CS328 Writing Assignment 2023

Mentor: Prof. Anirban Dasgupta

Understanding our campus life - Food Wastage Dataset 2019-20

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Content:

Link to our Netlify app:

Introduction

The aim of this project is to study the mess food wastage of IIT Gandhinagar, analyze the food wasting habits and suggest remedies to reduce food wastage. The mess halls in IIT Gandhinagar serve hundreds of students, faculty, and staff members each day. Despite efforts like display of food wastage through a white board, save food banners to minimize food wastage, a significant amount of food is still being wasted. This project aims to study the mess food wastage in detail and identify the factors contributing to it. By analyzing the amount of food wasted, we can gain insights into the patterns and habits of food wastage. Additionally, we conducted a Google form survey with the students to understand their preferences of food based on which we have conducted our analysis. Based on our analysis, we suggest remedies to reduce food wastage.Our ultimate goal is to help the mess hall in IIT Gandhinagar become more sustainable and reduce its environmental impact while also saving costs.

Dataset

Our data was collected from the food wastage log book at Jaiswal Dining Hall for the years 2019 and 2020. The data was manually recorded in the form of a PDF containing photos of the log book. We extracted the data from the PDF and entered it into an Excel sheet for analysis. During our initial analysis of the data, we discovered that there were missing months in the dataset. We addressed this issue by replacing the missing values with zeros. Additionally, there were some missing data points for specific meals on certain days. We took the average of the days around the same to account for it. We also collected mess menus from the mess secretary, seniors, and the data provided in the assignment. These menus were used to correlate the food served at the mess with the amount of food wastage. In our analysis with respect to food items, we have considered the mess menu and wastage data from July 2019 - December 2020 with the missing month as April 2020. For seasonal analysis, we consider the entire wastage data from Jan-2019 to December-2020.

Assumptions

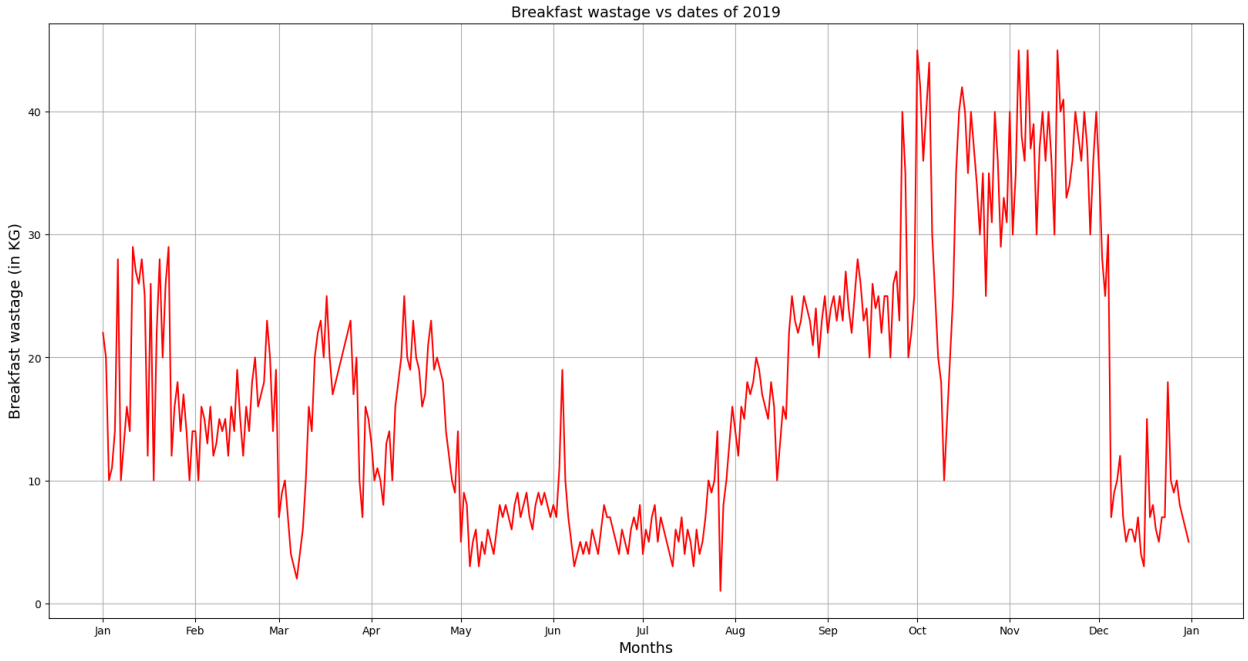
The dataset we have consists of the meal to meal basis wastage in addition to the total wastage for a day and the monthly mess menus. The assumptions that we have taken into account are as follows:

1. We have included only unique food items in every meal while creating the dataset and ignored the common items like daal, rice, chapati etc.
2. We have assumed that higher wastage corresponds to an increase in the consumption of the food.

