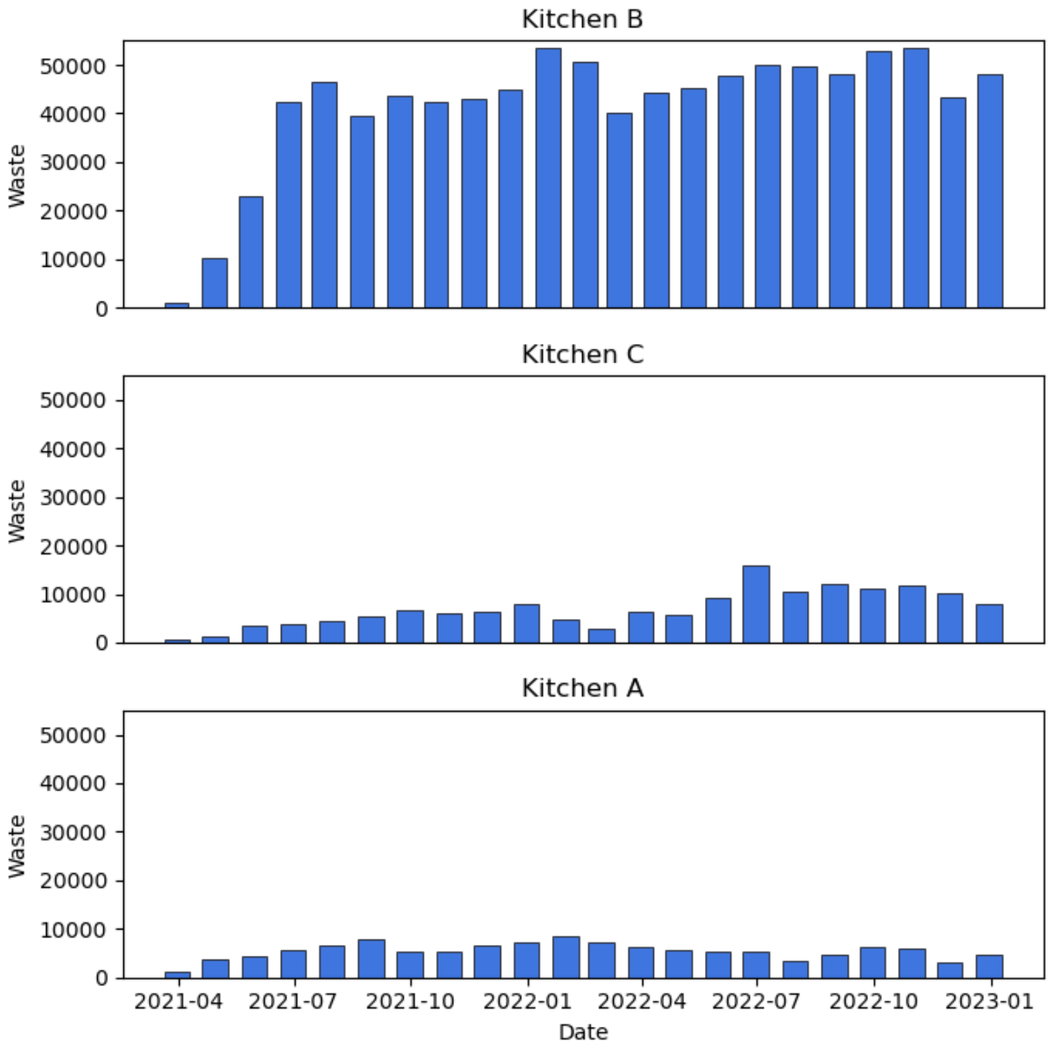
Team HIDB

Hector Mejía, Data Leader
Daniel Beteta, Time Forecaster
Bruno Muñoz, Data visualizations
Ignacio Córdova, Data Analyst

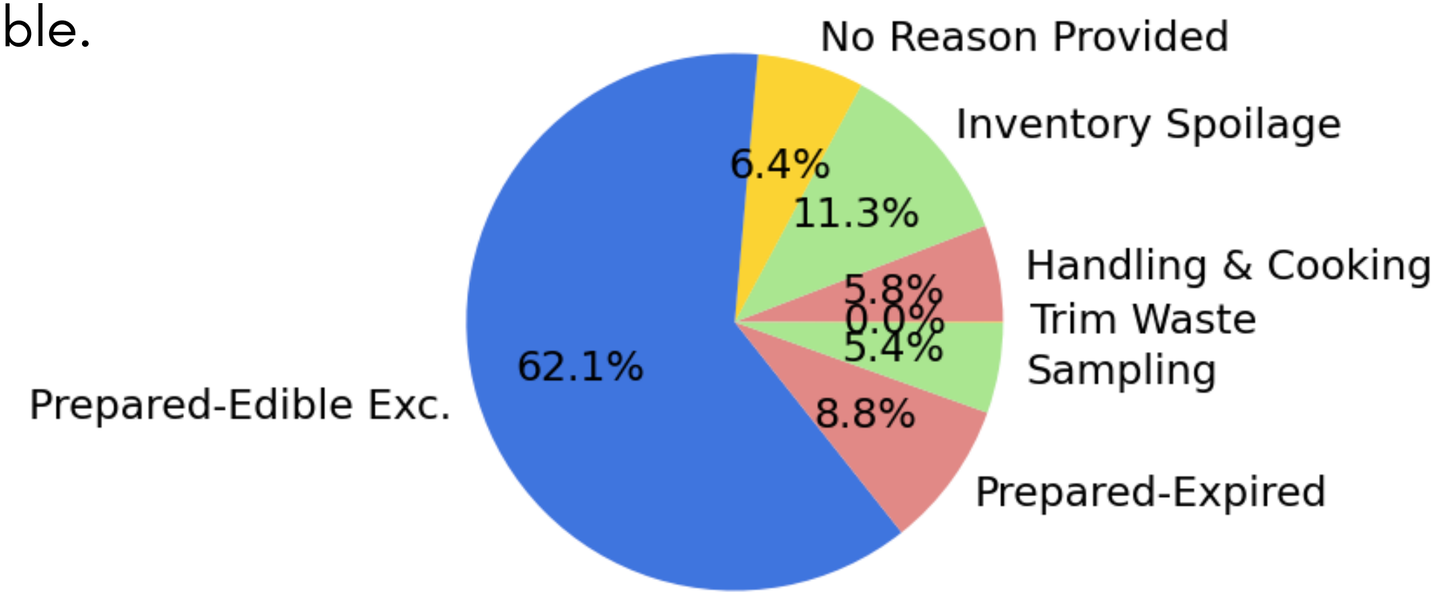
Exploratory Data Analysis

- Type "B" kitchens produce **x5** times more waste.



