

Lab 1 – Draft

Michael Nguyen

CS 411W

Dr. Hosni

1/24/2025

Version 1

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1 Introduction

In a constantly changing world where most daily activities have been innovated such as using phones to converse with family or driving cars for transportation, there lies a consistent habit that never changes, eating food. Something that is so basic yet overlooked, we need to eat nutritious food everyday to survive and sustain our delicate ecosystem of a body. Even though people are taught the importance of nourishments and know how crucial it is for making sure everyone can eat, we have a continuing issue of food waste.

1.1.1 Cost of Food Waste

There are multitude of reasons people throw away food like products being expired, moldy, forgotten, or just finding it distasteful. Either way, there are negative impacts when we discard unused food which 1.3 tons of the ones we threw away costed us \$940 billion alone per year(Kitche Waste App). Individual products being thrown away every now and then is usually not noticeable but adds up to a decent cost when accounted for. If nothing changes, this will only add to the burden of family savings as financial liberty is limited for many across the world. Another type of cost would be societal as developed countries like the US battle with obesity while others in the developing world are combatting malnutrition and just making sure there's enough food to get by. The disparity of 783 million people affected by hunger in 2022 is eye opening and of great concern and suffering, but you have people in other countries that throw away bread because they forgotten to eat it for couple days (UN Environment). Another lens to look through would be how much we destroy the environment just to grow the food we eat every day. Growing vegetables and cattle herding takes up a lot of land and

local water sources to maintain and harvest these products yearly. Farmers would have to cut down trees, dig up soil, and clear any animals to shape the area to be suitable for use which devastates the delicate ecosystem and disrupts the life cycle processes severely. During the harvest process, some harvests are discarded if it doesn't look pretty enough to be sold or not to a certain standard even if it's edible causing food waste.

1.1.2 Food Insecurity

Food insecurity could be caused by lack of affordability or inefficient usage of current food stocks owned by families. The core root would be not having easy access to food which affected 2.8 billion people worldwide in 2023 (William & Mary). Not using what's available usually cost food to expire and be thrown away needlessly contributing to the overall cost of waste which should be addressed.

1.2 LivelyShelf Solution

There is a way to tackle this ongoing issue that can lift a burden suffered by millions of people every year. Introducing LivelyShelf, a software solution meant to tackle the problems of food waste within the household offering a way to reduce cost, keep track of personal stock, and saving money for use elsewhere. It gets very hard if a person has to list every food they own from the top of their head and remember their expiration date, one of the benefits of LivelyShelf is to keep track of the food stock and a calendar to know when it expires. A logistical app that allows the household to have better grasp of their food can keep them from buying excess amounts or know what to use up right away without letting it go to waste. These habit helping features would reduce financial cost as they become more efficient and informative of their actions benefiting the people as a whole.

2 LivelyShelfs Product Description

LivelyShelfs is a cross-platform food tracking app that assists the user in reducing food excess or wastage to help lift some burdens of the household. This software is designed to be accessible on android, IOS and website to allow great flexibility in user interaction.

2.1 Key Product Features and Capabilities

Our software can keep track of food expiration dates, inventory stock, community connections, recipe recommendations, and over vast information resources on the tracked food items. There's a personal calendar that would be used to visualize the tracked food items to limit any clutter of texts. LivelyShelfs's user friendly interface keeps the app simple and simple to interact with so there's no confusion.

2.1.1 Grocery Spoilage Tracking

The user takes a picture of the barcode of the food or receipt to log the food onto the calendar with their expiration dates and total count of the item as a base for the tracking system. The groceries can also be inputted manually if there's no barcode available to all multiple methods of input. The front-end display visualization would be through a calendar for each user so they can have easy access to know when the food will spoil and how much is left.

2.1.2 Informational Resources

Our WebCrawler would scrape the internet for the selected food and display possible recipes that the user can create with their current inventory. The user would know how much is needed for the recipe and when they decide on a meal it keeps track of

the inventory usage. This is one method of helping to create ideas that are possible to use up the items and not be thrown away.