Seasonal trends (2019)

The following chart shows the food wastage during the year 2019 for breakfast, lunch, snacks, dinner and total wastage. Each vertical black line corresponds to the end of the months of the year 2019. In 2020, due to Covid Pandemic, we did not perform the season trend analysis.

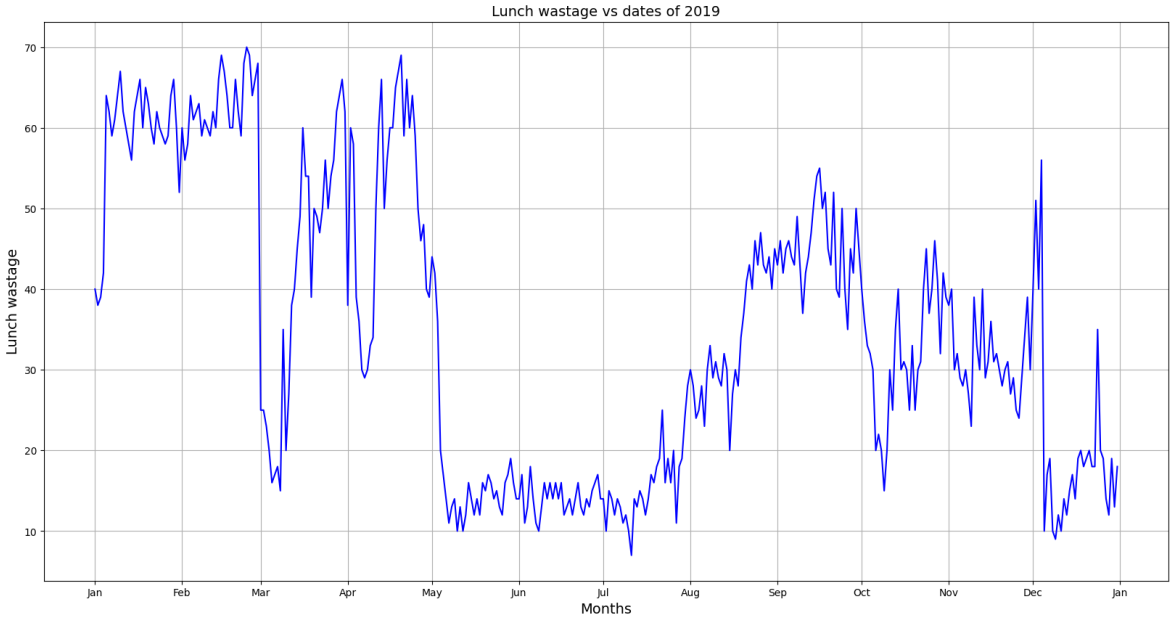
1. Breakfast



Observations

1. Food wastage is comparatively less in May, June, July, and December due to summer and winter breaks.
2. Sudden drop in food wastage in the middle 1st and 2nd semester, in the starting of March and September due to Mid-semester break.
3. Students do breakfast more in winters resulting in more wastage.

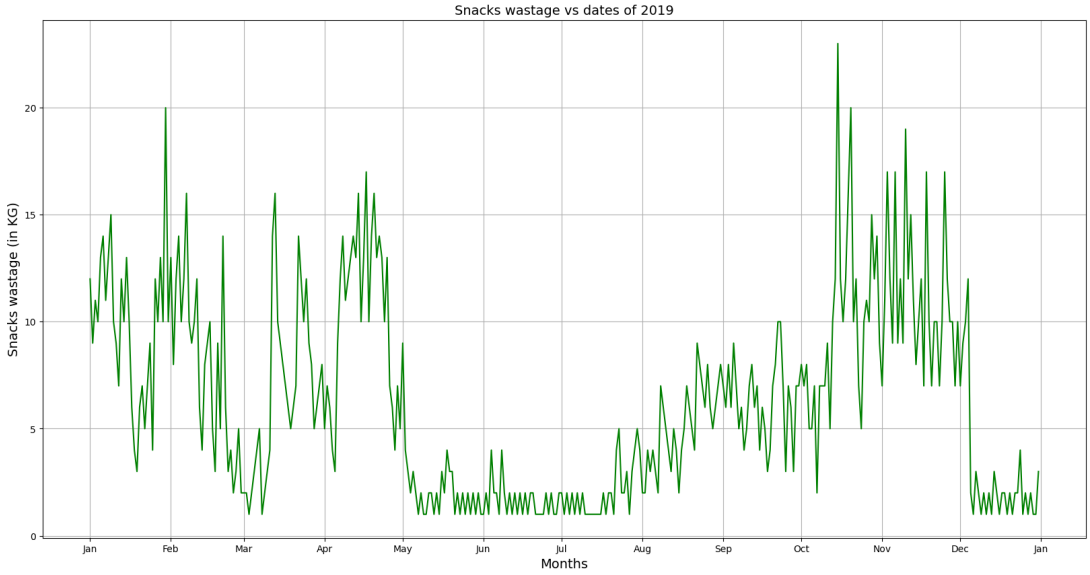
2. Lunch



Observations

1. Food wastage during 1st semester is more than the wastage during 2nd semester.
2. Students prefer to have lunch more after winter break as compared to after summer break. This leads to more wastage of food.