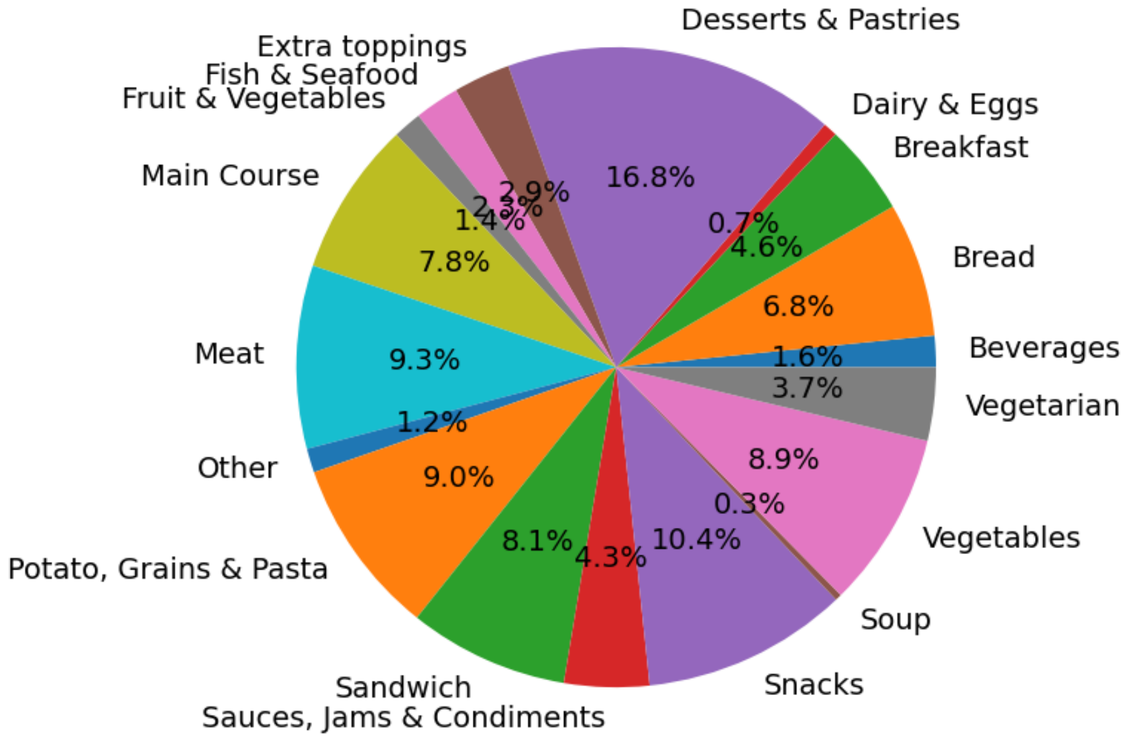
Exploratory Data Analysis

- Waste is **62%** Prepared-Edible.



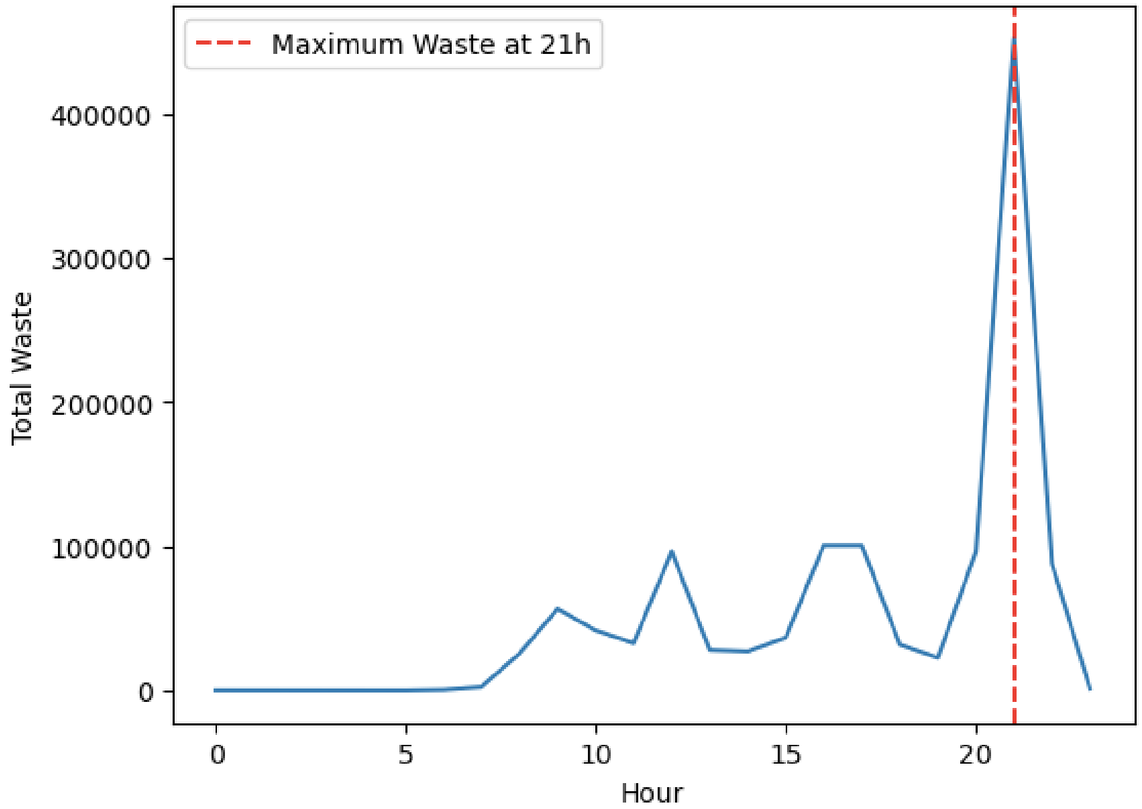
Exploratory Data Analysis

- **+50%** of waste is cheap (snacks, bread, pastries...).



Exploratory Data Analysis

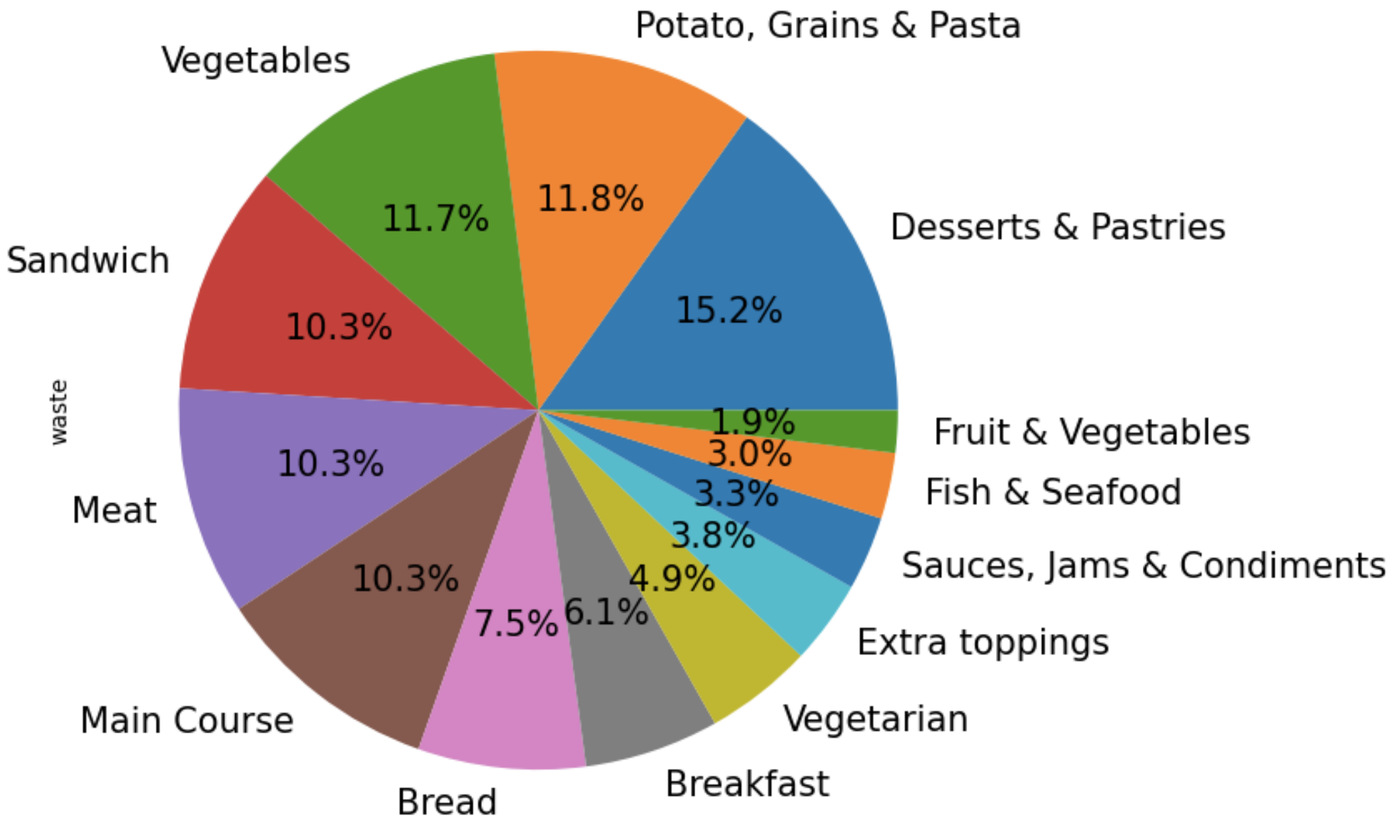
- **Inventory optimization** is crucial.

