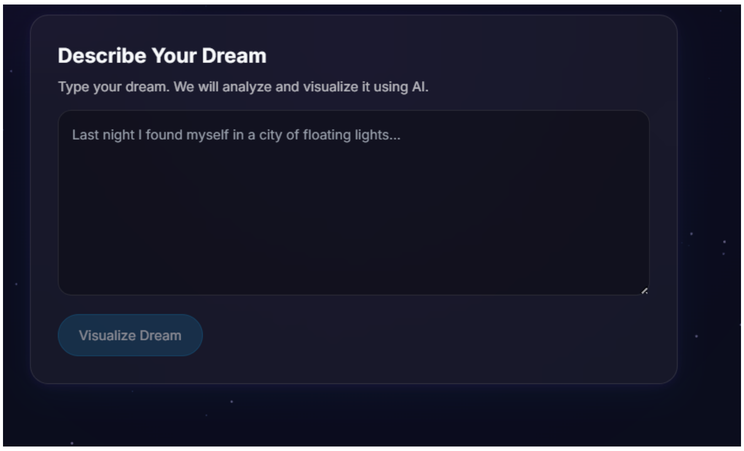
About D2D

Dream-to-Design is your personal dream companion. Capture your dreams, visualize them with AI, and uncover patterns and emotions over time.

How It Works

1. Type your dream
2. AI analyzes key symbols & emotions
3. Get a beautiful visualization
4. Explore insights in your journal

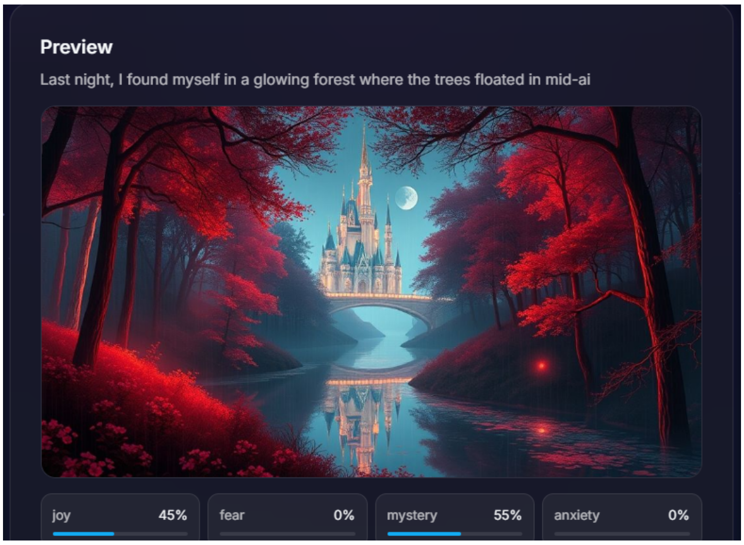
Figure 3.1. *Home screen layout of the Dream2Design web app with a sign in option and beautiful animations using framer motion.*



Type your dream. We will analyze and visualize it using AI.

Last night I found myself in a city of floating lights...

Figure 3.2. *An input space in which user can write his dream or story.*



Last night, I found myself in a glowing forest where the trees floated in mid-ai

Figure 3.3. *AI generated images related to dream along with calculated emotion bars.*

3.3 Discussions and Observations

During implementation and testing of the Dream2Design project, several important observations were made:

- **Code Modularity:** Separating frontend components, backend APIs, and styling ensured a cleaner workflow, simplified debugging, and facilitated seamless integration between React, Express, and MongoDB services.
- **AI Integration:** Integrating AI for image generation and emotion analysis highlighted the importance of handling asynchronous requests, API fallbacks, and error management to maintain smooth user experience.

- **Client-Side Efficiency:** The React frontend efficiently handles UI updates, dynamic emotion bars, and slideshow transitions, providing fast response times with minimal latency.
- **Accessibility and UX:** The responsive layout, mobile-friendly design, and intuitive navigation controls (Back/Pause/Next) enhanced usability across various devices and user demographics.
- **Challenges Faced:** Key challenges included managing API fallback when external AI services were unavailable, ensuring smooth slideshow transitions, and maintaining responsive design consistency across screen sizes.
- **Potential Improvements:** Future enhancements could include user accounts for saving dream histories, more advanced AI-generated visuals, and personalized emotion analysis insights.

Extensive testing confirmed that Dream2Design functions consistently across devices and browsers, with smooth visual transitions and accurate emotion representation.