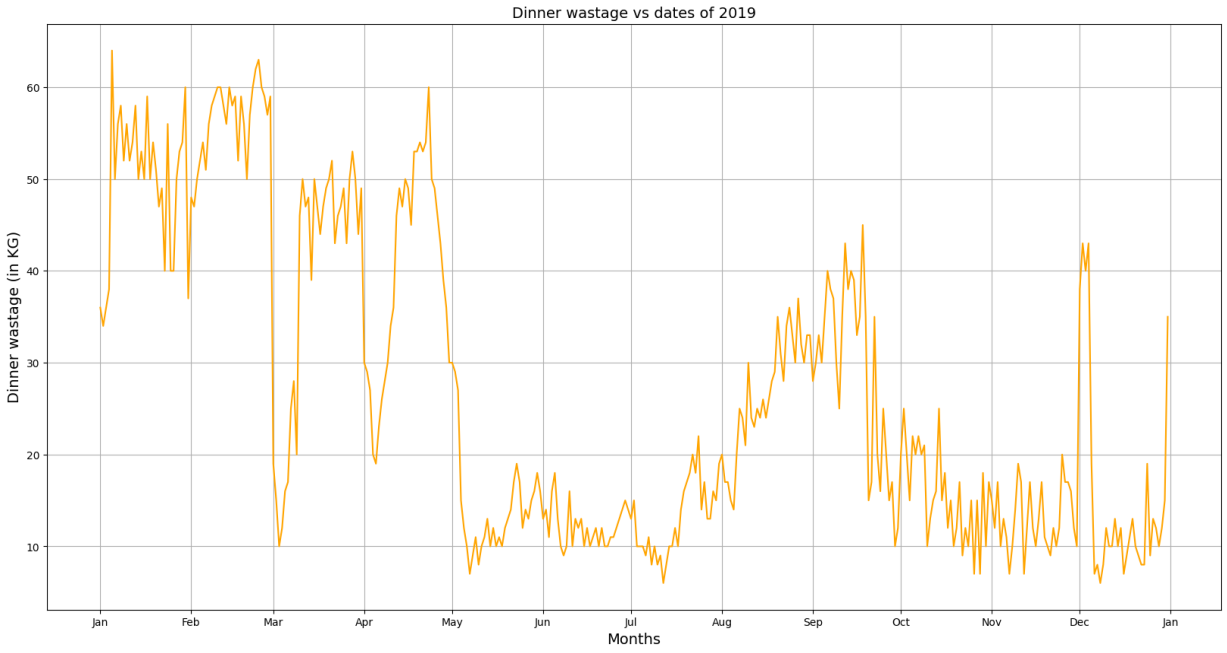
3. Snacks



Observations

1. No particular inference from the data. It seems that the students love having snacks regularly.
2. Food wastage on some days is almost half than the previous day suggesting that students like some snacks more than the other.