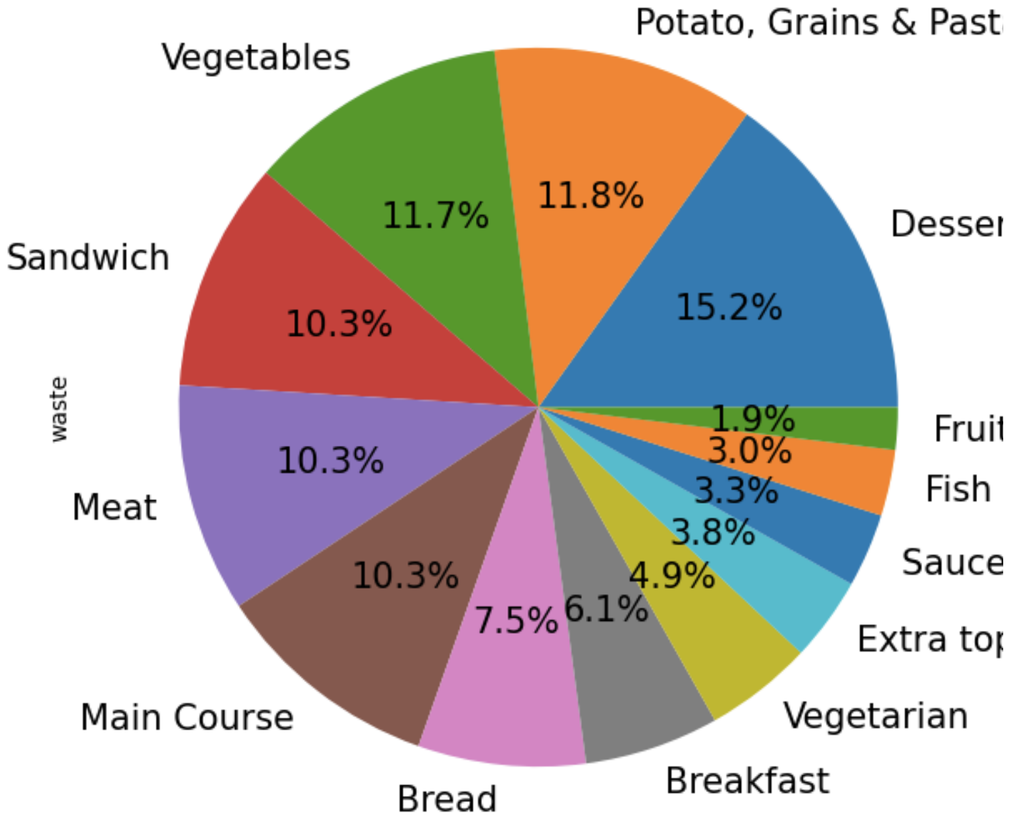


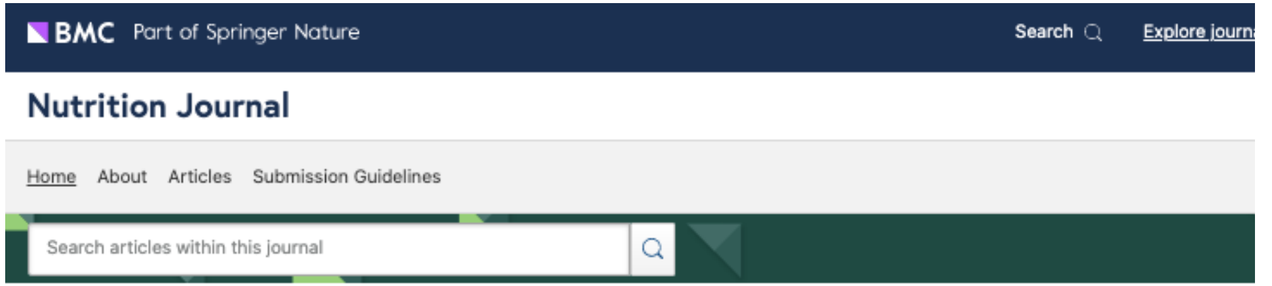
Key insights

- Type "B" kitchens produce **x5** times more waste.
- **+50%** of waste is cheap (snacks, bread...).
- Waste is **62%** Prepared/Edible.
- **Inventory optimization** is crucial.
- The most **economic value** is wasted through **meat**, **main courses** and **vegs**.

Total waste


Potato, Grains & Pasta
Vegetables
Desserts & Pastries
Sandwich
Fruit & Vegetables
Fish & Seafood
Sauces, Jams & Condiments
Extra toppings
Vegetarian
Breakfast
Bread
Main Course
Meat
waste
11.8%
11.7%
15.2%
10.3%
1.9%
3.0%
3.3%
3.8%
4.9%
6.1%
7.5%
10.3%
10.3%





Call for papers: Cross journal collection on Nutrition, Physical Activity and Aging

Nutrition Journal is calling for papers as part of a cross journal collection themed on **Nutrition, Physical Activity and Aging.** Participating journals include *Nutrition Journal*, *Nutrition & Metabolism*, *European Review of Aging and Physical Activity*, *Journal of Activity, Sedentary and Sleep Behaviors* and *BMC Geriatrics*. The submission deadline is 31 Aug 2022.

