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|  | MANIPAL INSTITUTE OF TECHNOLOGY  (A constituent Institute of MANIPAL UNIVERSITY)  MANIPAL - 576 104, KARNATAKA, INDIA |  |

Industrial Training

on

Web Application Development using MongoDB

SUBMITTED

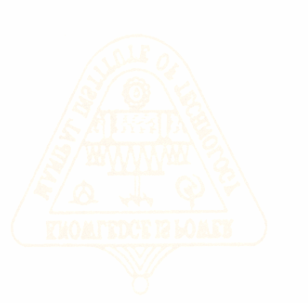
BY

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Under the Guidance of:

Pandarinath Siddineni

Director

Informatics In Context Med. Software IPL

Certificate Copy <Left bank intentionally>

CONTENTS

## ABSTRACT:

# INTRODUCTION:

I am Srivatsava Gummalla currently studying in the 7th semester of Computer Science and Engineering. This project is the part of my Internship program which was done in the company Informatics In Context Medical Pvt. Ltd under the guidance of Pandarinath Siddineni. The company develops healthcare software. The current project is a physician and disease codes lookup software which is used to locate a physician of a particular specialty in a given location. This software is a web application which has been developed using the full stack programming approach.

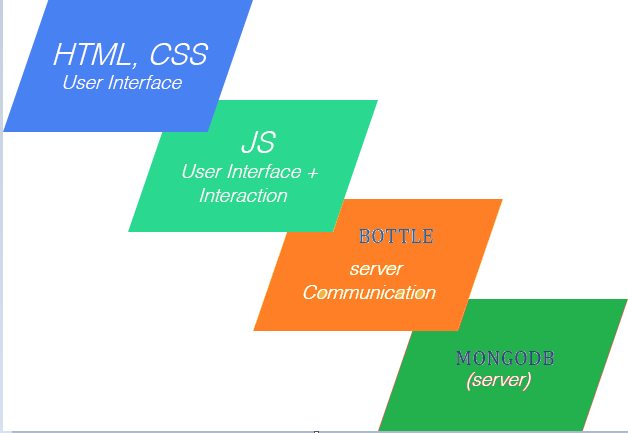
PROBLEM DEFINITION (PROJECT)

In the healthcare department, the ICD codes are provided for the diseases and NPI codes are given for each physician. Based on the disease code and the location of the patient the nearby physician with a relevant specialization needs to be suggested. The ICD codes have two versions which are the ICD-9 and the ICD-10. The presently used codes are the ICD-10 but the older ICD-9 codes are still used at some places. A lookup system for the relevant ICD-10 code for an ICD-9 code is needed.

1. Understand various tack elements used in web based application development.
2. Hands on experience with development tools (Eclipse, GIT, GIT Issues, DB Management etc.)
3. Study Healthcare Domain and Understand ICD codes and its usage.
4. Design and development of Databases for ICD and NPI databases using MongoDB
5. Web application development for:
   1. ICD look up
   2. ICD-9 Vs ICD 10 conversion
   3. Physician lookup application
6. Publishing API (web services) for
   1. ICD9 and ICD-10 lookup
   2. NPI database loop
7. Database optimization for large dataset like NPI database

# STUDY — FULL STACK WEB DEVELOPMENT PLATFORMS:

Full stack means a collection of software used in developing a complete web application. It can be broadly classified into front-end and back-end development. The back-end development consists of a server, a database and an application to communicate with the database. The front-end development consists of web pages and client-side code which the user can directly interact with to use the application. There are various kinds of stacks available based on the programming languages that are chosen at the different stages in development. Some of the most common examples of full stack are LAMP, MEAN etc.



## Stages of full stack:

1. Database:

Database is used to store all the data related to the service being provided by the application. The data stored in a database needs to be available at all times and it should be able to maintain the consistency of files. In the current project, a NoSQL database was chosen as it emphasizes on horizontal scalability. The database used is MongoDB. This database is a part of MEAN stack. It is easy to use as less restrictions are provided on data storage. The mongod server is used to provide access to the mongo database.

1. server-Side code:

The server-side code is the code used to build the backend software of the website. These codes, which are also called scripts, are designed to run on a server and interact with permanent storages like databases. It facilitates the transfer of data and also powers functions in dynamic web applications. It is also used to build the application programming interfaces(APIs). Some of the server-side scripts are PHP, Ruby, Python etc. In this project, the Python’s Bottle MVC framework has been used to develop the server-side scripts.

