An Academic Internship

Report on

WEB DEVELOPMENT USING MERN STACK

For 5th Semester B. Tech Course Requirement

Submitted by

SAURABH KOCH GOHAIN (200710007051)

VASHKARJYA DAS (200710007061)

BISWAJIT TERON (200710007016)

HIRAK JYOTI DAS (200710007024)

Department of Computer Science & Engineering

JORHAT ENGINEERING COLLEGE, Jorhat

Assam Science and Technology University

(Aug,2021)

Self Declaration

We hereby declare that the work which is being presented in this report entitled “WEB DEVELOPMENT USING MERN STACK” is an authentic record of our own work carried out during the month of December, 2022. The matter presented in this report has not been submitted elsewhere for any credit or requirement.

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Saurabh Koch Gohain

(200710007051)

……..

Vashkarjya Das

(200710007061)

……

Biswajit Teron

(200710007016)

…….

Hirak Jyoti Das

(200710007024)

ACKNOWLEDGEMENT

Firstly, **we Saurabh Koch Gohain (200710007051), Vashkarjya Das (200710007061**), **Biswajit Teron (200710007016), Hirak Jyoti Das (200710007024),** students of **Jorhat Engineering College** would like to express our sincere gratitude to professor **Dr. Rupam Baruah Sir, HOD** of **Computer Science and Engineering** for providing us an opportunity to do internship at Jorhat Engineering College, for us it was a unique experience to study about "**WEB DEVELOPMENT USING MERN STACK**" this internship period was a great chance for learning and professional development. Next, we would like to express our deepest gratitude to professor **Mr. Biswajit Sarmah Sir** of **Computer Science and Engineering** department for providing instructions and support throughout the internship period.

Without Sir's support this project would have been very challenging.

Finally, we would like to extend our gratitude towards our family and our friends and all the other professionals for helping us in carrying out this work successfully.

ABSTRACT

The most important skill that a computer science student should possess is programming knowledge. As technology has developed and been tailored to match every stream and specialty, coding has become crucial in many facets of life.

Data structures and algorithms (DSA) are the essential building blocks of coding. Understanding data structures' importance can help students better grasp how their code operates and how the computer handles the enormous amount of incoming data. Also, knowing how algorithms work enables them to develop strategies that can help them optimize their code even further, reduce the amount of time and space required for code execution, and effectively use their mathematical skills.

In this study we have tried to build a website using MERN Stack to help students boost their DSA skills. Our website contains various questions based on the difficulty level – Basic, Intermediate and Advance to help students gain deep concepts of DSA.

CERTIFICATE OF COMPLETION

This is to certified that **SAURABH KOCH GOHAIN** bearing Roll No: **200710007051** of the fifth semester, **Computer Science and Engineering Department**, JORHAT ENGINEERING COLLEGE, has successfully completed Internship – II (SAI –Academia, Code : SI181521) on the topic **" WEB DEVELOPMENT USING MERN STACK "**, under the guidance of **Mr. Biswajit Sarmah Sir**, Assistant Professor, Computer Science and Engineering Department, Jorhat Engineering College, as per the ASTU second curriculum.

Mr. Biswajit Sarmah
Internship Guide & Assistant Professor, Computer Science & Engineering, Jorhat Engineering College, Jorhat, Assam

Dr. Rupam Baruah
HOD & Professor, Computer Science & Engineering, Jorhat Engineering College, Jorhat, Assam

CERTIFICATE OF COMPLETION

This is to certified that **VASHKARJYA DAS** bearing Roll No: 200710007061 of the fifth semester, **Computer Science and Engineering Department**, JORHAT ENGINEERING COLLEGE, has successfully completed Internship – II (SAI –Academia, Code : SI181521) on the topic **“** WEB DEVELOPMENT USING MERN STACK **”**, under the guidance of **Mr. Biswajit Sarmah Sir**, Assistant Professor, Computer Science and Engineering Department, Jorhat Engineering College, as per the ASTU second curriculam.