Announcing the launch of In Review

Featured article: Dietary inflammatory in and cardiovascular disease risk in Hispan women from the Women's Health Initiati

Chronic inflammation plays a key role in the pathophysiology of cardiovascular disease (CVD), in

Novedad

MILANESA DE POLLO

Milanesa de pollo con mezcla de judías y patatas fritas

5,99 €

FISH AND CHIPS

Fish and chips, pescado rebozado con patatas fritas y salsa tártara

6,99 €

Novedad

FILETE DE SALMÓN

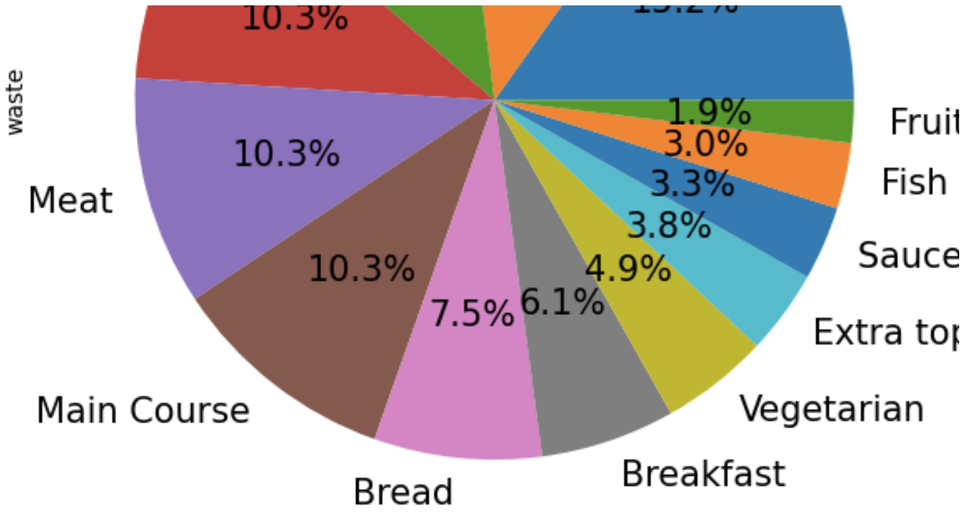
Filete de salmón con cuscús, vegetales a la parrilla y yogur.

7,99 €

CODILLO ASADO

Codillo asado de cerdo en su jugo con guarnición de patatas fritas.

9,99 €



Fruit

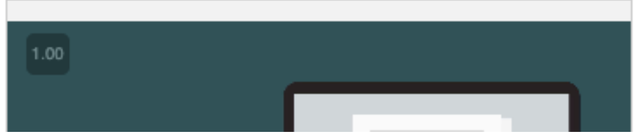
Fish

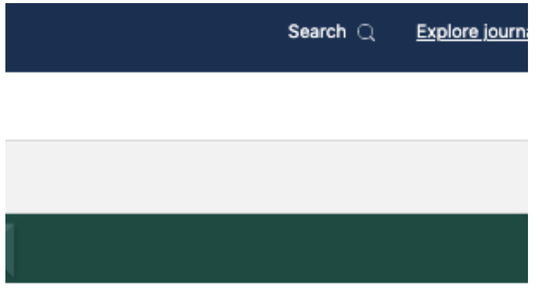
Sauce

Extra top

Physical Activity, *Journal of Activity, Sedentary and Sleep Behaviors* and *BMC Geriatrics*. The submission deadline is 31 Aug 2022.

Announcing the launch of In Review





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MILANESA DE POLLO

Milanesa de pollo con mezcla de judías y patatas fritas

5,99 €

HOT DOG CLÁSICO SIN GUARNICIÓN

Hot dog clásico sin guarnición

0,50 €

HOT DOG VEGETARIANO

Hot dog vegetariano con lombarda y pepinillos

0,50 €

HOT DOG VEGETARIANO

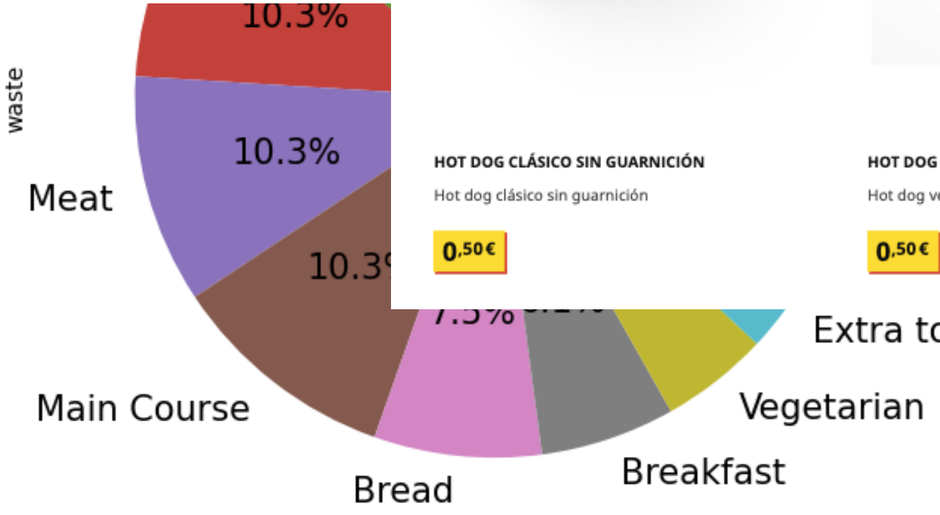
Hot dog Vegetariano con pepinillos y cebolla frita