1. Client-Side code:

This code is the code which is used to develop the webpages and is part of the front-end development. It is used to generate the web pages and provide user interaction and interface. The HTML, CSS languages are used to provide the interface and develop static webpages. The JavaScript is used to provide interaction for the user and make the web page dynamic.

1. Middleware:

Middleware is computer software that connects software components or applications. It is present along with the server-side scripts in a web application and provides enhanced performance. The software consists of a set of services that allows multiple processes running on one or more machines to interact. The common middleware services are CORBA, DCE etc. In the current project, no middleware has been used.

One of the full stack technologies which is currently gaining popularity is MEAN stack. This stack uses MongoDB, Express.js, Angular.js and Node.js.



In MEAN stack the MongoDB is a NoSQL database and uses JSON style documents for data representation. The Express.js provides the server framework for web applications. Angular.js is a front-end java script framework to develop the client-side architecture. Node.js is a concurrent JavaScript environment for building scalable and fast web applications. The benefits of using MEAN stack is that the entire code can be written using Java Script. It supports the Model View Controller(MVC) framework. The other advantage is the use of JSON to transfer the data and the huge module library of Node.js.

# ARCHITECTURE AND DESIGN:

Development Platform:

1. Python

Python is an easy to learn and easy to use language for the development of software. It offers high readability and efficiency for web development. The python version 3.6.0 has been used in this project. Python also has a lot of support from the community which was helpful for quickly solving the issues encountered when programming.

1. Bottle

Bottle is a fast, simple and lightweight WSGI micro web-framework for Python. Bottle version 0.12.13 has been used for the server-side scripting in the project. It is used to host the server. It is used in routing and in creating templates. It has a built in HTTP development server and has convenient access to form data, file uploads, cookies, headers and other HTTP-related metadata.

1. MongoDB

MongoDB is a NoSQL and document oriented database. Data is stored in the form of JSON documents in the database. The MongoDB version 3.4.0 has been used in this project. It provides the database for storing documents and a server for accessing the database. This database is used in storing the NPI physician data and the ICD codes. These data are first imported to the database and then is made available through the server.

1. MongoEngine and PyMongo

PyMongo is a Python distribution containing tools for working with MongoDB, and is the recommended way to work with MongoDB from Python. MongoEngine is a document object mapper for working with MongoDB. These software are used in establishing connection to the database and to write queries to the database. The model of the collection that is used to store the records in the database is also designed using MongoEngine.

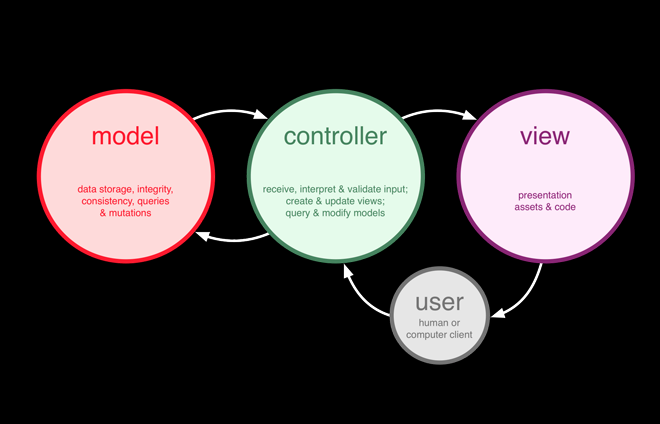
1. HTML, CSS

The HTML is the standard markup language for creating web pages. It is used to design static web pages. CSS is a language that describes the style of an HTML document. In the front-end development, the client-side code has been written using HTML and CSS as the base.

1. JavaScript

JavaScript is a high-level, dynamic, weakly typed, object-based, multi-paradigm, and interpreted client-side programming language. This is used alongside HTML and CSS in creating dynamic and interactive webpages. The jQuery using Ajax has also been implemented in this project. As the Mongo database stores data in JSON format dealing with these objects is easier when using JavaScript.

Bottle MVC framework: (Model-View-Controller):



The Model-View-Controller (MVC) architectural pattern separates an application into three main components: the model, the view, and the controller. This pattern has been used for the development of the product. The Model component corresponds to all the data-related logic that the user works with. In this project, all the collections present in the database have been created as models using MongoEngine and have been titled starting with the word model. These models are used when the data is being imported to the database. The View component is used for all the user interface logic of the application. It is these views that are visible to the user. The template files of bottle have been created as views and have been titled starting with the word view. These views are written in HTML, CSS and JS. Controllers act as an interface between Model and View components to process all the business logic and incoming requests, manipulate data using the Model component and interact with the Views to render the final output. The controller files in the project have been written using python’s bottle framework. These files have been named starting with the word cnt.