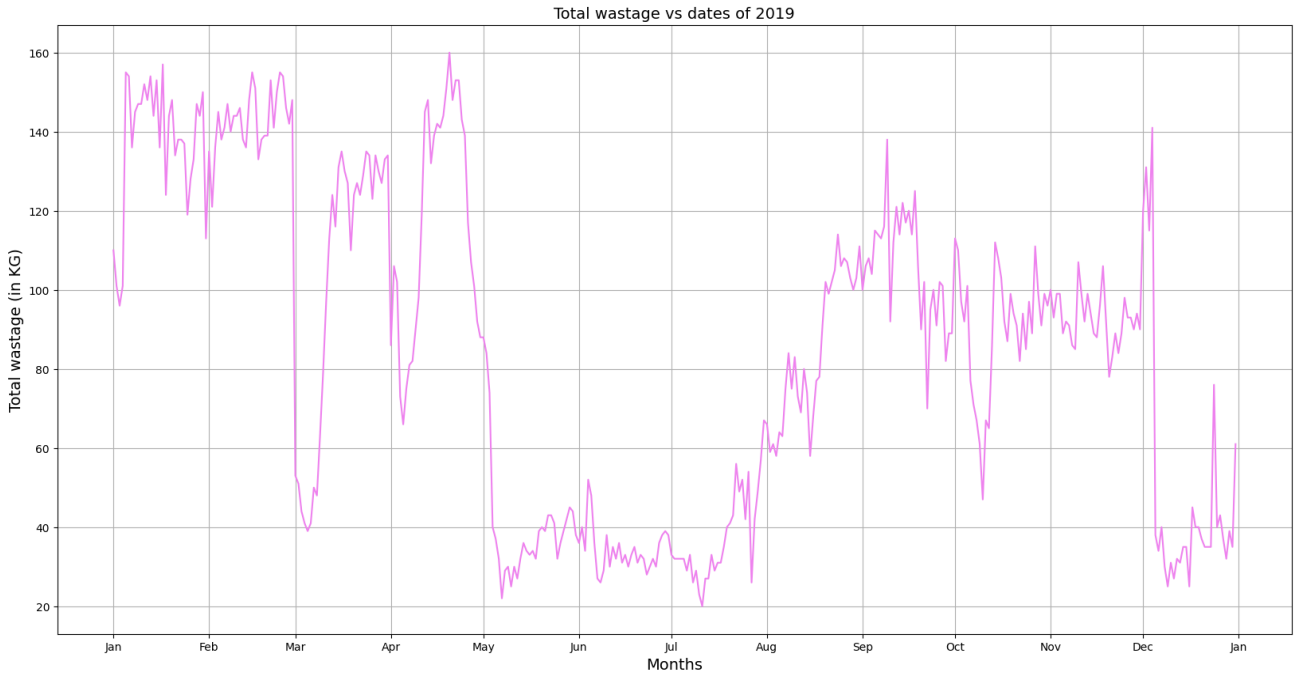
4. Dinner



Observations

1. Food wastage during 1st semester is more than the wastage during 2nd semester.
2. The food wastage distribution of dinner is almost the same as the food wastage distribution of lunch.
3. It suggests that students have both lunch and dinner with the same frequency.

5. Total

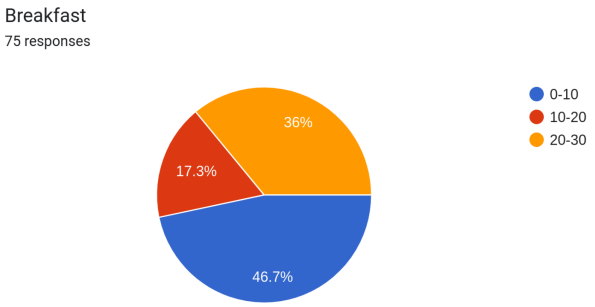


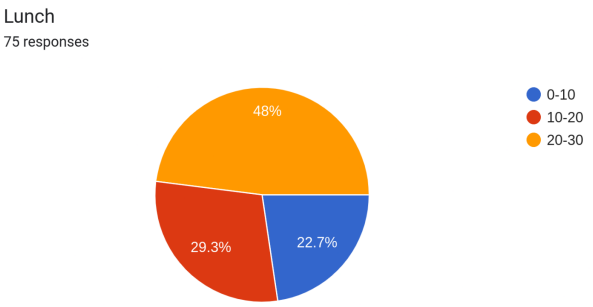
Observations

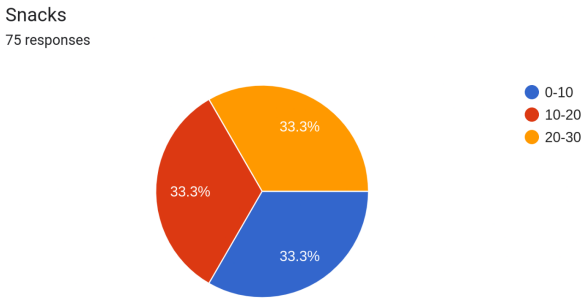
1. Food wastage is less in summer, winter and mid semester break.
2. The food wastage is more after winter break as compared to summer break because of more student preference.
3. The continuous ups and downs suggest that there is a particular liking towards some food as compared to the other.

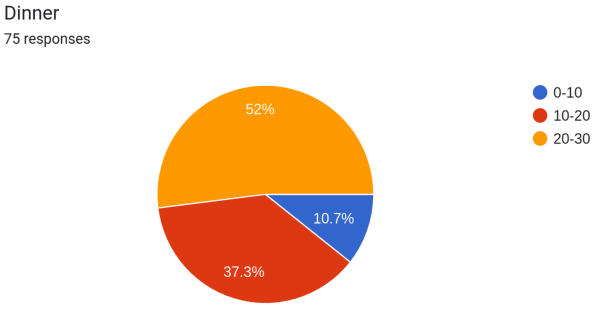
Observations from survey

Since we did not have access to the number of students having a particular meal, we conducted a survey using a Google Form. The survey asked questions about how often students ate breakfast, lunch, snacks, and dinner at the mess, as well as their preferred food items.







