Online Banking Application Using A MERN Stack

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Final Year Project - Banking Application using MERN stack

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Contents

About this project

Analysis of this project: This project was designed by me for the module Applied Project & Dissertation with the purpose being to complete an online banking system using a MERN(Mongo, Express, React & Node) stack. The project should allow user to login, view statements, takeout loans, perform transactions and will show the user there monthly and yearly expenditures using graphs. The project will also be secure and utilize user accounts using a mongo Database to ensure that the users account is secure.

The main purpose of this project is to utilize the MERN stack to provide a full and rich user experience and to provide a secure, intuitive and polished online banking system. The project will also utilize Python scripts to perform statistical analysis on user expenditure and income and will provide an estimate of how much money the user should have for the month based upon previous monthly expenditure.

This project was designed to be a stand alone application where a user can perform all their banking needs without any other software. The user should be find the UI intuitive and the features helpful.

This project will link many disparate technologies together for the purpose of providing the user with the features they need. I plan to use this project to show the skills I have attained during my course and to learn a new framework(React). I also plan to improve and cultivate my skills using new technologies such as various Python libraries and React. This project is stored on a GitHub repository the link to which is found in the Preamble & Intro

Authors: My name is **Ultan Kearns**, I am a fourth year student at GMIT. I have never used React or LaTeX before but I plan to learn a lot about these technologies during the course of this project. [1]

Chapter 1

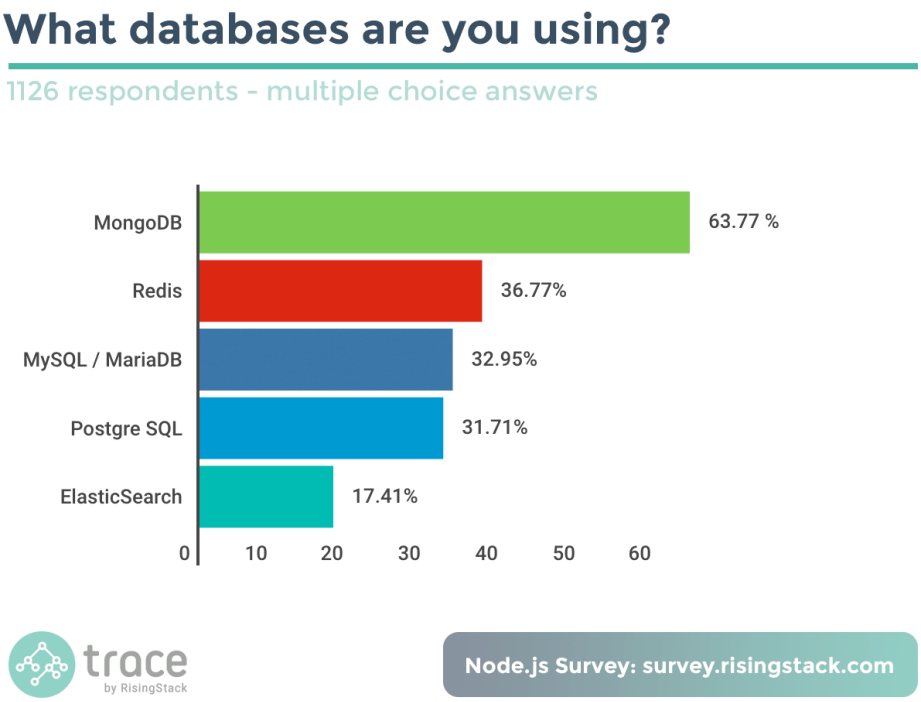
Introduction

1.1 Why A MERN stack?

There are many reasons why I have chosen to use a MERN stack for this application the main one is because it provides a framework for a full stack application. MERN stands for **Mongo - For the database backend(Hosted on Mlab, all user info is stored here), Express - A web application framework host a server in a relatively short time compared to other methods , ReactJS for asynchronous JS & Node - for package management.** [?]

1.1.1 Mongo

As you have read above the MERN stack is very powerful in creating a full-stack application when used correctly. The reason I chose the database Mongo is because it offers an open source alternative to MySQL and other proprietary databases [?] and many companies seem to be migrating to it because it is open source and in some cases may offer better performance than other databases.



[?] Mongo is easy to learn as it stores it's data in JSON format and is schema-less, that is the user defines their own schemas. I have also used it for 2 other projects in Angular and find it an easy database to use in relation to projects.

