Data Structures and Algorithms

Documentary Report

Communicare is a social web application the aim of which is to provide a platform which helps in the exchange of goods or services between the direct users that put up requests on the forum. Depending on the request object, posts relating to it will appear in sorted order of locations from nearest to farthest for the user. This way they can connect with the owner of the desired post as per their location *and* time of comfort.

This application was mainly created by using a Python web framework called Flask which provides an easy to use interface and libraries for a complete website development along with the management of front end. Our work was done on libraries such as Flask-WTF and WTFforms which allows for form validation and helps to avoid Cross-Site Request Forgery (CSRF) easily. Flask-login which allows the creation of a login form in order to have a personal user-account access system, Flask-SQLAlchemy which makes the creation, access and maintenance of relational databases fairly easier and this is where we implemented our sorting algorithm. We used Bootstrap (a powerful HTML, CSS and JS library) for front end design and web flow and finally, Geopy library for handling location of user.

The flow of work was divided among the members over the period of the month. We first created forms for the various pages of register, login, post etc. as well as the front end design along with these. Then we created routes between these pages for the URL connections from page to page as required. Then finally, we created our relational database that is the main piece of data we work with; we retrieve the data of the posts of users from the database and send it into our sorting function for the final step.

Our main backend operation was based on sorting the posts according to the user that has logged in or as per his object of interest. The sorting algorithm makes use of the quick-sort algorithm which has the complexity of O(n log n) for datasets that are not very large (which is the case in our system) and so that makes it faster. It gets two inputs; the post with whose respect the location is sorted (the current user's) and the entire database of posts which are being sent as a list of dictionaries where each dictionary corresponds to an individual post by different users. Every post or dictionary contains the key of location which has the latitude and longitude coordinates of the user's locations (of the respective post). The distance between the current user's coordinates and every one of the coordinates in the dictionaries in the list is calculated (with the help of a helper function) and then quick sorted in ascending order in the list itself. That is, the dictionaries are sorted are per their 'location' key whose coordinates have the minimum distance with the current user. The sorted list of dictionaries is then returned and formatted as per the SQL requirements, then sent back to the database where it was retrieved from and finally displayed for the current user. Every post or dictionary is stored in the system securely since we used hashed passwords with UTF-8 encoding for every user and provide a secure backend data protection for every individual.

Throughout this process, we coordinated well with each other with never any complaints or hassle; this project was a success in terms of team work, cooperation and product building even though we think we can do so much more in order to actually launch this web application for official use.

This application could very well prove to be fruitful in times like this where emergencies now seem more frequent than ever due to the lockdown and necessities seem to lack in households and companies. Givers and takers can easily connect and share resources without any third party involvement and thus allow for a safe maintenance of social

distance as well as quick arrangement of resources that might save someone's job, or allow them to create a dish they've been craving for days without ending up at the supermarket and having to ensure many measures to stay safe and hygienic.

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