Lab 1 – LivelyShelfs Product Description

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January 31, 2025

Version 1

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1 Introduction

Food waste is a growing problem worldwide. The US alone generated 66.2 million tons of food waste in 2019 (EPA, 2019). This can be food that simply isn't eaten after it is served, or food that is left to spoil. In addition, there can be mishaps in the production process that also result in food waste.

The food waste problem is more than just the fact that food is not being used for its intended purpose. The waste of food in households and across the world has cascading economic, societal, and environmental costs. In addition to this, food insecurity is another issue that is closely related to the food waste problem. Food insecurity is the inability for an individual to get food to meet their needs or access food resources, an issue that shouldn't exist on such a large scale in modern times.

Food waste is responsible for a shocking amount of economic loss. The UN Food and agriculture organization estimates that a 1/3 of the food produced every year is wasted (Shapiro, 2024). This estimate of food waste is equivalent to a total value of $940 billion wasted on food. The US alone is responsible for $218 billion of the total $940 billion (Shapiro, 2024). This loss is an almost unimaginable amount for the average person. If we take a closer look at the average American, they spend $1300 a year on wasted food, which is more than they spend on many other needs like gas, clothing, and home maintenance (Berard, A, 2020). This economic loss could be reduced greatly if a proactive approach was taken and people worked to reduce food waste.

The societal impacts of food waste are a little harder to see at first glance. Food waste can worsen other issues that are already present such as hunger and malnutrition. Even though such a

large amount of food is wasted annually, 783 million people were affected by chronic hunger in 2022 (Move For Hunger, n.d.). Food waste is not the only wasted resource in the process of food waste. Other resources like water and energy that are used in the process of producing and transporting food also end up misused when food is wasted. If these resources were put to good use instead of being wasted, perhaps issues like hunger and the environmental impacts of this waste could be lessened.

Agriculture, the process of growing crops and food production, accounts for 70% of water usage worldwide (Lewis, J, 2024). This massive amount of water usage is wasted when the food it is used to produce is also wasted. When food is wasted, it is often sent to a landfill. Of the food waste generated by food retail, food service, and residential sectors in the US, 60% of it is sent to a landfill (EPA, 2019). Landfills have direct negative impacts on the environment. Landfills are directly responsible for 8% of global greenhouse gas emissions (Move For Hunger, n.d.). Wasted food in landfills not only contributes to an already worsening climate crisis but also uses land that could be put to more productive use.

Food insecurity is a problem parallel to food waste. Food waste can worsen hunger and while food waste continues to grow food insecurity grows as well. In 2023, 2.3 billion people suffered from food insecurity, and in 2022, 2.8 billion people were unable to afford healthy diets (World Health Organization, n.d.). It is equally important to note that a larger portion of people in lower income areas and countries are affected by food insecurity and unable to afford healthy diets than those in countries with higher average incomes.

Food waste is a massive problem with cascading effects into society as a whole and the environment. Due to this, a solution needs to be developed to help lessen the problem and its consequences. The ideal solution to food waste would be to stop food waste before it occurs by

helping people understand how much food they need and encouraging them to not overindulge. However, if this is impossible, another key solution characteristic would be helping people lessen the impact of food they waste by introducing greener ways to dispose of food as opposed to dumping food into landfills.

Our solution to the problems of food waste and food insecurity is LivelyShelfs, an application designed for busy households and individuals with the goal to provide proactive approaches and tools to minimizing food waste such as easy grocery spoilage tracking. By reducing food waste, we hope to help people save money and implement more sustainable practices. LivelyShelfs provides many benefits to not only the user but also society. Through the reduction of food waste less food will end up in landfills resulting in lower emissions worldwide. When less food is wasted, less money is wasted as well.

2 Product Description

LivelyShelfs is a web application with the goal of helping households reduce their food waste in order to save money and have a positive impact on the environment. We hope to help green minded individuals reduce their food waste through grocery tracking and food sharing. LivelyShelfs aims to not only help individuals reduce their own waste but also connect networks of friends who can work together to reduce food waste community wide. While mainly focusing on reducing food waste we also hope to lessen the impact that food insecurity has on individuals and communities allowing them to grow and move forward together.

2.1 Key Product Features and Capabilities

LivelyShelfs' key features are grocery inventory tracking, recommendations for ways to use food about to spoil and to reduce waste based on user inventory and food usage, providing

informational resources based on user inventory, predictive waste analysis and Shelf Friends. Through Shelf Friends we plan to provide food sharing and messaging capabilities. The informational resources and recipe recommendations are provided through LivelyShelfs' web crawling capabilities.

Grocery spoilage tracking through LivelyShelfs is done through a visual calendar and list. Both the calendar and list show spoilage dates and have a color-coded system based on how soon each item will expire. LivelyShelfs offers two input methods for grocery tracking: manual input from the keyboard and barcode scanner input via camera.

LivleyShelfs plans to provide informational resources through web crawling. The goal is to crawl the web for information specific to user needs such how to store certain foods they may have, or green methods they can take to reduce food waste. This will also encompass things like freezing items so that they can be stored for longer, or donating packaged food that might not be used to local food pantries or food drives. If the unfortunate event does occur that some food goes to waste, LivelyShelfs will also crawl the web to provide users with information on the least harmful ways to dispose of the waste such as composting.