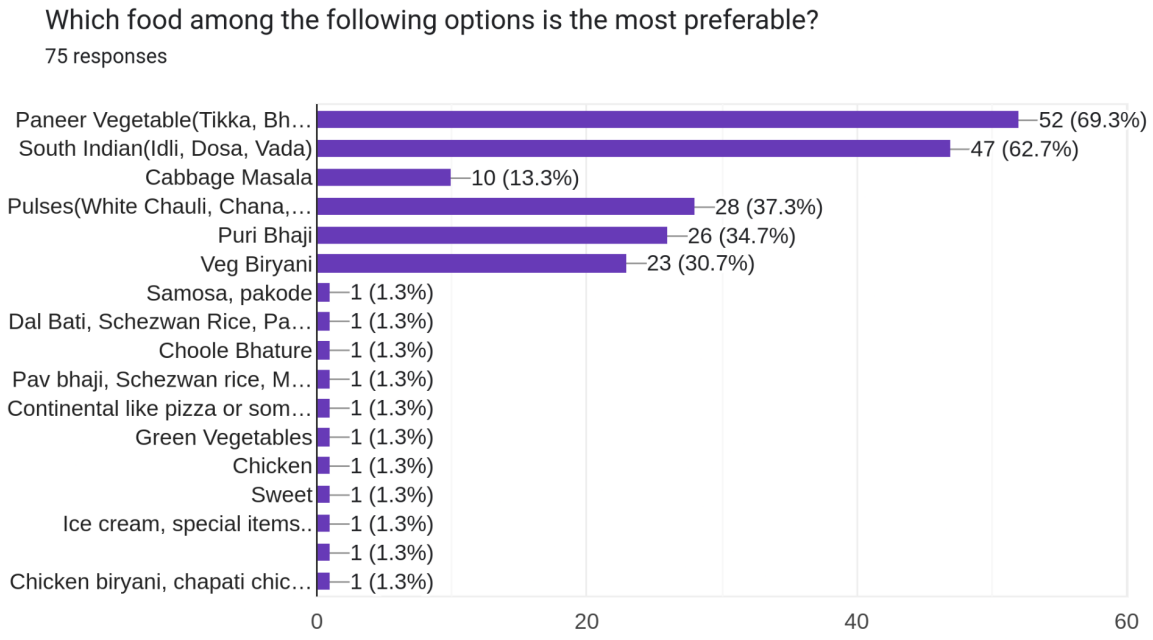


Inferences

1. This suggests that lunch and dinner are quite popular at the mess, with nearly half of the students having lunch at the mess almost every day.
2. This suggests that snacks are evenly distributed among the three frequency ranges.
3. From the data, it is evident that dinner is the most popular meal at the mess, with 52% of students having dinner at the mess for 20-30 days. Lunch being second most popular with 48%. Breakfast and snacks are less popular, with a higher percentage of students having these meals at the mess for 0-10 days.

Some other patterns and information that can be inferred from the data include:

- The percentage of students having breakfast for 20-30 days is higher than that of lunch for 20-30 days.
- The percentage of students having dinner for 20-30 days is higher than any other meal for 20-30 days.
- The percentage of students who have snacks at the mess is evenly distributed among the three frequency ranges.



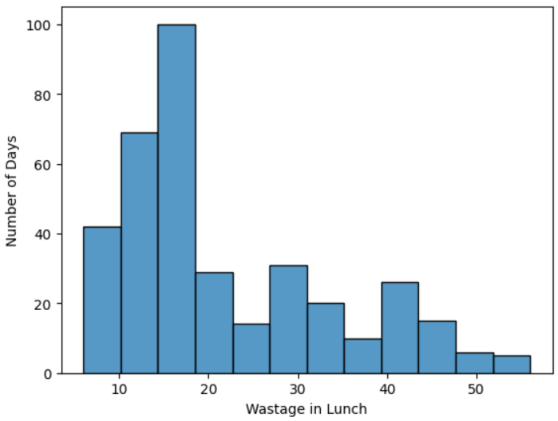
Based on the data, we can infer the following:

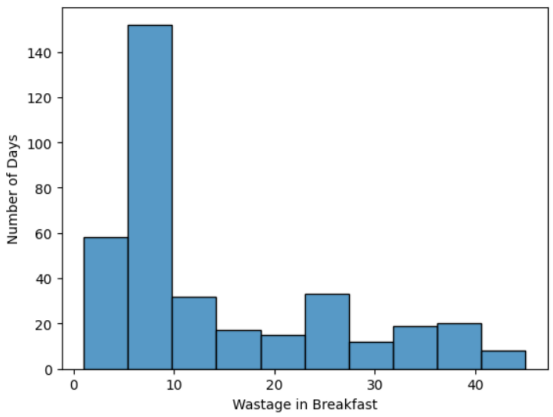
1. Paneer Vegetable dishes (Tikka, Bhurjee, Palak, Shahi, etc.) are the most popular among students, with 69.3% of students preferring this option.
2. South Indian dishes (Idli, Dosa, Vada) are also quite popular, with 62.7% of students preferring this option.
3. Cabbage Masala is the least popular option among students, with only 13.3% of students preferring this dish.

