Lab 1 – Study Buddy Description

John Crotzer
CS 411

Mr. Thomas Kennedy
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1. Introduction

A study group is a collection of people with similar goals who wish to share and improve their knowledge through collective course-based studying. The benefits of a study group are very well documented. Study groups allow for students and other users to share knowledge collectively. A group setting allows everyone to motivate each other to succeed (Benefits of Joining a Study Group 2018). A study group can also help with mental health aspects of stressful exams or tests. Surrounding one’s self with other highly motivated people will allow for the change of decreased anxiety and stress that comes from a difficult examination. Study Buddy not only aims to raise grades and aid students in passing stressful exams but also aims to improve overall mental health.

Study Buddy will be a web-based application that is engineered to display on any home desktop computer or mobile computing device. Study Buddy’s main intent is to streamline the arduous processes of forming an effective study group. Study Buddy will also greatly aid those students or users who cannot attend a live section of a course due to geographical issues, i.e., online students. Online courses are becoming a much more viable option as the Internet grows and connects the world around us. Or the application will aid students who have anxiety and may not want to approach their fellow peers about forming a study group.

Figure 1 is a graphical representation of the current process one must navigate to form a study group without the aid of the Study Buddy application. A student must first take the initiative and approach fellow classmates directly or post on the often forgotten about discussion board hoping for a reply. This current process is not scalable to larger groups for each student that joins the group effectively reduces the odds of success with each iteration of adding a new member thus decreasing the amount of people in the class to choose from. After a positive response is received, a hand full of applications are now required to set up the meeting, provide communication, and keep track of course work or collaborative documents. This, as shown, is a complicated and unorganized process. It actively encourages students to shy away from study groups.
As shown in Figure 2, The Study Buddy application will make finding people to form study groups a much more pleasant experience. After downloading Study Buddy, first time users will then be directed to a new user sign up page. During this process a user will create an account and fill out all relevant data pertaining to the user. These fields can include selected subjects interested in studying and their preferred study preferences. Some examples of possible study preferences are choosing from a selection of different learning styles, preferred study atmospheres, and dates available to meet for study sessions. After all the required user information is enter the user then starts searching for other users searching for similar study conditions and preferences. Once an acceptable group has been put together users can then use the application to communicate important details such as setting meeting dates for study sessions.
2. Study Buddy Product Description

The Study Buddy software’s main purpose is to bring enjoyment to study group formation. It will match the best possible candidates to ensure a successful group study is formed with maximum efficiency in wisdom pooling. This application aims to reduce stress on users learning new skills and increase knowledge gained with each study session.

2.1. Key Product Features and Capabilities

The chief and most central feature is at the heart of Study Buddy and that is the Intelligent Buddy Matching Algorithm, that is in place to ensure each user is pair with the very best candidates (Figure 3). With a mathematical process study buddy analyzes your search
preferences and matches it against other users of likewise selections. This is down by breaking down preferences into separate vectors and finding the cosine between the two vectors allows us to calculate the best matches for each user.

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>User: Jamal Williams</th>
<th>User: John Crotzer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Auditory</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Kinesthetic</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Reading/Writing</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

\[
cos\theta = \frac{\|\mathbf{W} \cdot \mathbf{C}\|}{\|\mathbf{W}\| \|\mathbf{C}\|}
\]

\[
= \frac{2}{\sqrt{2} \times \sqrt{3}}
\]

\[
= \frac{2}{\sqrt{6}}
\]

\[
\approx 0.8165
\]

Figure 3: Intelligent Buddy Matching Algorithm

2.2. Major Components (Hardware/Software)

Study Buddy will be strictly a software solution for the problem domain. This means no extra hardware is required to run the application. The application will be written in the Java programming language which employs the build once run anywhere paradigm. This notable feature of the Java language allows for anyone to run the software so as the user has the Java Runtime Environment installed. It will be built in strict adherence to the Java Enterprise Edition specification for web applications. The Java web application ecosystem is represented in Figure 4. The Study Buddy application will sit upon the Java Server Faces framework (JSF). This
framework is the combination of Java Server Pages and Java servlets. JSF combines these two technologies. JSF also comes with special tags for eye pleasing page components that makes for enhanced user experience and design. The codebase is deployed to an application container server called Glassfish that handles all requests and responses to and from the application. This container allows for multiple instances of the application to exist at once for handling heavy loads.

Data storage will be handled through Microsoft SQL Server 2017. The Java Enterprise Edition comes with a database interface known as the Java Persistence API (JPA). This interface will handle all back-end data persistence will efficiency and ease. Setting up a connection pool inside the Glassfish environment allows us to create multiple SQL connections to our database instead of spinning up new connections on request. These pre-built connections add performance and rollability to the application.