0,50 €

HOT DOG VEGETARIANO

Hot dog vegetariano con lombarda y cebolla frita

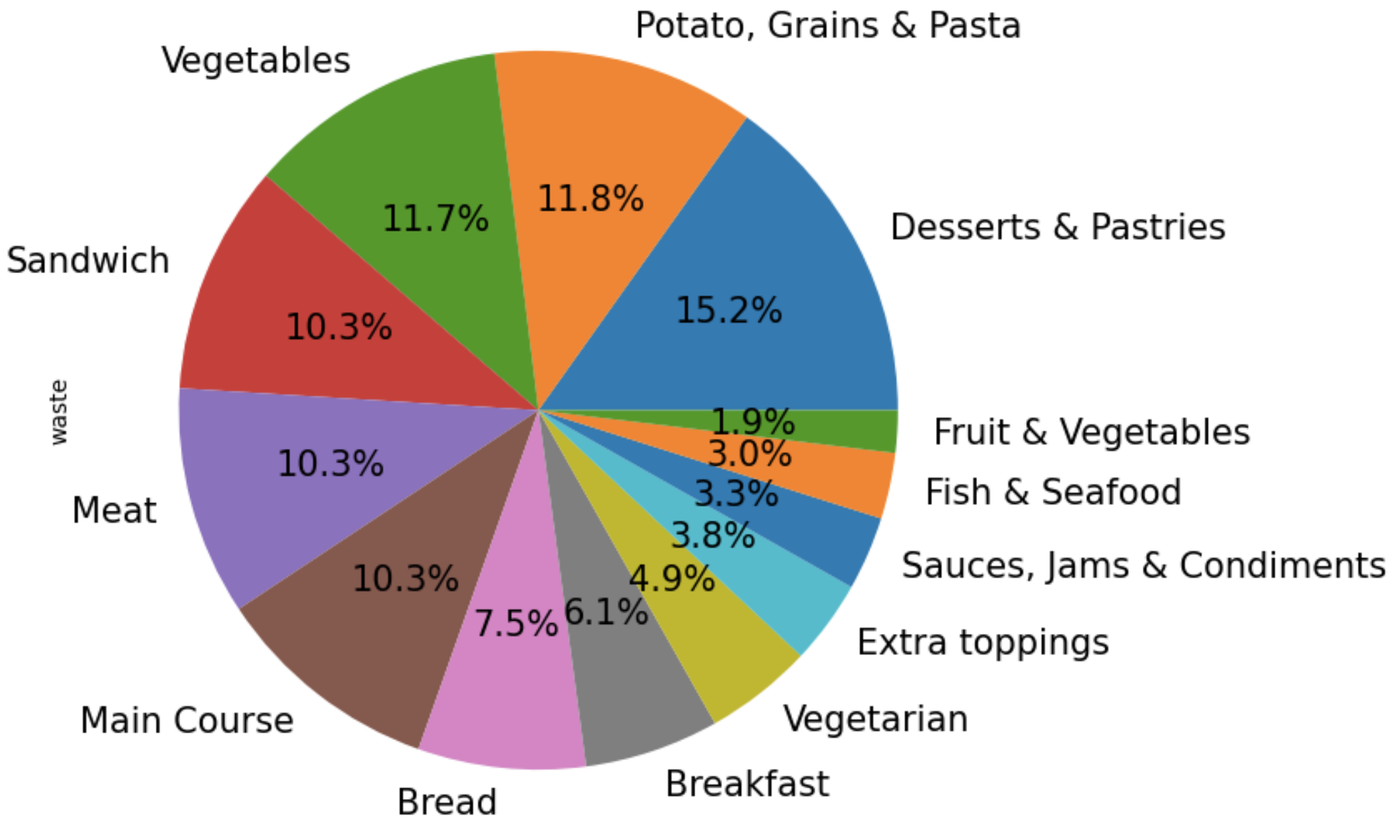
0,50 €



Extra to

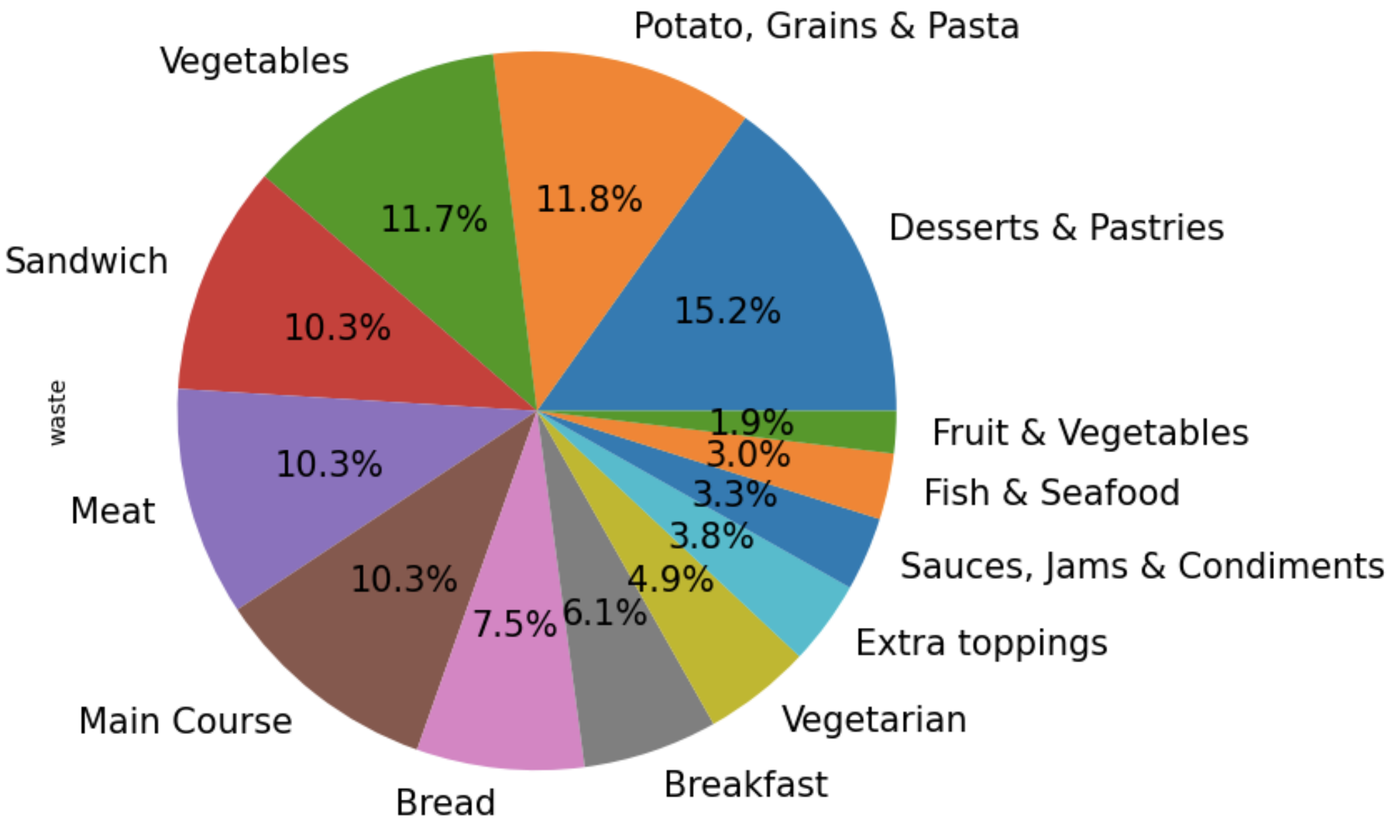
pathophysiology of cardiovascular disease (CVD), in

Use of EXTERNAL DATA...