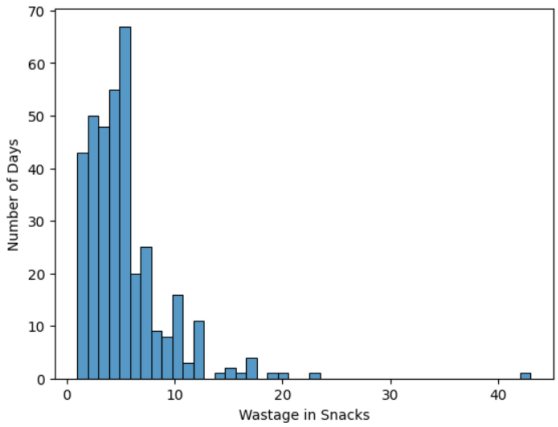
This information can be useful in planning the menu for the mess and reducing food wastage by offering more of the popular dishes and less of the less popular ones.

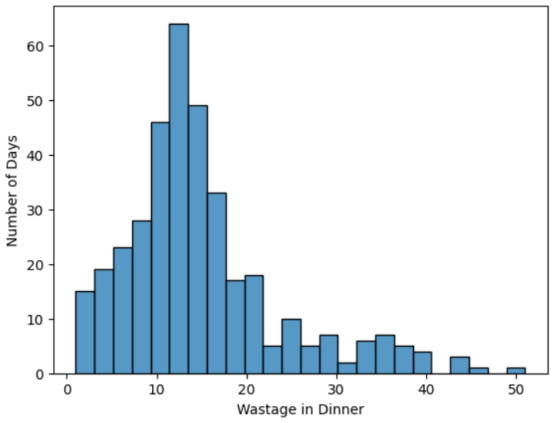
Histogram of Wastage V/s Days:

The below plot shows the histogram for the number of days with the food wastage. For lunch we can see that 15-20kg seems to be the most frequent food wastage. It can be inferred that the average wastage for lunch would be much higher on normal days because this data consists of many covid days.



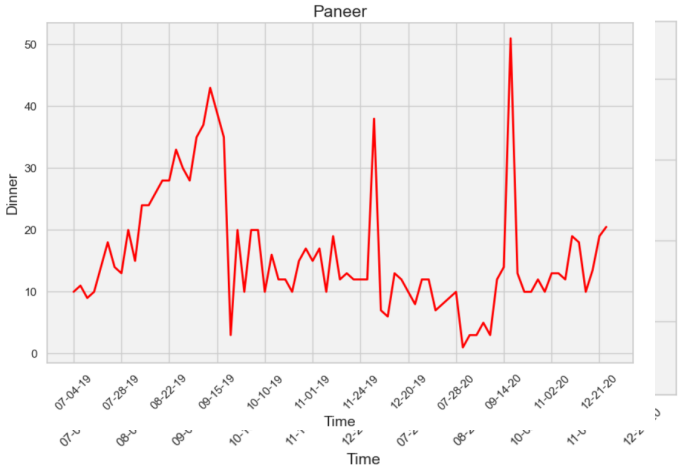


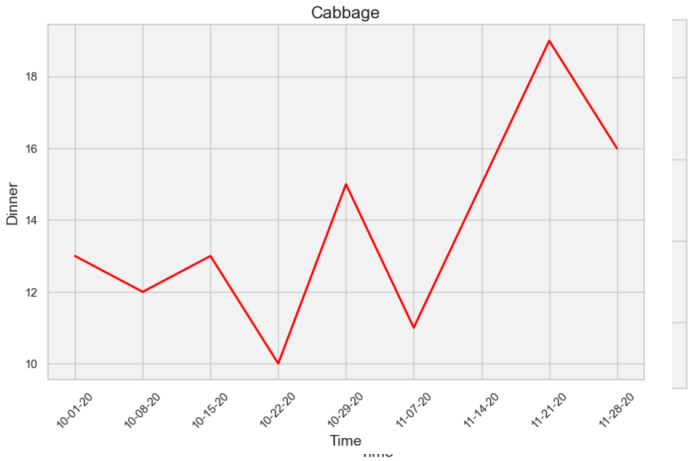


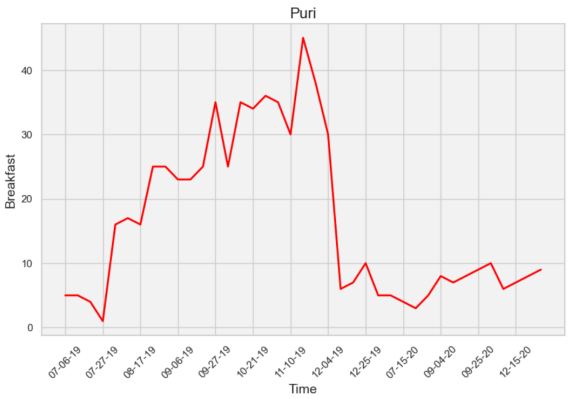


Hot-Favorite Dishes V/s Time:

We floated a google form to identify the hot favorite dishes among the community.We then analyze the food wastage over time when these dishes were served in the mess in different meals. Please use the interactive demo created in the notebook to generate these plots.