Mr. Biswajit Sarmah
Internship Guide & Assistant Professor, Computer Science & Engineering, Jorhat Engineering College, Jorhat, Assam

Dr. Rupam Baruah
HOD & Professor, Computer Science & Engineering, Jorhat Engineering College, Jorhat, Assam

CERTIFICATE OF COMPLETION

This is to certified that **BISWAJIT TERON** bearing Roll No: 200710007016 of the fifth semester, **Computer Science and Engineering Department**, JORHAT ENGINEERING COLLEGE, has successfully completed Internship – II (SAI –Academia, Code : SI181521) on the topic **“** WEB DEVELOPMENT USING MERN STACK **”**, under the guidance of **Mr. Biswajit Sarmah Sir**, Assistant Professor, Computer Science and Engineering Department, Jorhat Engineering College, as per the ASTU second curriculam.

Mr. Biswajit Sarmah
Internship Guide & Assistant Professor, Computer Science & Engineering, Jorhat Engineering College, Jorhat, Assam

Dr. Rupam Baruah
HOD & Professor, Computer Science & Engineering, Jorhat Engineering College, Jorhat, Assam

CERTIFICATE OF COMPLETION

This is to certified that **HIRAK JYOTI DAS** bearing Roll No: 200710007024 of the fifth semester, **Computer Science and Engineering Department**, JORHAT ENGINEERING COLLEGE, has successfully completed Internship – II (SAI –Academia, Code : SI181521) on the topic **“** WEB DEVELOPMENT USING MERN STACK **”**, under the guidance of **Mr. Biswajit Sarmah Sir**, Assistant Professor, Computer Science and Engineering Department, Jorhat Engineering College, as per the ASTU second curriculam.

Mr. Biswajit Sarmah
Internship Guide & Assistant Professor, Computer Science & Engineering, Jorhat Engineering College, Jorhat, Assam

Dr. Rupam Baruah
HOD & Professor, Computer Science & Engineering, Jorhat Engineering College, Jorhat, Assam

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Introduction

Academic internships are internships mainly done to explore the new technological domains and how they can be applied practically to solve problems. Academic internships are the need of the hour as they help us acquire a deeper understanding of the topics which may not be taught in our curriculum.

As part of our academic internship project, we, under the supervision of Mr. **Biswajit Sarmah** Sir, Assistant Professor, Computer Science & Engineering, Jorhat Engineering College learnt about various aspects of MERN Stack and have created a webpage which will help students to practice questions based on DSA to improve their coding skills.

About

- **Assam Science and Technology University:**
  The Assam Science and Technology University was established by Government of Assam under Assam Science & Technology University Act 2009. It aims to provide education and research in the field of science & technology and other professional courses in Assam. ASTU is the premier and only technical university in the North Eastern Region of India. The university is responsible for academic regulation of all undergraduate and post-graduate programs in engineering, and pharmaceutical sciences and a few professional courses in science and management sectors. ASTU also conducts an in-house post-graduate course in Energy

Engineering. Since its 2 inception, ASTU has been undertaking high quality teaching and research in frontier areas of science & technology continuously upgrading the syllabi and creating environment for international standard research and emphasizing in bridging the ancient wisdom of the region with modern technology.

- **Jorhat Engineering College:**
  Jorhat Engineering College, a premiere technical institute of North East India has completed its 60 years of relentless service to the society. The college started functioning with its first batch of students on the 10th of October, 1960. The college, affiliated to Assam Science and Technology University, currently offers AICTE recognized B.Tech courses on Civil, Mechanical, Electrical, Computer Science and Instrumentation and M.Tech courses in Civil and Electrical Engineering. The college has been offering a three year post graduate course leading to Masters of Computer Applications since 1987.

Background And Motivation:

Full stack developer is one of the most in-demand job roles right now. What makes full stack developer different is their ability to adapt to different situations and contribute to the product in multiple different ways.

There are multiple reasons which make MERN stack the fastest growing tech stack in the world. Some of which are:

1. **Quick Coding Time**: MERN stack has one of the quickest coding time for most of the applications and once we understand it then

we can create a basic application in a small amount of time without any hassle.