1.1.2 Express

I chose to use Express because it is a very useful API when creating a server. It is very helpful when pulling data from the server and displaying it to the client it is also very scalable and offers good security when used properly.

It is also very easy to setup and can be connected to the MLab database in minutes upon starting the project. I have also used this server before and have a bit of experience with it and found it very helpful in the projects I used it for which were a messaging forum and an E-commerce application both using MEAN(Mongo,Express,Angular & Node) stacks.

1.1.3 React

I also chose this project because I have zero experience in ReactJS and since it's such an up and coming framework I decided on it for this project. It also offers many features and libraries which are desirable when programming a user interface to ensure the user finds the application intuitive and easy to use. ReactJS also utilizes modular programming for components which makes designing web applications far easier than just using HTML, CSS & Javascript. React is also very fast at rendering pages so that the user will not experience a major delay in accessing information.

1.1.4 Node

The reason I chose Node Package Manager was because it offers many great packages which can be used to improve productivity on my part and also the applications security, UI, UX and various other aspects of the application. I debated using Yarn for this project but settled on Node because it was already installed on my laptop. Node is a very useful tool when developing full-stack applications and was very helpful in installing tools and libraries for react.

1.2 Why a banking application?

1.2.1 Explanation of why I chose this project

A banking application is broad in scope and offers many questions to the developer such as how can I optimize load times and how can I ensure user data is secure. I think questions such as these offer the potential for growth in the areas of design and problem solving - which are two of the most major skills a software developer can possess. I feel that an application such as a multi-user banking system can be beneficial to my career and help to improve my skills as a developer. Banking applications also have the potential

to offer a wide array of features and are ubiquitous in the real world, think major banks such as AIB & Bank of Ireland. Banking systems also offer a broad range of problems such as security, design and usability.

1.2.2 My Contention with existing online banking systems & how I plan to improve upon them

The current generation of online banking systems or at least the ones I have used tend to have a variety of problems. These problems are glaringly obvious to most people and the main problems include but are not limited to: usability, appearance, lack of personalization & lack of information given to user. I will how I plan to solve each of these problems below:

- **Usability:** I aim to provide an intuitive and cutting-edge user interface using the latest react libraries to provide the user with an easy to understand banking application. All features will be easily navigated to using a navigation bar and I will aim to make features as obvious as possible to the user.
- **Appearance:** The UI of the modern day online banking system tends to be absolutely depressing. I aim to reduce this by adding in a responsive UI and to offer the user a vibrant online banking experience.
- **Lack of personalization:** I aim to make this application very personal to the user by adding in personalized expenditure charts and giving the user a unique and inimitable banking experience.
- **Lack of information:** Modern banking applications sometimes display a lack of information given to the user. I plan to solve this by offering the user expenditure charts, reports and also by sending automated emails to them when their account balance falls below a user specified number.

1.3 Requirements

Below I will include the requirements for this application and expand upon them.

- **Multiple Users:** This application must allow multiple users to execute simultaneous banking and user sessions must be independent of each other.

- **Secure:** Database information must be encrypted
- **Accurate:** All statments and user information must be accurate.
- **Login/Logout** The user must be able to login and logout
- **information**: The user must be able to view all information related to them (eg: statments, withdrawl dates etc.)
- **Graphs/Charts**: The banking app must display expenditures and credit in graphs and charts generated from python scriptss
- **Emails** The application must be able to email the user a forgot password if they forgot their password and alos be able to email the user if budget controls are turned on.
- **Register** The user must be able to register new accounts using an email and password also ensure that it cannot be an email that already exists.
- **Delete account** The user must be able to terminate their account and all information that exists about the user must be purged from the server.
- **Change information** The user must be able to update all their personal information in relation to their account except obviously banking statments and balances.
- **User sessions** The application must use cookies to maintain a user session and ensure that the cookies do not last more than a specified timeframe max of a day.

1.4 Outline of chapters

Below I will outline the chapters that my Dissertation is broken up into and give a brief outline of each one.

1.4.1 Context

In Chapter 2 I will discuss the context of my project and how online banking applications have affected the modern age and traditional banking. I will research how online banking came about and how it is useful for the consumer as well as the bank.

1.4.2 Methodology

In Chapter 3 I will discuss the methodology I followed and how it affected my project and productivity. I will also discuss my how I planned to complete the project and discuss the methodologies I utilized in completing this project. I will discuss why I chose these methodologies and give the reader an insight into how this application was developed.