2.1.3 Recommendations

Expanding on the information resources, the app would analyze current inventory and rate of usage to give the user options on their food stock. This let the users be guided on possible choices that impact conservation behavior like buying less of certain items that isn't consumed as often or what gets depleted at a fast rate. Behavioral efficiency allows for habit control and assist in prevention of food waste. Helps the user in understanding what needs are to be met and narrows the focus so users aren't overwhelmed by large amounts of information.

2.1.4 Community Hub

When there is food the user doesn't want to eat anymore but not let it go to waste, there's a feature where they're able to offer the item to the local community. Users can connect with local friends or guests so when an individual has extra inventory of certain food items, they can put it up within the community tab for others if they want it. This gives an alternative to throwing it away or letting it spoil within the household.

2.2 Major Components (Hardware/Software)

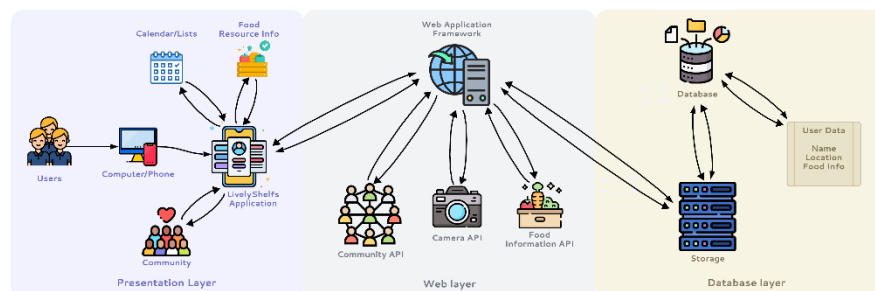


Figure 1: Major Functional Components Diagram

The hardware aspect would be the user accessing the application through a smartphone or computer. The photo can be taken on a food or inputted manually on the certain device. The data would be stored on a dedicated server to keep track of all inventories and the calendars. The software aspect would be the development tools such as java, python, NumPy, Apache and time with the first 2 being the languages for the backend while the rest are libraries. The framework would be utilizing Django and Junit, the database is constructed in MySQL and the front-end for user interface would be JavaScript, HTML, and CSS.

2.2.1 Three-tier Architecture

The three-tier architecture within our design are the presentation, web, and the database layer of our software. The presentation layer as shown in Figure 1 is what the user will interact with the for the application. The web layer would handle the process and connections between the presentation and the database in information handling. The database layer would handle the data storage and queries for the user inputs.

2.2.1.1 Presentation Layer

The development tools utilize in the construction of our front-end of the application consists of JavaScript, HTML, and CSS. JavaScript would allow for us to create functional buttons that the user can click or tap that leads to its designated purpose like inputting groceries button. HTML would allow for the framework of the user interface itself with a consistent format that can be displayed on cross-platform. CSS would handle the visual design to make sure that the display is well developed and aesthetically pleasing for the user experience.

2.2.1.2 Web Layer

The Web Layer would utilize the development tools Java and Python for the back end to retrieve and process user input. Implementation of Camera API and Web Crawler/Information API would allow for retrieval of data and accessing the web to give the most accurate information on the food item given. LivelyShelfs would also have a recommendations algorithm where the tracked food can be analyzed, and the Web Crawler will search for recipes or the best options to handle the current food items.

2.2.1.3 Database Layer

The database layer would be handled by MySQL for data storage and retrieval based on the needed data at the moment. If the user wants to check what is currently in their inventory or if the recommendations algorithm wants to know to look for recipes on the web it will interact with the database to find out. This would handle the user accounts, inventories, recipe, and information resources within the designated server for analyzation and later usage.

3 Identification of Case Study

The case study for LivelyShelfs would target and provide insight on the Customers, User, and Stakeholders. These are the target audience that would have weight in the understanding and investment of our app.