2. **Lots Of Integrations:** MERN stack is completely based on JavaScript and JavaScript has lot of 3rd party libraries as well as integrations. Therefore, whenever we are faced with any challenging problem, chances are somebody has already created a robust solution for that and we can easily integrate it with our application.
3. **NoSQL Based:** One of the critical components of MERN stack is MongoDB which is the most popular NoSQL based database. Since, most of the newer projects are using NoSQL based database learning, MERN stack has a significant advantage over other relational tech stacks.
4. **Reduced Cost:** Since MERN stack provides the fastest development time for an application, this directly reduces the cost to develop the project.
5. **Robust Ecosystem:** MERN stack has one of the most robust & friendly developer eco-system out there. The documentation for its frameworks is top notch and any help related to MERN stack is just a google search away.

Methodology

Method of Undergoing the Internship:

From getting introduced to the topic of “WEB DEVELOPMENT USING MERN STACK” till completion of the project, we were constantly guided by Mr. Biswajit Sarmah Sir throughout the due course of internship, which otherwise would have been an uphill task. Meetings were conducted on weekly basis where we would discuss about various aspects of MERN Stack, ask our doubts, present the assigned tasks, finally wrapping up with home tasks. We also referred various articles and videos available on the internet to get detailed idea about the topics. sFinally, we made the web application by implementing the various concepts that we have learnt. We then deployed the server on local host.

Takeaways from the Internship

What is MERN Stack?

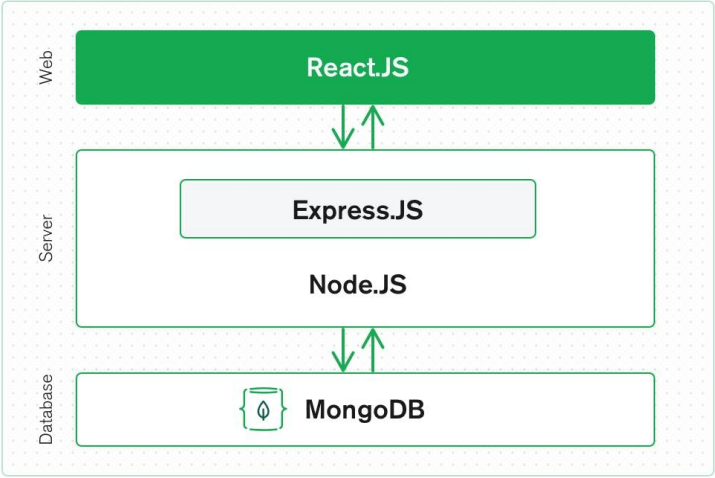
MERN Stack is a JavaScript Stack that is used for easier and faster deployment of full-stack web applications. MERN Stack comprises of 4 technologies namely:

- MongoDB — document database
- Express(.js) — Node.js web framework
- React(.js) — a client-side JavaScript framework
- Node(.js) — the premier JavaScript web server

It is designed to make the development process smoother and easier. Each of these 4 powerful technologies provides an end-to-end framework for the developers to work in and each of these technologies play a big part in the development of web applications.

How does the MERN stack work?

The MERN architecture allows users to easily construct a three-tier architecture (front end, back end, database) entirely using JavaScript and JSON.



- **React.js front end:**
  The top tier of the MERN stack is React.js, the declarative JavaScript framework for creating dynamic client-side applications in HTML. React lets users build up complex interfaces through simple components, connect them to data on their back-end server, and render them as HTML.

- **Express.js and Node.js server tier:**
  The next level down is the Express.js server-side framework, running inside a Node.js server. Express.js bills itself as a “fast, unopinionated, minimalist web framework for Node.js,” and that is indeed exactly what it is. Express.js has powerful models for URL routing (matching an incoming URL with a server function), and handling HTTP requests and responses.
  By making XML HTTP Requests (XHRs) or GETs or POSTs from your React.js front end, users can connect to Express.js functions that power their application. Those functions, in turn, use MongoDB’s Node.js drivers, either via callbacks or using promises, to access and update data in their MongoDB database.

- **MongoDB database tier:**
  If our application stores any data (user profiles, content, comments, uploads, events, etc.), then we are in need of a database that is just as easy to work with as React, Express, and Node.
  That's where MongoDB comes in: JSON documents created in our React.js front end can be sent to the Express.js server, where they can be processed and (assuming they're valid) stored directly in MongoDB for later retrieval. Again, if we are building in the cloud, we would want to look at Atlas. If we are looking to set up our own MERN stack.

What is DSA?