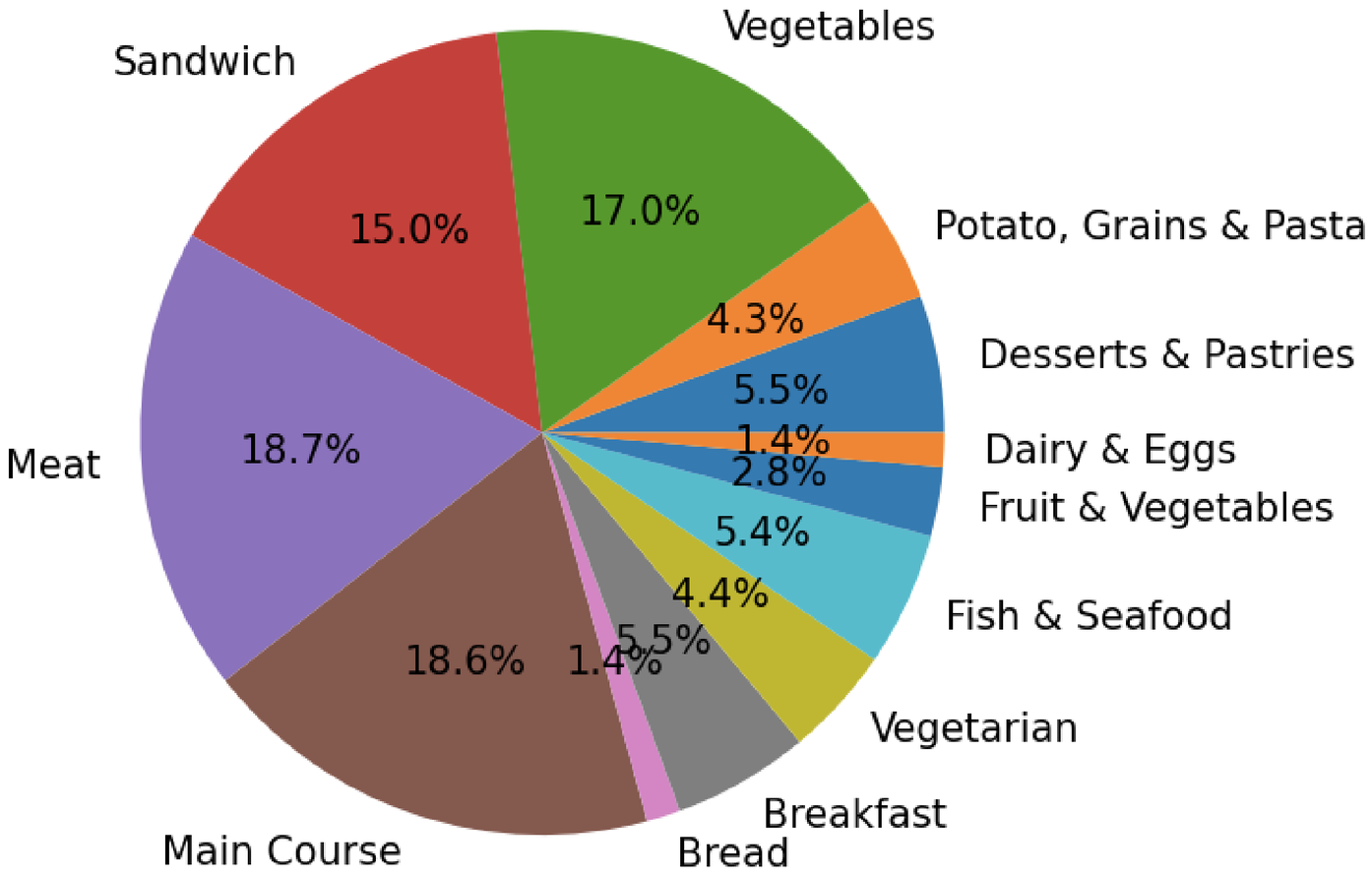
...to go from WASTE to VALUE

From waste...




```
category_value = {'Extra toppings': 0.1,
                  'Meat': 1,
                  'Potato, Grains & Pasta': 0.2,
                  'Sandwich': 0.8,
                  'Fruit & Vegetables': 0.8,
                  'Main Course':1,
                  'Desserts & Pastries': 0.2,
                  'Vegetarian': 0.5,
                  'Sauces, Jams & Condiments': 0.1,
                  'Snacks': 0.1,
                  'Vegetables': 0.8,
                  'Bread': 0.1,
                  'Soup': 0.1,
                  'Beverages': 0.1,
                  'Fish & Seafood': 1,
                  'Breakfast': 0.5,
                  'Dairy & Eggs': 0.8,
                  'Other': 0.5}
```