1.4.3 Technical Review

In chapter 4 I will discuss the technical aspects of this project and discuss how they impacted the development of this project and why they were implemented. I will discuss the MERN stack in more detail and how it was utilized to create a full-stack online banking application.

1.4.4 System Design

In Chapter 5 I will explain the architecture and design of this project. I will use graphs and diagrams to explain how the application is designed and how it will function when deployed. I will also present some of the code I used and how it is used to perform various functions of the banking application.

1.4.5 System Evaluation

In chapter 6 I will analyze the finished product. I will test the system and evaluate if it is up to standard and meets all the requirements I have specified. I will test if the scalability, security and the UI to ensure that the user is provided with the features outlined in the requirements section.

1.4.6 Conclusion

In chapter 7 will briefly outline what I learned from this project and highlight all my findings from previous sections. I will also discuss the impact the project had on my skills as a software developer and how it helped me to grow as a developer. I will also discuss what I would do differently if I had to do the project over again.

Chapter 2

Context

- Provide a context for your project.

2.1 Project Objectives

  - To provide safe & secure online banking
  - To provide an intuitive UI that can be easily navigated by the user
  - To provide user generated statistical analysis of expenditure
  - To provide a multi-user server and banking service
  - To provide a RESTful API to the banking service(client/server totally independent ,stateless environment, caching)
  - To provide a scalable application
  - To provide user with security using encryption for the mongo database
  - To limit loadtimes of traditional online banking eg. 365 Online Banking and others

- Briefly list each chapter / section and provide a 1-2 line description of what each section contains.
- List the resource URL (GitHub address) for the project and provide a brief list of the main elements at the URL.

2.2 Filler

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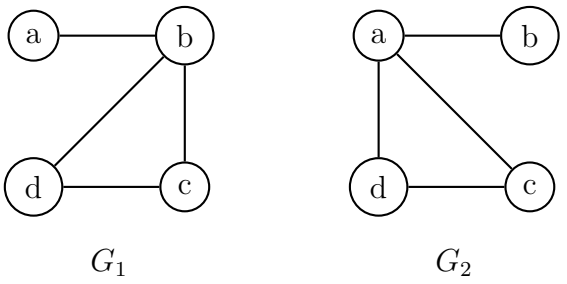
Chapter 3

Methodology

About one to two pages. Describe the way you went about your project:

- Agile / incremental and iterative approach to development. Planning, meetings.
- What about validation and testing? Junit or some other framework.
- If team based, did you use GitHub during the development process.
- Selection criteria for algorithms, languages, platforms and technologies.

Check out the nice graphs in Figure



G_1 G_2

Figure 3.1: Nice pictures

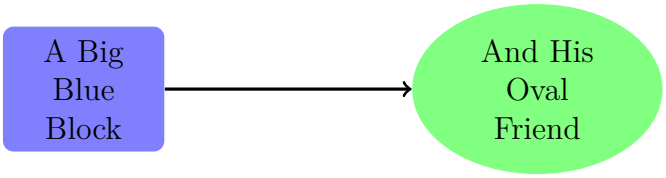


Figure 3.2: Nice pictures

Chapter 4

Technology Review

About seven to ten pages.

- Describe each of the technologies you used at a conceptual level. Standards, Database Model (e.g. MongoDB, CouchDB), XMl, WSDL, JSON, JAXP.
- Use references (IEEE format, e.g. [1]), Books, Papers, URLs (timestamp) – sources should be authoritative.

4.1 XML

Here's some nicely formatted XML:

```
<this>
  <looks lookswhat="good">
    Good
  </looks>
</this>
```

Chapter 5

System Design

As many pages as needed.

- Architecture, UML etc. An overview of the different components of the system. Diagrams etc... Screen shots etc.

Column 1	Column 2
Rows 2.1	Row 2.2

Table 5.1: A table.

Chapter 6

System Evaluation

As many pages as needed.

- Prove that your software is robust. How? Testing etc.
- Use performance benchmarks (space and time) if algorithmic.
- Measure the outcomes / outputs of your system / software against the objectives from the Introduction.
- Highlight any limitations or opportuni-ties in your approach or technologies used.

Chapter 7

Conclusion

About three pages.

Appendices

Appendix A

Preamble & Intro

- Link to my github Go to page 3

Bibliography

[1] A. Einstein, "Zur Elektrodynamik bewegter Körper. (German) [On the electrodynamics of moving bodies]," *Annalen der Physik*, vol. 322, no. 10, pp. 891–921, 1905.