The term DSA stands for **Data Structures and Algorithms**. As the name itself suggests, it is a combination of two separate yet interrelated topics – Data Structure and Algorithms.

- **Data Structures:** A data structure is defined as a particular way of storing and organizing data in our devices to use the data efficiently and effectively. The main idea behind using data structures is to minimize the time and space complexities. An efficient data structure takes minimum memory space and requires minimum time to execute the data.

- **Algorithm:** Algorithm is defined as a process or set of well-defined instructions that are typically used to solve a particular group of problems or perform a specific type of calculation. To explain in simpler terms, it is a set of operations performed in a step-by-step manner to execute a task.

Importance of Learning DSA

Data structures and algorithms provide a set of approaches for efficiently handling data. As a result, it is important for programmers to have a strong understanding of DSA fundamentals in order to write efficient and correct code. Some important reasons to learn DSA are:

- **Improved problem-solving skills:** Learning DSA helps you develop a systematic approach to solving problems, which can be applied to a wide range of situations.
- **Better coding efficiency:** By understanding how to use the right data structures and algorithms, you can write code that is more efficient and performs better.
- **Enhanced ability to learn new programming languages:** Having a strong foundation in DSA makes it easier to learn new programming languages and technologies.
- **Improved job prospects**: Many employers place a high value on DSA skills, so having a good understanding of these concepts can make you a more competitive job candidate.

What is Git?

Git is a popular version control system. It was created by Linus Torvalds in 2005, and has been maintained by Junio Hamano since then.

It is used for:

- Tracking code changes
- Tracking who made changes
- Coding collaboration

What does Git do?

- Manage projects with **Repositories**
- **Clone** a project to work on a local copy
- Control and track changes with **Staging** and **Committing**
- **Branch** and **Merge** to allow for work on different parts and versions of a project
- **Pull** the latest version of the project to a local copy
- **Push** local updates to the main project

Working with Git

- Initialize Git on a folder, making it a **Repository**
- Git now creates a hidden folder to keep track of changes in that folder
- When a file is changed, added or deleted, it is considered **modified**
- We select the modified files we want to **Stage**
- The **Staged** files are **Committed**, which prompts Git to store a **permanent** snapshot of the files
- Git allows us to see the full history of every commit.
- We can revert back to any previous commit.
- Git does not store a separate copy of every file in every commit, but keeps track of changes made in each commit!

Why is Git needed?

When a team works on real-life projects, git helps ensure no code conflicts between the developers. Furthermore, the project requirements change often. So a git manages all the versions. If needed, we can also go back to the original code. The concept of branching allows several projects to run in the same codebase.

What is GitHub?

GitHub is a Git repository hosting service that provides a web-based graphical interface. It is the world's largest coding community. Putting a code or a project into GitHub brings it increased, widespread exposure. Programmers can find source codes in many different languages and use the command-line interface, Git, to make and keep track of any changes.

GitHub helps every team member work together on a project from any location while facilitating collaboration. We can also review previous versions created at an earlier point in time.

What are GitHub's Features?

1. Easy Project Management

GitHub is a place where project managers and developers come together to coordinate, track, and update their work so that projects are transparent and stay on schedule.

2. Increased Safety With Packages

Packages can be published privately, within the team, or publicly to the open-source community. The packages can be used or reused by downloading them from GitHub.

3. Effective Team Management

GitHub helps all the team members stay on the same page and organized. Moderation tools like Issue and Pull Request Locking help the team to focus on the code.

4. Improved Code Writing

Pull requests help the organizations to review, develop, and propose new code. Team members can discuss any implementations and proposals through these before changing the source code.

5. Increased Code Safety

GitHub uses dedicated tools to identify and analyze vulnerabilities to the code that other tools tend to miss. Development teams everywhere work together to secure the software supply chain, from start to finish.

6. Easy Code Hosting

All the code and documentation are in one place. There are millions of repositories on GitHub, and each repository has its own tools to help you host and release code.

What is an API?

API stands for Application Programming Interface, a software-to-software interface that enables two applications to exchange data among each other. Each time we use an app like Facebook, send an instant message, or check the weather on our phone, we're using an API.