From waste.....to value

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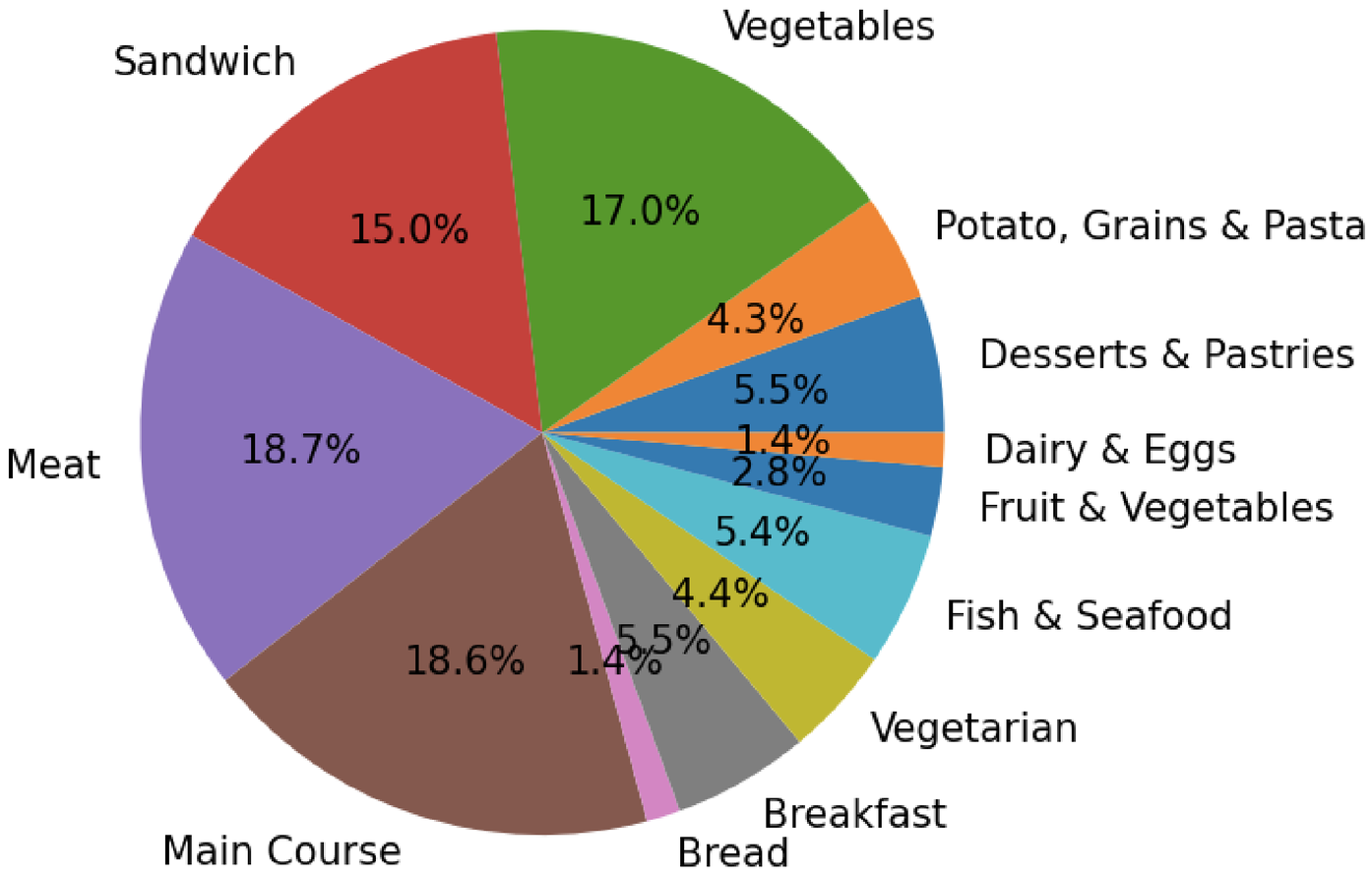
```

...to value



- Managers and stakeholders care about money, not weight.

$$\text{Money} \propto \text{weight}$$

- Allows us to reduce waste achieving maximum economic return.

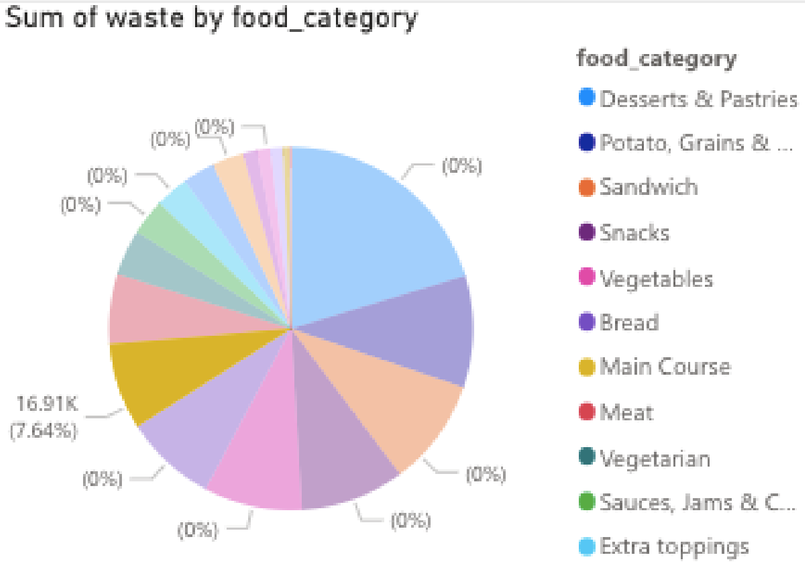
Usecase #1: waste and value loss reduction

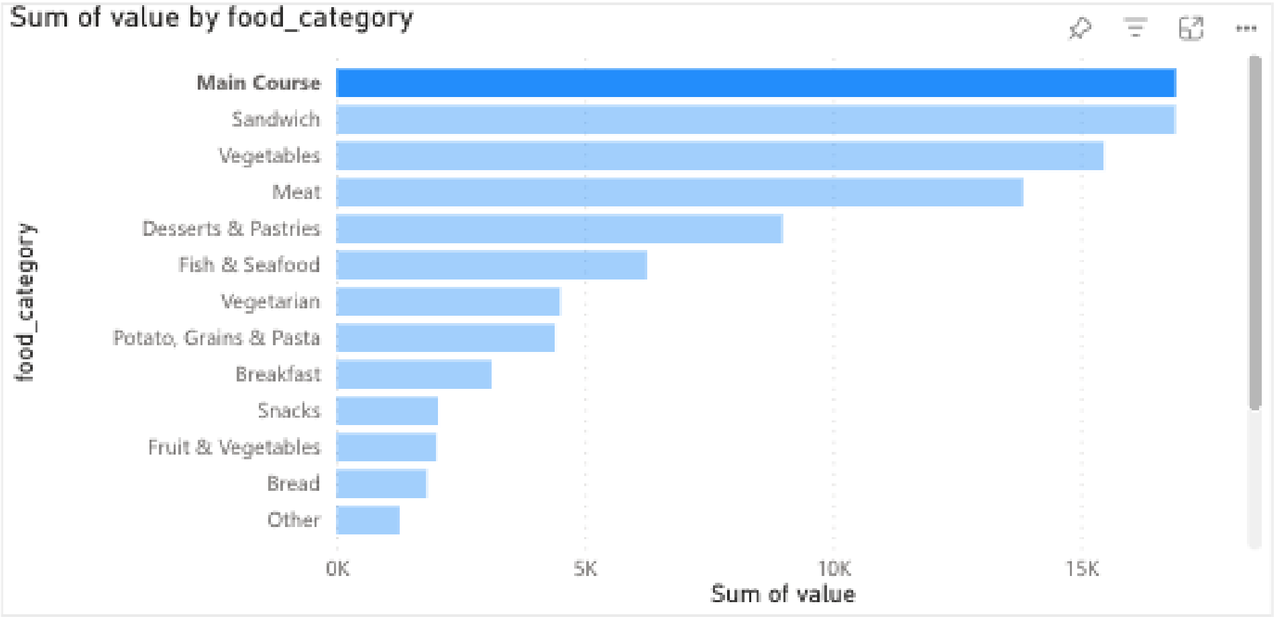
- Allow managers and stakeholders to make data driven decisions.
- We can't fight what we can't see.
- Raise awareness of employees with weekly dashboards.

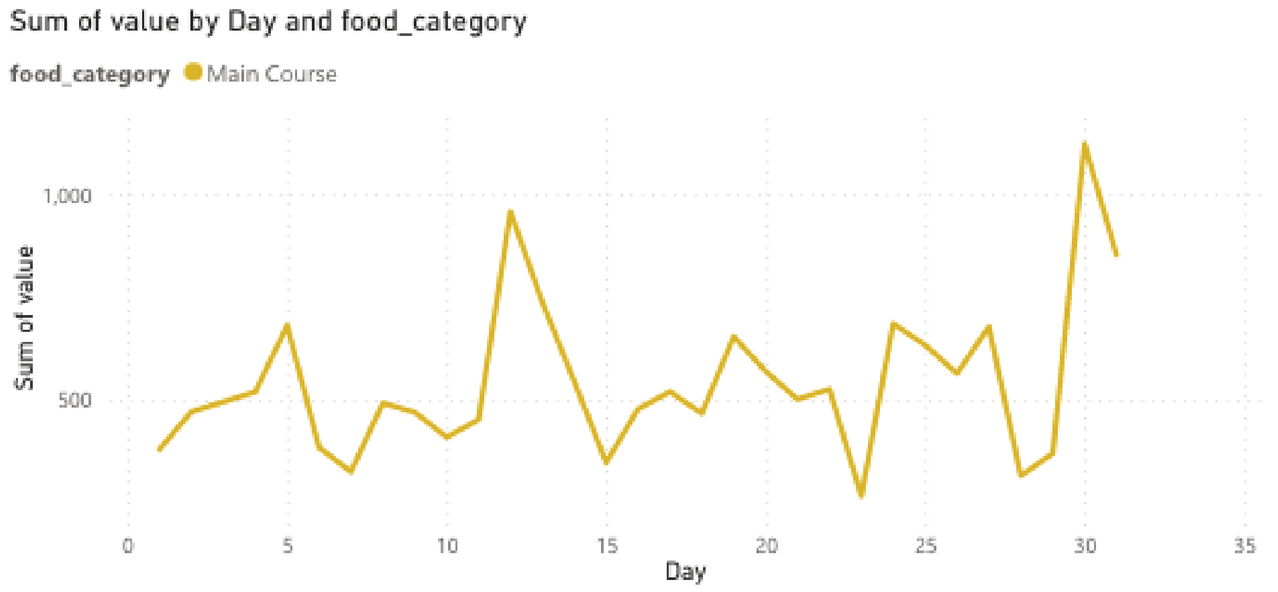
Usecase #2: anomaly detection

- Share with the team the most problematic
- We can't fight what we can't see.
- Raise awareness of employees with weekly dashboards.

Usecase #1: waste and value loss reduction







Usecase #1: waste and value loss reduction
Business impact

- Dashboard allows managers to **optimize inventory** and reduce waste.
- Focusing on **top 3** food categories fights the **+30%** of waste.