The application will also make user of several external APIs to add extended functionality to the application. Google’s robust “easy to use” APIs will be used to integrate the Google Hangouts chat like functions to provide communication for the study group. Github’s API will be used for code sharing and repository creation for technical minded users. We will leverage Google Drive as a way for users to create shared space for easy document sharing and collaboration.
3. **Identification of Case Study**

The target audience will be mostly in the realm of students of college or high school age. However, just because students are the main audience does not mean they are the only ones who can benefit from it. Several situations lend its self to Study Buddy’s domain. Professions who wish to attain accreditation within their field. Such as lawyers who would want to form together to pass a states BAR exam. Possible users may be cyber security professionals looking to pass their CompTia security+ certification. Lastly, Study Buddy can serve as a social media platform allowing academically interested individuals to come together and share a common interest in a subject. The end user need for this application can be seen below. Figure 5 is the current application for study group formation at Old Dominion University. It is a design that inspires little and offers even less in the terms of useful features.
4. Study Buddy Product Prototype Description

The Study Buddy prototype will implement the core features of the overall application. Core features include the user creation and storage of user preferences. It will also include the proprietary Intelligent matching System that allows for complex analysis of user data for expert matching. It will also leverage Google Hangouts for easy communication for study group members.

4.1. Prototype Architecture (Hardware/Software)

Since the Study Buddy software is a software only solution no additional hardware will be required to operate the application. The prototype, much like the final version, will also be written in the Java programming language to offer cross platform compatibility.
4.2. Prototype Features and Capabilities

The prototype will feature the Intelligent matching system to aid in the formation of study groups. It will feature easy to navigate user interface to provide a clean and uncluttered view for every user. The prototype will also feature Google Hangouts integration for communication for group members. A detailed list of every feature available in the Study Buddy prototype is shown in Table 1.

4.3. Prototype Development Challenges

The main challenge in development of the application will be technical unfamiliarity. This will stem mainly from developers who have never worked with the frameworks the application will require. This lack of experience will be the main bottleneck in application development. Although, while lots of challenges remain in the construction of the web application. It would be amiss to not mention the lack of experience the lead engineer has in managing so many engineers.
<table>
<thead>
<tr>
<th>Features</th>
<th>Study Buddy Final Product</th>
<th>Study Buddy Prototype</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GUI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Login</td>
<td>Allows user entry of authentication credentials</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>New User</td>
<td>Allows a user to create an account</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Study Preference Setting</td>
<td>Allows users to set study preferences for intelligent buddy matching algorithm</td>
<td>Will be implemented with limited study preference fields</td>
</tr>
<tr>
<td>Search for buddies</td>
<td>Allows user to search for study buddies</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Create a study group</td>
<td>Allows user to create a study group</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Set wait time</td>
<td>Allows user to set wait time in case of no matched buddies found</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td><strong>Features</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Web Application</td>
<td>The way in which the user will interact with the Study Buddy application using a web browser</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Mobile Application</td>
<td>The way in which the user will interact with the Study Buddy application using their smartphone device</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Private Message</td>
<td>Allows users to send and receive private messages within the Study Buddy App</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Block buddies</td>
<td>Allows users to block buddies with different goals</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Partner match by subject of interest</td>
<td>Matching Study Buddies by their own subject interest</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Intelligent Buddy Matching</td>
<td>Matching Study Buddies with the proprietary algorithm</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Google Hangout Integration</td>
<td>Allows users to integrate their Google Hangouts accounts for setting meeting times and web conferencing</td>
<td>Will be implemented</td>
</tr>
<tr>
<td>Slack Integration</td>
<td>Allows users to integrate their Slack accounts, allowing channels to be made to aid in communication between Study Buddies</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Codeshare integration</td>
<td>Allows users to share their code real time with their Study Buddies</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Schedule syncing with &quot;Buddy&quot;</td>
<td>Allows users to make matches with Study Buddies based on the availability they input</td>
<td>Will not be implemented</td>
</tr>
<tr>
<td>Rate your buddy</td>
<td>Allows users to provide feedback on their Study Buddies</td>
<td>Will not be implemented</td>
</tr>
</tbody>
</table>

Table 1: Prototype Features

5. Glossary
**Auditory Learner** - best comprehend information by listening to information rather than reading it or seeing it visually.

**Business Logic** - The programming that manages communication between an end user interface and a database.

**CRUD** - Stands for Create, Read, Update, and Delete. Basic database/application operations.

**Entity Class** - A simple Java Class with member variables and getter and setter methods defined.

**JPA** - Java Persistence Application Programming Interface is an API for handling all database operations such as storing or retrieve entities from the database.

**JSF** - Java server faces is a java framework that couples the view and servlet into one managed component.

**Kinesthetic Learner** - best comprehend information by participating in activities or solving problems in a hands-on manner.

**ORM** - Object-relational mapping. Technique for persisting objects into a database table. Tables are modeled after Entity classes.

**Procrastination** - delaying or postponing a task, which needs to be completed, often to the
detriment of the procrastinator.

**Prototype** - the prototype of Study Buddy will be a reduced scale version of the final product, and will demonstrate the functionality of the completed product in a simulated environment.

**Reading/Writing Learner** - best comprehend information by reading texts to further absorb information by condensing and rephrasing it in traditional lecture and note-taking environments.

**Study Group** - a small group of students with similar goals who meet regularly to review course material and prepare for exams.

**Visual Learner** - best comprehend information by visualizing relationships and ideas through maps, charts, diagrams and even essays.

**Web Application** - an application that uses a website as the interface

6. References

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