Advantages of using an MVC framework:

1. Faster development process
2. Ability to provide multiple views
3. Modification does not affect the entire model
4. Support for asynchronous technique

NO SQL Data Bases:

Why MongoDB?

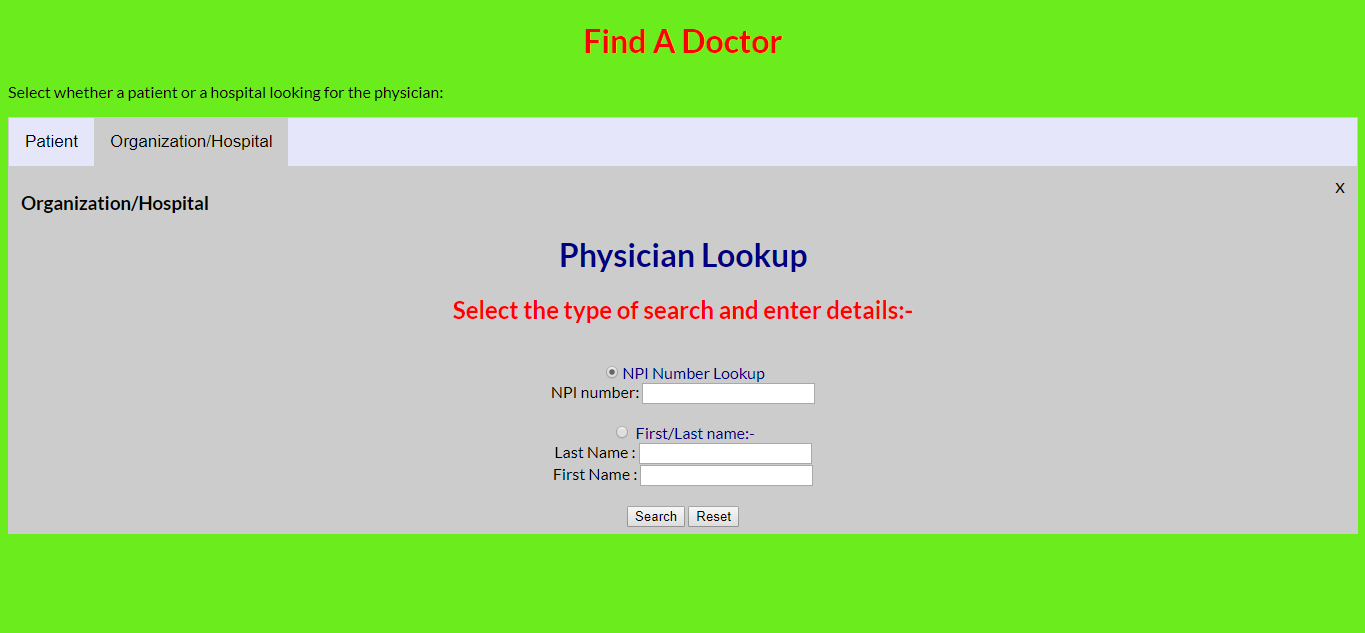
Mongo Data Base:

DEVELOPMENT METHODOLOGY AND TOOLS

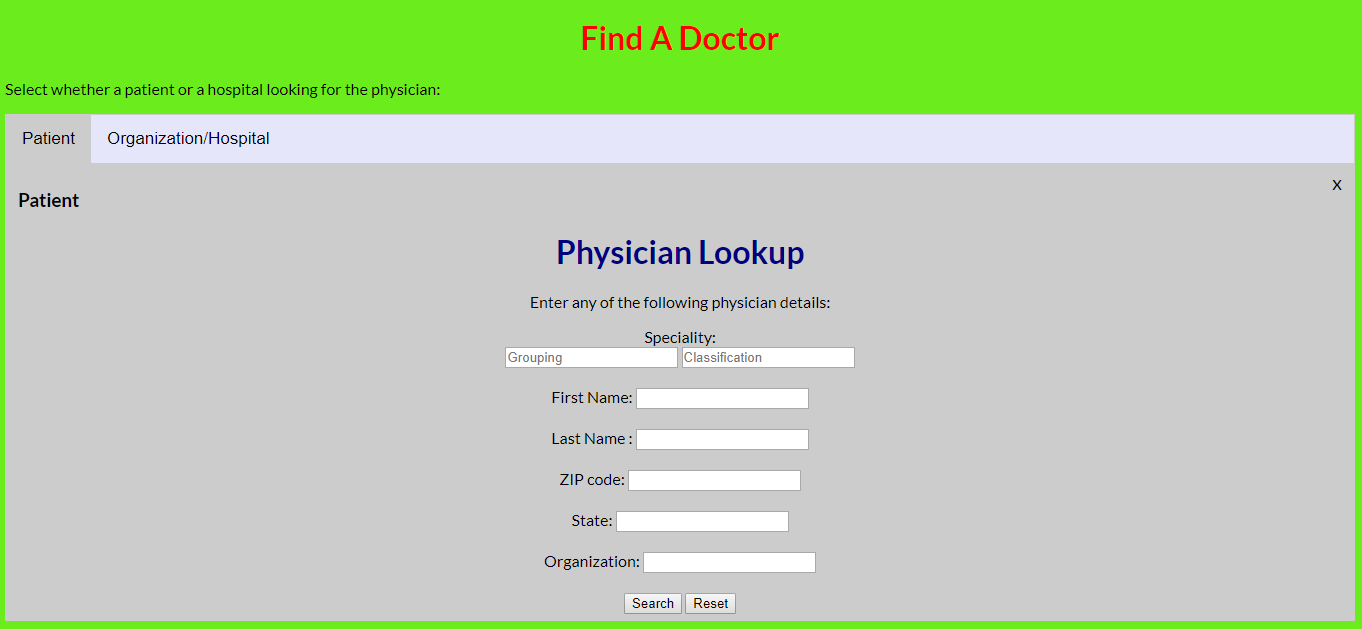
1. GitHub: Version Control and Configuration Management
2. RoboMongo, Version-XXX: DB administration and Visualization
3. Eclipse IDE Neon Version-XXX
4. Task Assignment and Issue Tracking: Git Issue

# RESULTS AND TESTING:

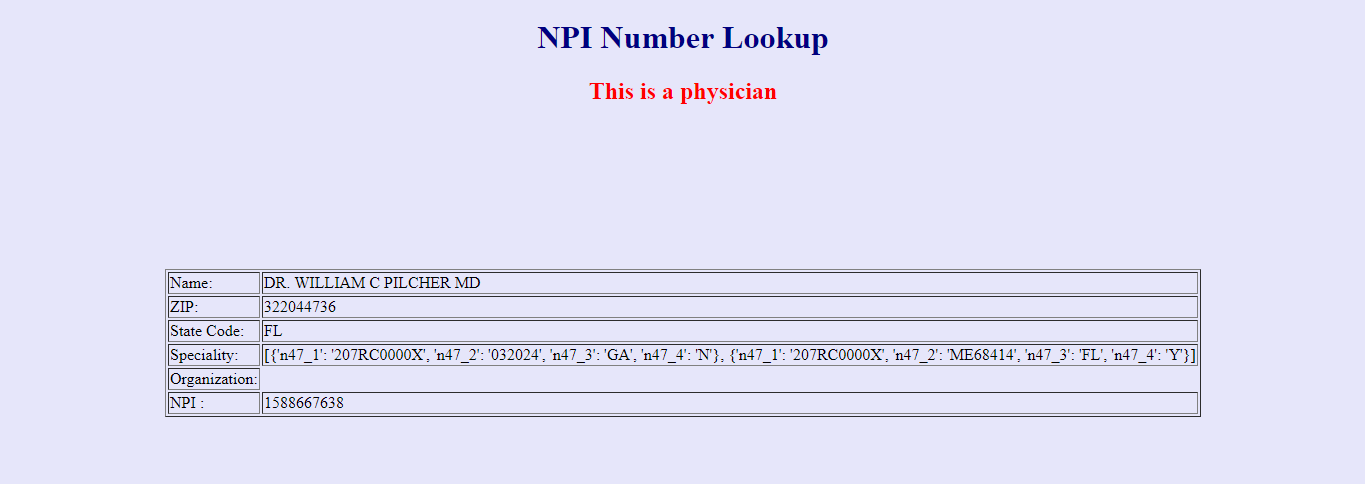
1.Physician Search for organizations based on the NPI number or the first/last name