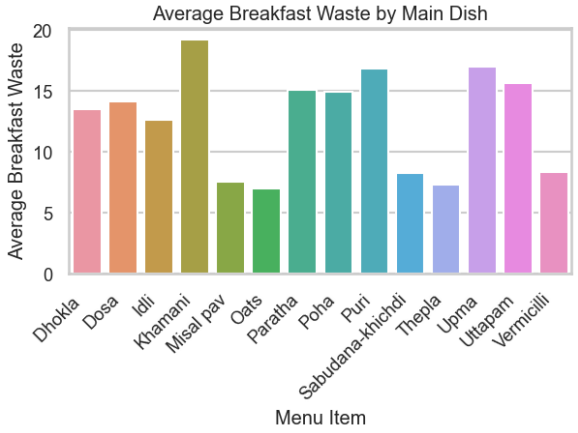


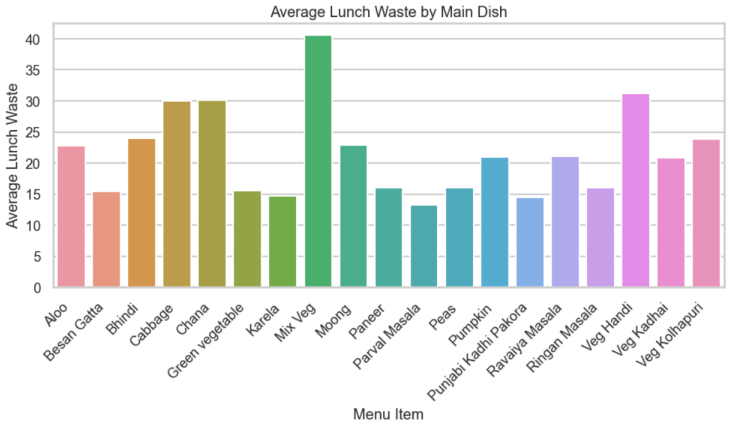


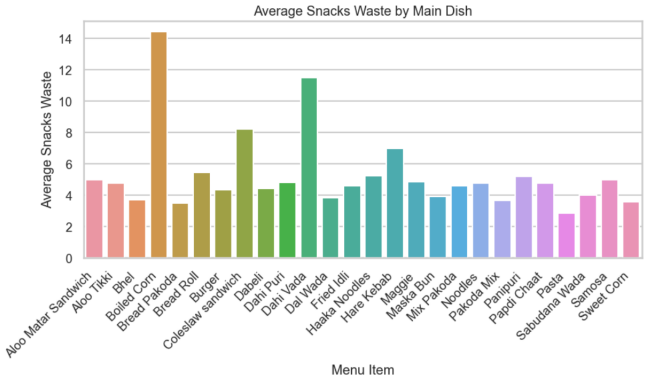


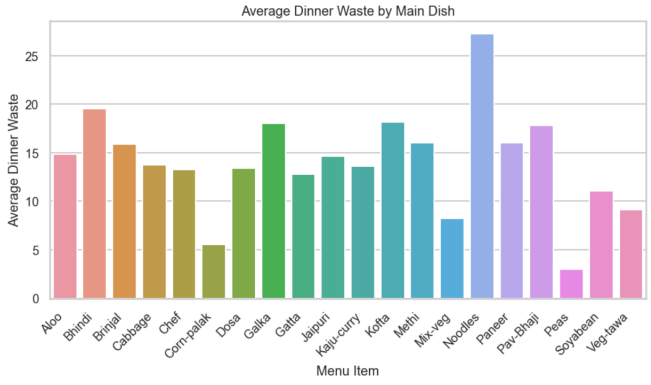
Average Food Waste

We show the average food wastage across different meals for a particular menu item in the below plots.









We can infer that Khamani is the most wasted item in the Breakfast, Mixed veg in the Lunch and Noodles (Chinese food) in the Dinner. It seems that boiled corn is wasted the most in snacks but we need to take into account that even if there is no food wastage for corn there will always be an overhead of waste because of its cob.

Hypothesis

Null Hypothesis: There is no significant difference between the amount of food wasted in weekends and weekdays

Alternate Hypothesis: There is significant difference between the amount of food wasted in weekends and weekdays

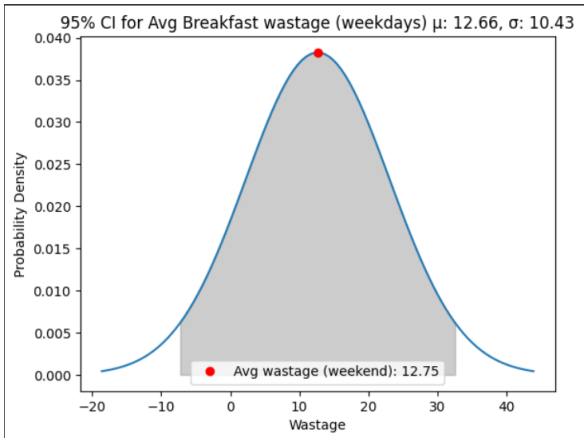
We pose the above mentioned hypothesis for all the four food items (Breakfast, Lunch, Snacks, Dinner). Based on the dataset and our analysis we get the following results:

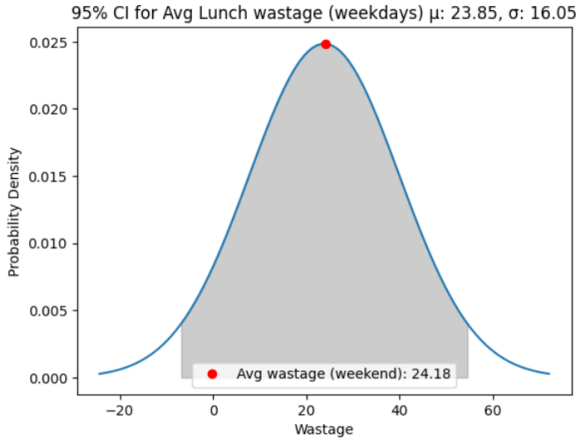
- We calculate the mean and standard deviation corresponding to the weekdays and weekends for all the four meals.
- We get the following values for breakfast, lunch, snack and dinner.

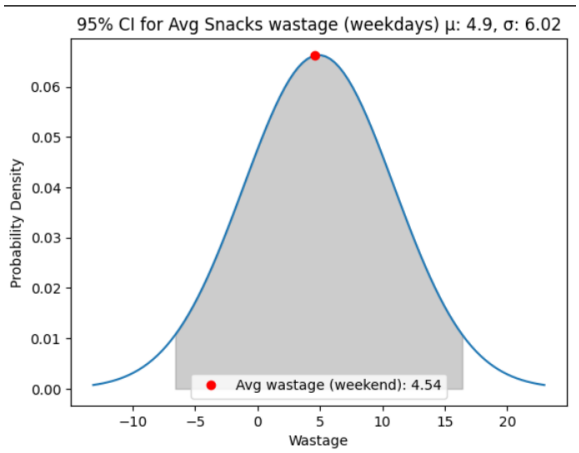
Meals	Weekdays		Weekend	
	Mean	Sigma	Mean	Sigma
Breakfast	12.66	10.43	12.75	10.49
Lunch	23.85	16.05	24.18	17.10
Snacks	4.9	6.02	4.54	3.66
Dinner	18.44	13.99	18.1	14.41

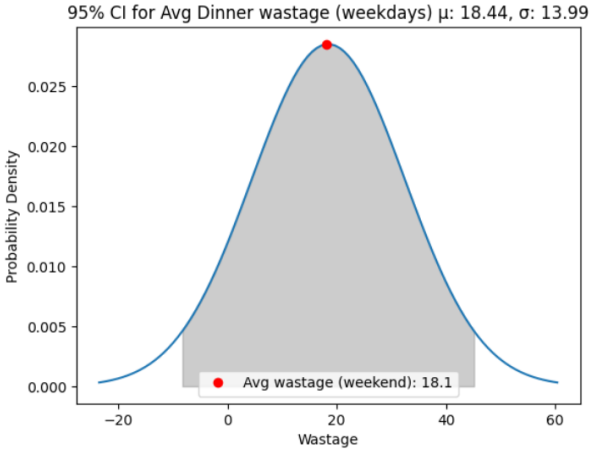
- We check the hypothesis using two methods:

1. **Confidence Interval**: We plot the normal distribution using the mean of the weekdays and using its standard deviation, highlight the 95% confidence interval. Each time the mean corresponding to the weekend's food wastage lie in the 95% confidence interval. The red highlighted point shows the mean of the average food consumption on weekends.









2. **P-value:** It is the probability of obtaining a test statistic as extreme or more extreme than the observed results, assuming the null hypothesis is true. In all the cases if the p value obtained is less than 0.05 we reject the null hypothesis else the null hypothesis may or may not be rejected.

From both the methods we cannot reject the null hypothesis. Thus, there are chances that the there is no significant difference between the food wastage between weekends and weekdays.

Reduce wastage through insights from data

Some of the suggestions we give through the analysis of the data are

1. The menu can include items which are wasted the most and the least together to reduce wastage. For example: Mix Veg with higher wastage could be served with Besan Gatta which has a low wastage.

2. Items which have the highest average wastages should not be served together. For ex: In Lunch, we should not serve Mix. Veg with Veg. Kadhai.

3. New vegetables could be introduced in dinner especially as the mean of data wastage with frequency is high in both aspects perhaps due to repetition. Thus new vegetables could be introduced to mitigate this wastage.

4. Our findings suggest that food wastage primarily occurs when individuals put more food on their plates than they can consume. To address this issue, we recommend creating awareness and implementing rules to prevent students from wasting food.