Simply put, when we use an application on our mobile phone, the application connects to the Internet and sends data to a server. The server then retrieves that data, interprets it, performs the necessary actions and sends us the information we wanted in a readable way — all of this happens via API.

Why are APIs important?

APIs can be a service for developers. Every time developers write a new program, they don't have to start from scratch to build a core application that tries to do

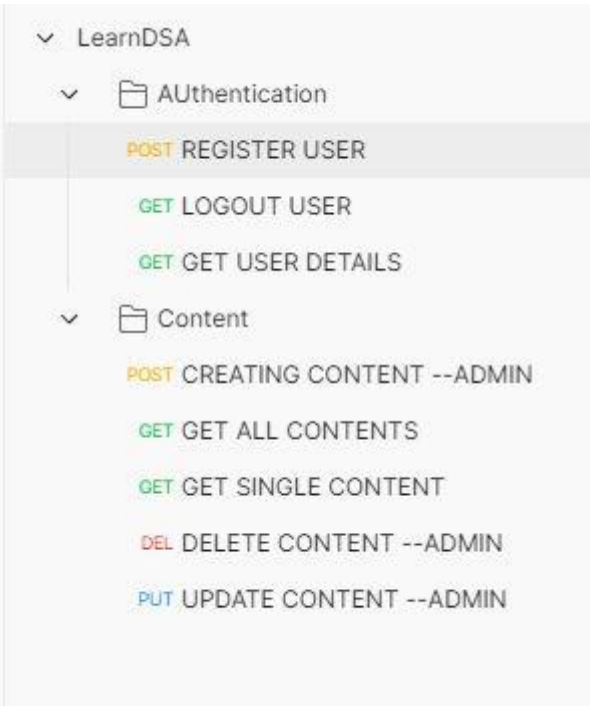
everything. Instead, they can contract out certain responsibilities by using already created pieces that do the job better.

Project Execution

This Project is made using MERN which comprises of MongoDB, ExpressJS, ReactJS and NodeJS

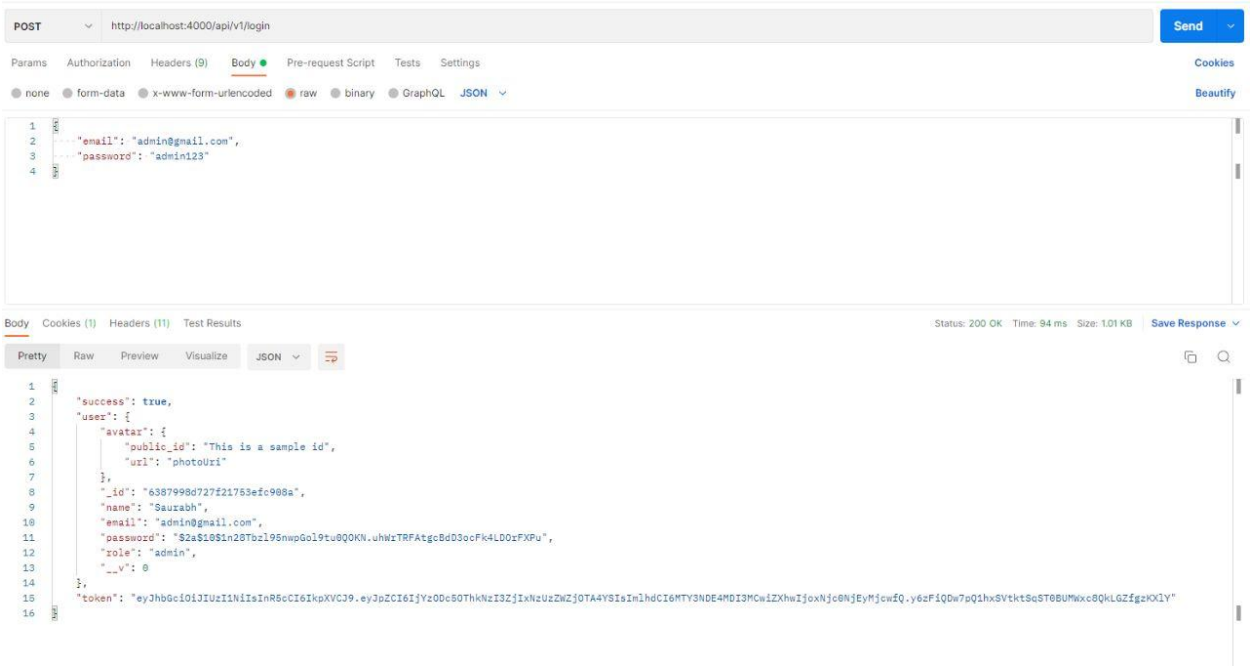
- The first component is MongoDB, which is a NoSQL database management system.
- The second MERN stack component is ExpressJS. It is a backend web application framework for NodeJS.
- The third component is ReactJS, a JavaScript library for developing UIs based on UI components.
- The final component of the MERN stack is NodeJS. It is a JS runtime environment, i.e., it enables running JavaScript code outside the browser.