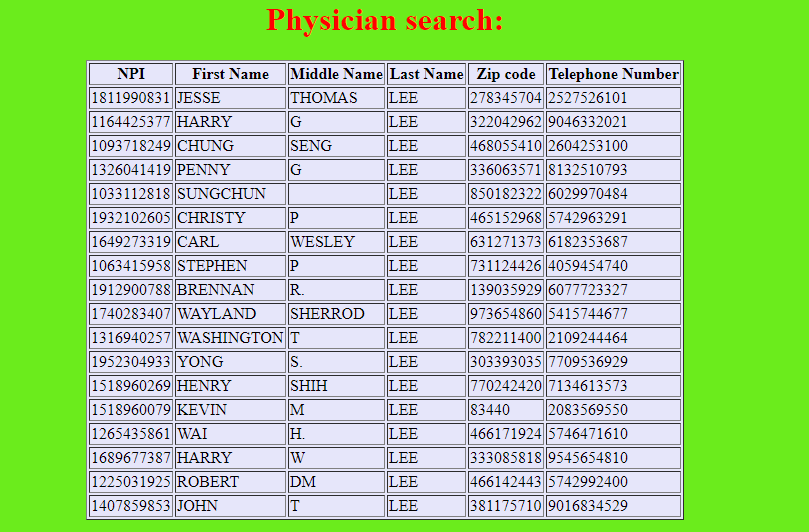
2.Physician Search for individuals based on specialty and location



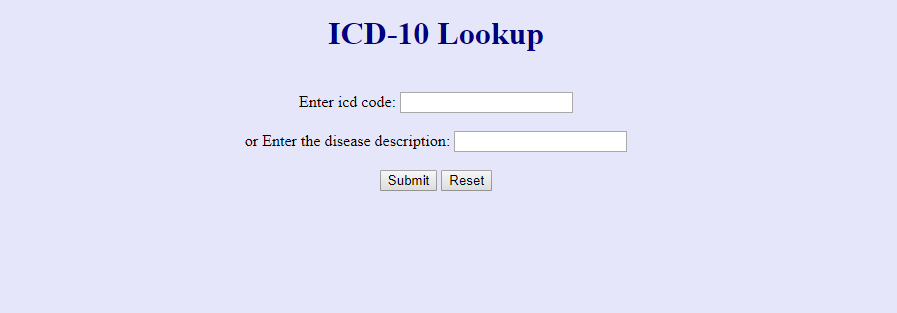
3. Display of physician details based on NPI number

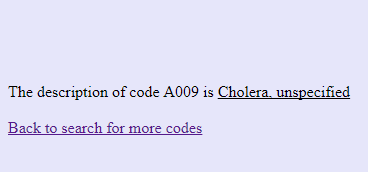


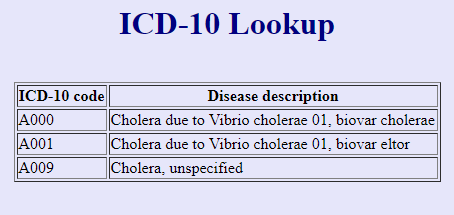
4.Physician search given first name or last name



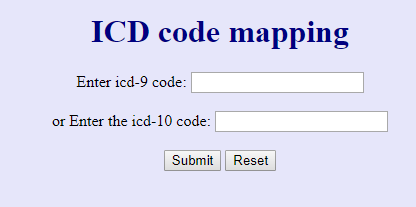
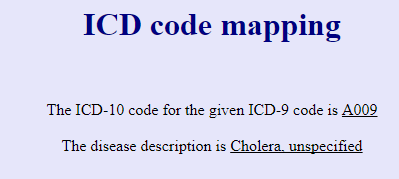
5.ICD code lookup:







6.ICD9 to ICD10 mapping:



CONCLUSION

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1. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68-73.
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6. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

**INFORMATION**

**(Regarding Industrial training)**

**IV year B.Tech. (CSE)**

1. Industrial training could be training, internship, to be completed before 7th semester for a minimum period of 4 weeks
2. Certificate from the organization citing the date of commencement of the training and the end date (minimum of 4 weeks) is essential.
3. The certificate should preferably contain the word **“industrial training”** in it.
4. It should be attested by the organization head or any concerned authority.

The following information should be present in the industrial training report.

1. Front page
2. Copy of the Certificate from the company in the company letterhead
3. Abstract ( 1 page)
4. Details of the organization (1-3 pages)
5. Information acquired during the study period (10-20 pages)
6. Conclusion (1 page)
7. References in IEEE format

Font size 12, spacing 1.5 with proper justification.

Industrial training coordinator H.O. D ( Dept. of CSE)

Shanthi P.B