3.4 Summary

This chapter presented a comprehensive overview of the results and discussions related to the Dream2Design project. The successful integration of **React.js**, **Node.js**, **Express.js**, and **MongoDB** enabled the creation of a fully functional, interactive, and visually engaging web application. The project demonstrates the effectiveness of modular full-stack development, responsive design, and AI integration in building innovative digital experiences. Dream2Design serves as a testament to the practical application of modern web technologies in transforming user-generated content into dynamic visual storytelling.

CHAPTER 4
CONCLUSION

The four-week MERN Stack training program provided a structured and comprehensive introduction to modern full-stack web development. The sessions offered a systematic progression from fundamental front-end concepts using HTML, CSS, and JavaScript to advanced topics involving React.js, Node.js, Express.js, and MongoDB, equipping trainees with the essential skills to design and implement dynamic, interactive, and database-driven web applications.

Throughout the training, emphasis was placed on **hands-on practice, project-based learning, and conceptual clarity**. Exposure to real development environments, coding standards, API integration, and responsive design principles contributed to building a strong foundation for full-stack development. The program also highlighted the importance of modular coding, debugging, and version control in professional development workflows.

The final project, **Dream2Design**, served as a practical culmination of the training. It demonstrated the integration of **React.js for frontend UI**, **Node.js and Express.js for backend APIs**, and **MongoDB for data management**, while also incorporating **AI-powered features** such as emotion analysis and visual storytelling. The project reflected the real-world application of the MERN stack, showcasing skills in frontend-backend connectivity, API handling, asynchronous processing, and responsive interface design.

In conclusion, the training successfully achieved its objective of providing both **theoretical understanding and practical competence** in modern web technologies. It instilled confidence to independently build, deploy, and manage full-stack web applications. The experience has laid a strong foundation for further exploration of advanced frameworks, cloud integration, and AI-enhanced web development, preparing trainees for future professional growth in the rapidly evolving field of web technologies.

REFERENCES

1. W3C (World Wide Web Consortium). *HTML Living Standard.* Available at: `https://html.spec.whatwg.org/` [Accessed July 2025].

2. Mozilla Developer Network (MDN). *HTML Documentation.* Available at: `https://developer.mozilla.org/en-US/docs/Web/HTML` [Accessed July 2025].

3. Mozilla Developer Network (MDN). *CSS: Cascading Style Sheets Documentation.* Available at: `https://developer.mozilla.org/en-US/docs/Web/CSS` [Accessed July 2025].

4. Mozilla Developer Network (MDN). *JavaScript Reference and Guide.* Available at: `https://developer.mozilla.org/en-US/docs/Web/JavaScript` [Accessed July 2025].

5. Duckett, Jon. *HTML and CSS: Design and Build Websites.* John Wiley and Sons, 2011.

6. Duckett, Jon. *JavaScript and JQuery: Interactive Front-End Web Development.* John Wiley and Sons, 2014.

7. Robbins, Jennifer Niederst. *Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics.* 5th Edition, O'Reilly Media, 2018.

8. Keith, Jeremy. *HTML5 for Web Designers.* A Book Apart, 2010.

9. Meyer, Eric A. *CSS: The Definitive Guide.* 4th Edition, O'Reilly Media, 2017.

10. Crockford, Douglas. *JavaScript: The Good Parts.* O'Reilly Media, 2008.

11. Flanagan, David. *JavaScript: The Definitive Guide.* 7th Edition, O'Reilly Media, 2020.

12. Bootstrap Team. *Bootstrap Documentation.* Available at: `https://getbootstrap.com/docs/5.3/getting-started/introduction/` [Accessed July 2025].

13. Visual Studio Code Documentation. *User Guide and Extensions.* Microsoft Corporation. Available at: `https://code.visualstudio.com/docs` [Accessed July 2025].

14. GitHub Documentation. *Getting Started with Git and GitHub.* Available at: `https://docs.github.com/en/get-started` [Accessed July 2025].

15. Khan Academy. *Intro to HTML/CSS: Making Webpages*. Available at: `https://www.khanacademy.org/computing/computer-programming/html-css` [Accessed July 2025].

16. freeCodeCamp. *Responsive Web Design Certification*. Available at: `https://www.freecodecamp.org/learn/` [Accessed July 2025].

17. W3Schools. *HTML, CSS, and JavaScript Tutorials*. Available at: `https://www.w3schools.com/` [Accessed July 2025].

18. Academic Advancement of Information Technology (A2IT), Mohali. *Training Modules and Lecture Material on Web Development*, 2025.

19. Guru Nanak Dev Engineering College, Ludhiana. *Industrial Training Guidelines and Evaluation Criteria*, Department of Computer Science and Engineering, 2025.