Step 1(Preparing the Backend): All the required APIs are created using mongoDB, ExpressJS and NodeJS and also using different libraries. These APIs are saved in Postman Canary for testing.

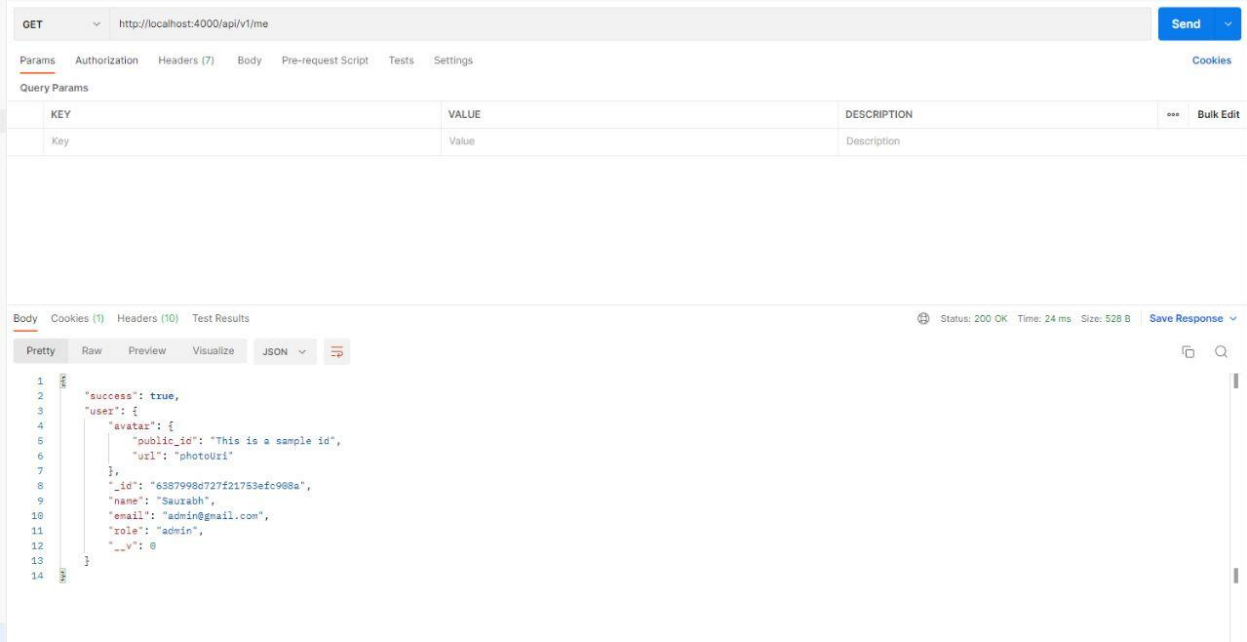


Some of the examples of how the APIs are working are:

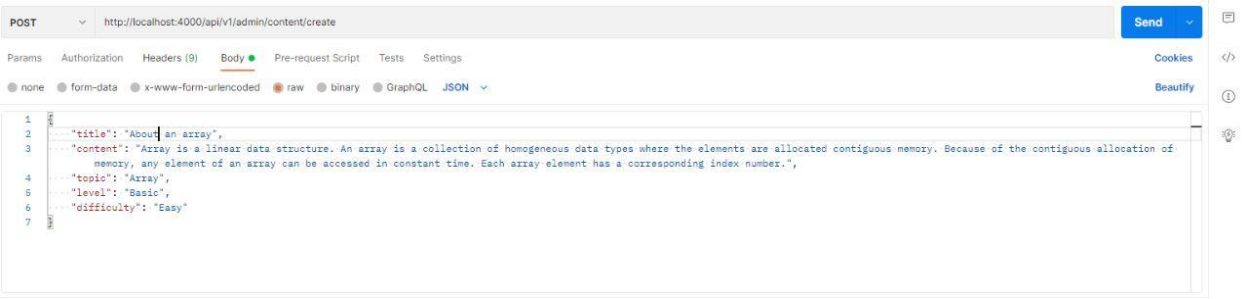
Below is the example which shows how the login information of users are stored



Next we have created an API to show the user details :

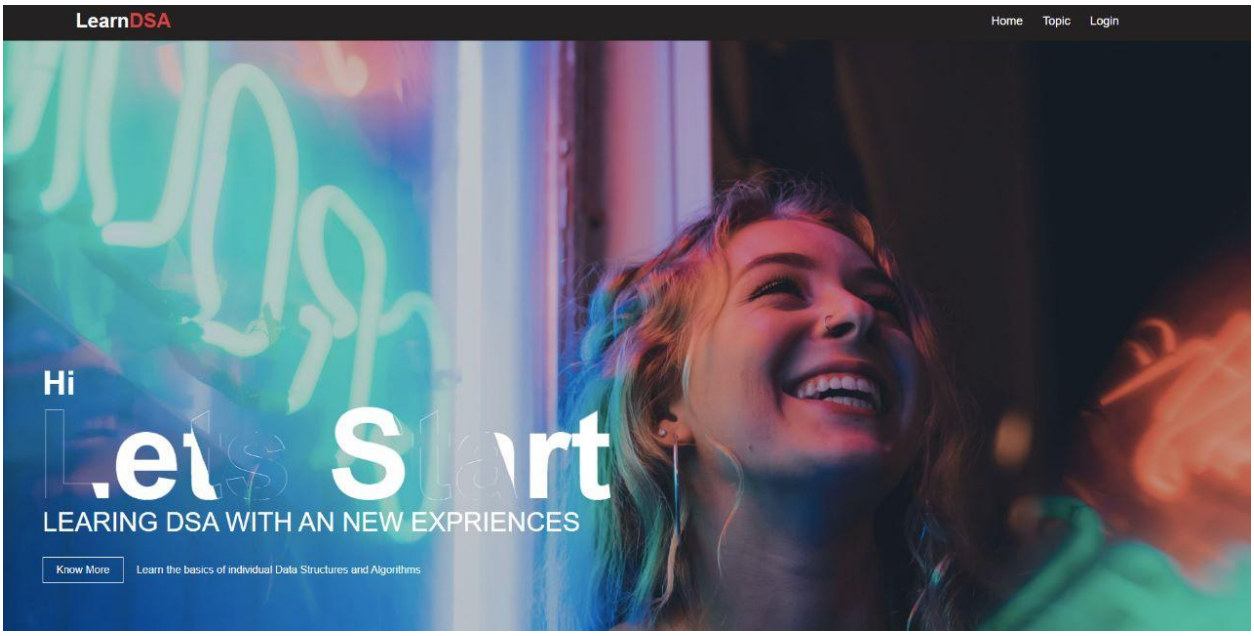


We have also created an API to create the content for our webpage:

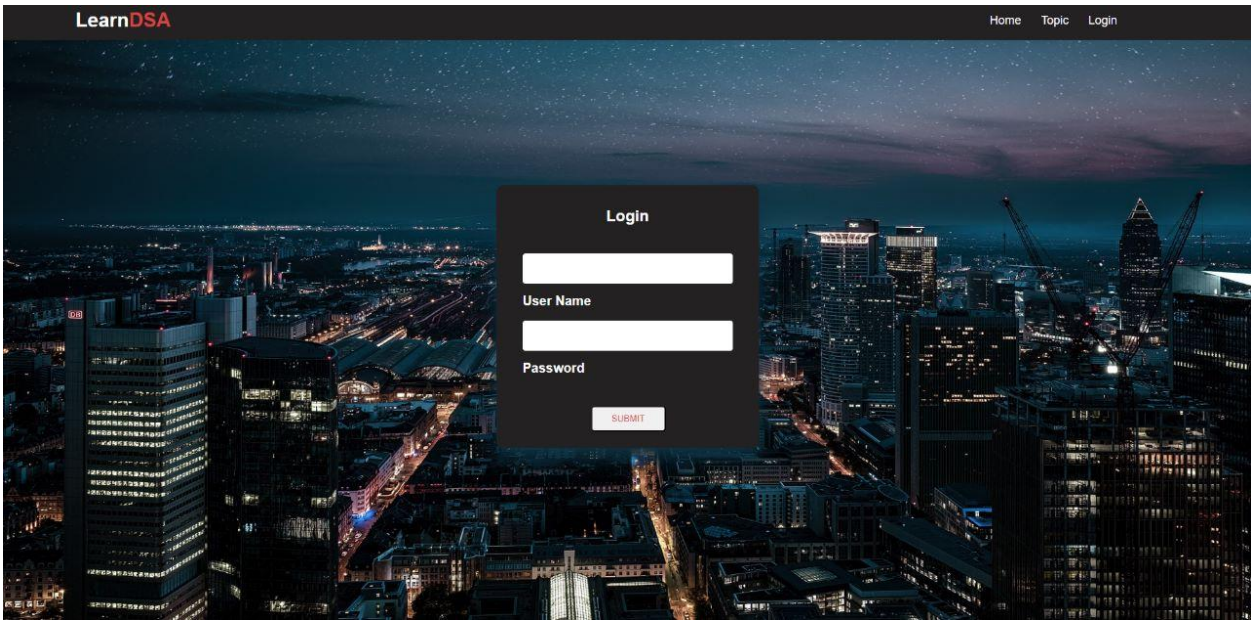


Step 2(Preparing the Frontend): We have created the following components for our website:

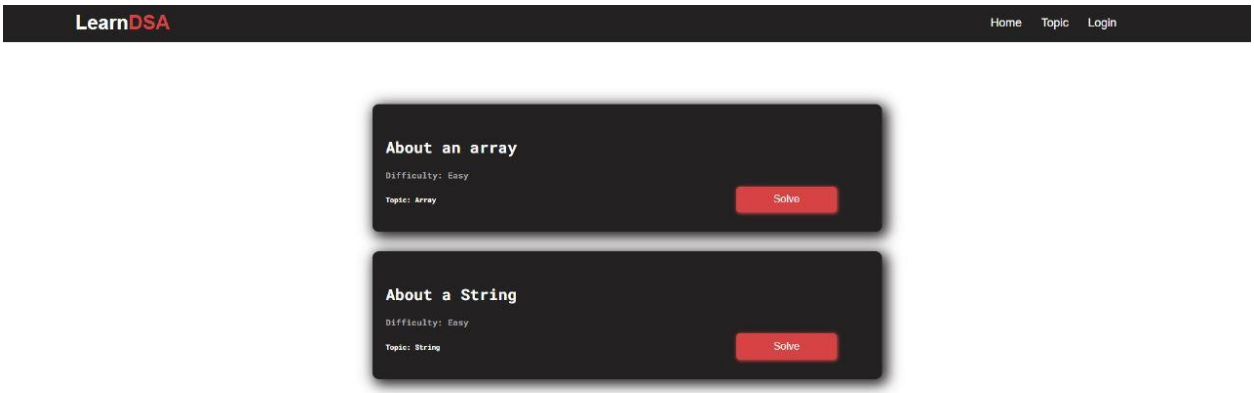
Home Page: As we can see below is the homepage of our website. It contains a navbar at the left of which is our logo i.e. **LearnDSA** and at the right of the navbar it contains the other links to visit the other components of our website.



Login Page: Below is the login page for our website.



Contents: Below is the contents page of our website.



Code Compiler : Next is the code compiler page of our website. Here students can practice DSA problems.

Conclusion

The purpose of this study was to learn about various aspects of Web Development Using MERN Stack. The study introduced us to the ground reality of the present-day scenario of the concerned matter. The final project helps us to realize the general challenges faced while designing a web page using MERN Stack and the ways to achieve the solutions. Based on the study it can be concluded that Web Development Using MERN Stack has a wide scope in today's world.

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