Recommendations for recipes and food sharing are also provided by LivleyShelfs. The recipe recommendations will require web crawling for recipes that include owned ingredients that will spoil soon. If the user or their shelf friends have the required ingredients available to share, the recipe will be recommended to them. Food sharing recommendations generally follow the same process as recipe recommendations. If a user has a food item that may spoil soon and there is no suitable recipe that uses the item, they will be recommended to share the item with their shelf friends.

Shelf Friends are close friends or family members that you would feel comfortable sharing food you might not use with. LivelyShelfs plans to bring these groups of people together to reduce food waste in communities. Users will be able to request food items that their friends wish to share and share items they may not use before they spoil with their friends. In addition to this we intend to implement friend-to-friend messaging to add a level of communication for users who may wish to share food or anything else with each other.

The keystone feature provided by LivelyShelfs is predictive waste analysis. Predictive waste analysis aims to directly target and reduce user specific food waste via analyzing trends in how food is used individually. For example, if a user continually buys a certain item and lets it go to waste, they will be notified of this trend. The goal of the notification is to make them aware of how they are wasting food and how much it is costing them while also encouraging better habits. We hope to prevent food waste before it occurs instead of giving alternatives of how to dispose of already wasted food with this feature.

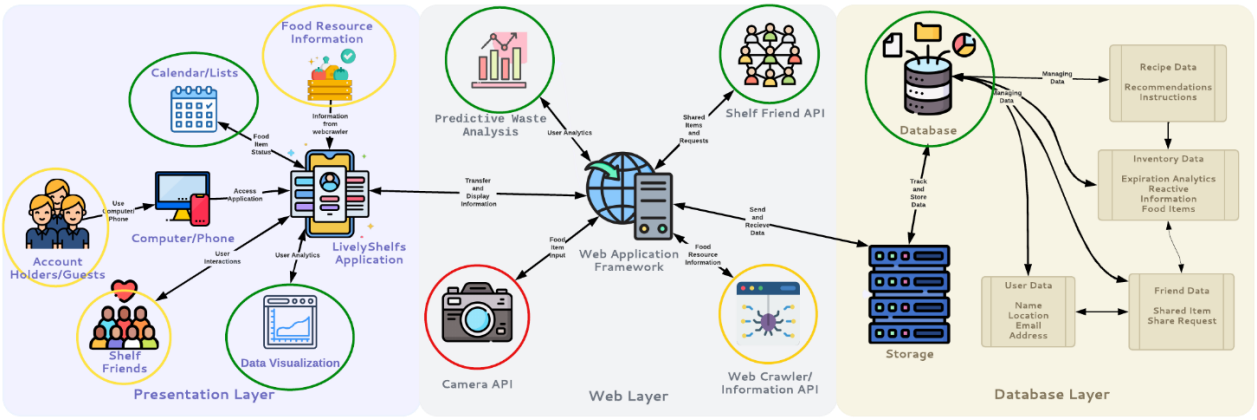
2.2 Major Components (Hardware/Software)

The LivelyShelfs application is made up of three separate layers. These layers are the presentation layer, the web layer, and the database layer. All three layers work together to bring our ideas to life and help those who use LivelyShelfs as a service.

The presentation layer consists of the UI/UX of LivelyShelfs. This is the layer where users will interact with the application and use features like the calendar and list for grocery tracking. Additionally, this layer is where shelf friends will be able to interact with each other. The presentation layer and web layer interact through the transfer and display of information.

Figure 1:

LivelyShelfs Major Functional Component Diagram



The web layer is the backend of the livelyshelfs application. This is where functionality like the web crawler for finding recipes and helpful information to users will be. The functionality for interacting with shelf friends will be a part of this layer, as well as functionality for all other features like grocery input into inventory and recommendations.

The database layer is where all of the application and user data will be stored and managed. This includes things like user inventory data, such as the groceries they have and when they will expire, recipes we plan to recommend to users, and friend data. The database layer and web layer interact through data operations such as the storage and retrieval of data.

3 Identification of Case Study

The main customer of LivelyShelfs is the heads of households. Ideally, our customers will be those who manage the food in their household and cook most of the food, as these people will be

the most mindful of what food they have and when they need to use it by. Our main customers will also likely be environmentally conscious individuals who are looking to reduce their waste.

LivelyShelfs' users share a similar profile to the customers: environmentally conscious people who are looking to reduce food waste. However, our users also extend a bit further than this. We are hoping to attract users who struggle to keep track of their food and would like an easier way to stay on top of things. LivelyShelfs also caters to people who are hoping to save money by spending less on excess food they end up not using. Users also include extensions of the customers, who are the head of their households, via account guests. Account guests would be anyone else who also lives in the house so that they may track extra things they buy or use.

LivelyShelfs' case study group could include multiple different groups such as community groups, businesses or retailers, and potentially political organizations. Community groups that may be interested in reducing food waste across their community and enriching their community to be more environmentally friendly are potential investors in LivelyShelfs, as it could help them reach their own goals. We have a similar perspective towards businesses like restaurants or food retailers who wish to reduce their own food waste. Chains could potentially add each other as shelf friends and transfer unused goods to another chain in need, reducing cost while continuing to provide their service. Political organizations have the same interest as local communities to become stakeholders in LivelyShelfs. They may wish to help their members/constituents to reduce food waste and create greener habits with the goal of creating a better society for everyone.

4 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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