3.1 Customer

The customer audience that would benefit most from our app would be the head of the households or those within that handle or cook the food. These individuals would already be weighed down by the stress of important responsibilities like paying the bills, taxes, insurance and other management tasks that may leave them little time to handle the

food within their homes. LivelyShelfs will try to ease a part of their burdens so that they don't have to focus too much on food management and waste.

3.2 User

The user would be those that interact with our software application as some people may have difficulties keeping track of their food or forget how much they have of certain items and may accidentally buy excess. The application would be able to handle the tracking and management of food items so the user doesn't have to worry about over buying food or accidentally leaving some out to spoil.

3.3 Stakeholder

The groups that would have some stakes within relation to our app would be local communities, business/retailers, and environmental organizations. Like minded neighbors that wouldn't want their food to go to waste can connect with our app to facilitate the process of giving to one another with ease of communications. This builds a stronger local group that would strive for reduce waste and reduce the impact on the environment. Those that are in the restaurant or whole foods business may lack the knowledge themselves or have too many responsibilities to keep track of all the food items. This would help with tracking and organization to minimize their waste that are thrown out frequently. Environmental organizations that push for limiting human impact on the environment would morally align with our goals. It has been shown that harvesting crops take up a lot of land and natural resources within the local ecosystem so this software would help induvial behavior changes to help against that on the consumer end.

4 LivelyShelfs Product Prototype Description

The prototype that LivelyShelfs is currently in would help test and implement what search APIs or recommendation algorithms would work best for the software.

Compared to the final product, this would allow us to test and make sure all functions pass the specified requirements and have a functional framework of an app.

4.1 Prototype Architecture

The current prototype architecture that is designed for would be cross platform on IOS, android, and desktop. This is so that users can interact on a mobile device or within a stationary setting.

4.1.1 Hardware

LivelyShelfs is a software application that doesn't rely on any proprietary device or hardware to be constructed. The main goal is to have functionality on the cross-platform operating systems so most mobile devices and desktops can utilize and interact with the application without issue.

4.1.2 Software

The software we currently have is within a GitHub repository that utilizes JavaScript, HTML, and CSS that works as a web application at the moment. Basic information on what the app would be able to do and a visualization of each function and design UI are shown as well. The backend and database construction are currently in the design phase and will be refined and completed for the final product.

4.2 Prototype Features and Capabilities

The initial framework is displayed in a simplistic manner so that it can at least run, and further development can be made. The main capabilities like tracking and storing food data has not been constructed yet but are on a priority task list on how it will be developed. Further development on the back end and database will be done at a later date and have functionality.

4.3 Prototype Development Challenges

Some challenges would be the database design schema and algorithm searches for LivelyShelfs to use. There are multiple algorithms and processes that LivelyShelfs can approach with the construction of the architectures but is currently being researched on what is most compatible and effective. We are making sure that there wouldn't any function from the libraries within our development tools or algorithms we have researched to impede upon the development and may cause the software to not run and crash.

5 Glossary

API: Also known as "Application Programming Interface" it is a protocol that allows for different software applications to communicate with one another.

Community Hub: A part of LivelyShelfs that helps bring the community together and allows user interaction to share sustainable habits and tips.

Database: An organized collection of information stored electronically.

Food Insecurity: Not having access to enough food to meet one's needs or not being able to access quality food to meet one's needs.

Food Waste: Food that isn't used for its intended purpose or is not used before spoiling.

GitHub: A service that allows developers to collaborate on the development of projects and provides version control.

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JUnit: A testing framework for Java.

Landfills: A site where waste is disposed of, typically the waste is covered by soil.

Spoilage Calendar: An efficient and intuitive calendar provide by LivelyShelfs that notifies users of when their food is going bad

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Sustainability: A goal to avoid actions that harm the environment or deplete natural resources while still meeting one's needs.

Trello: A service that helps with project management and planning.

VSCode: Also known as "Visual Studio Code" it is a development environment used by the team that is compatible with many different languages.

Web Application Framework: Software platform intended to help developers in building web applications, providing access to pre-built tools and libraries.

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