- Focusing on **top 3 value waste** fights the **+50%** of value loss.
- Focusing on value (instead of only weight) shows immediate results to stakeholders.
- Dashboard tackles **locations** and all **3** kitchen types in parallel.

Usecase #1: waste and value loss reduction

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Usecase #2: anomaly detection

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Usecase #2: anomaly detection

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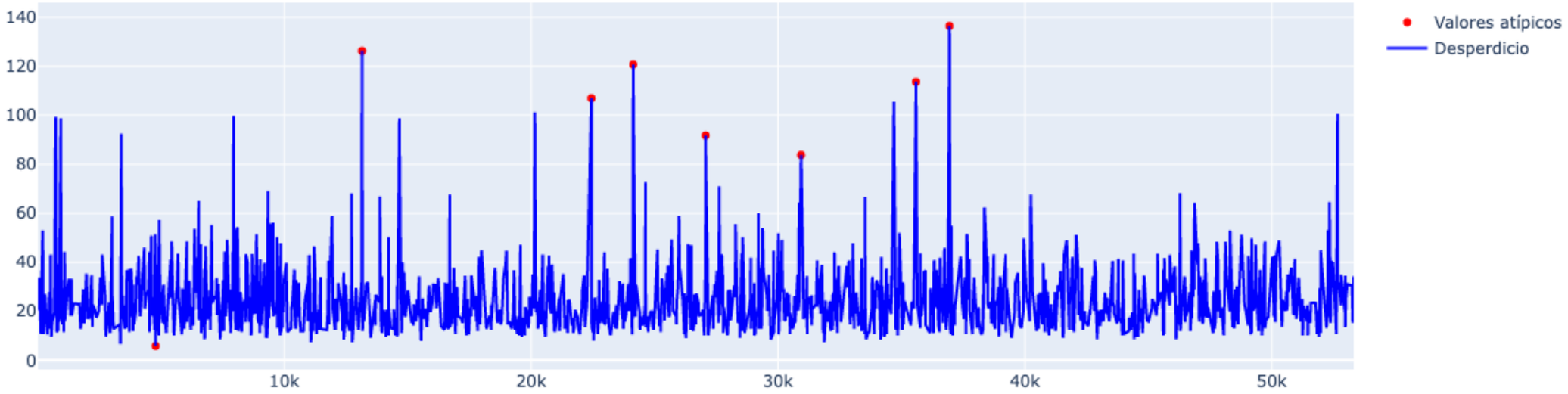
What if our data is not fully accurate?

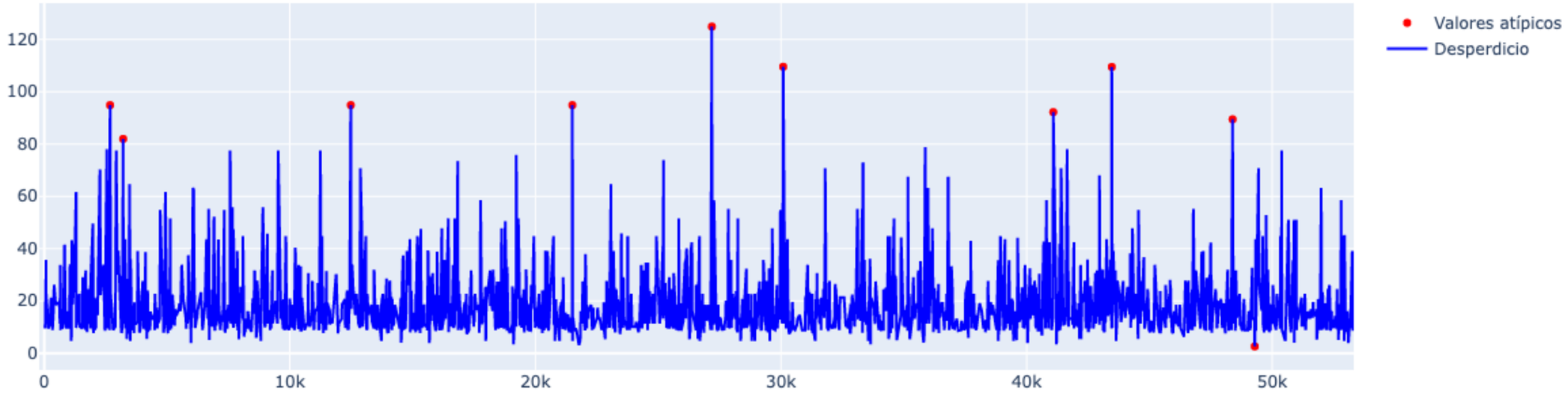
Using isolation forest, we found anomalies throughout the data!



Automatically-classified anomalies

There are also anomalies in human entries

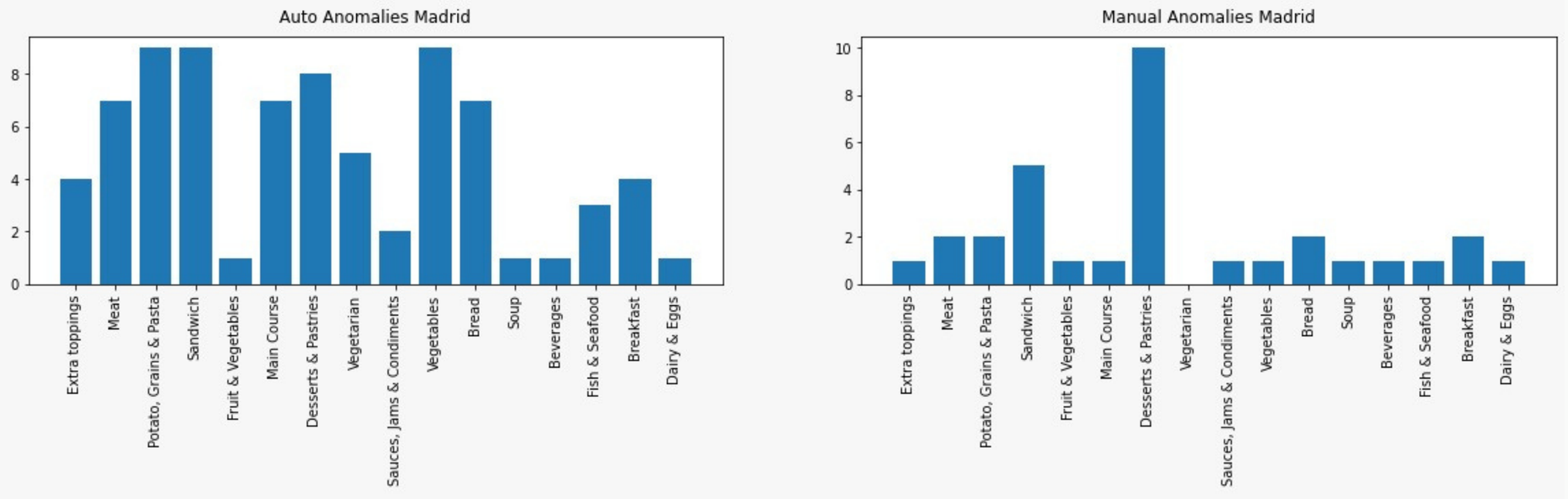
Are those mistakes from the operators of the kitchen?



We found 158 anomalies in the measures of Madrid and 126 in Barcelona

Going deeper in Madrid...

We analyzed the number of anomalies for all the food types



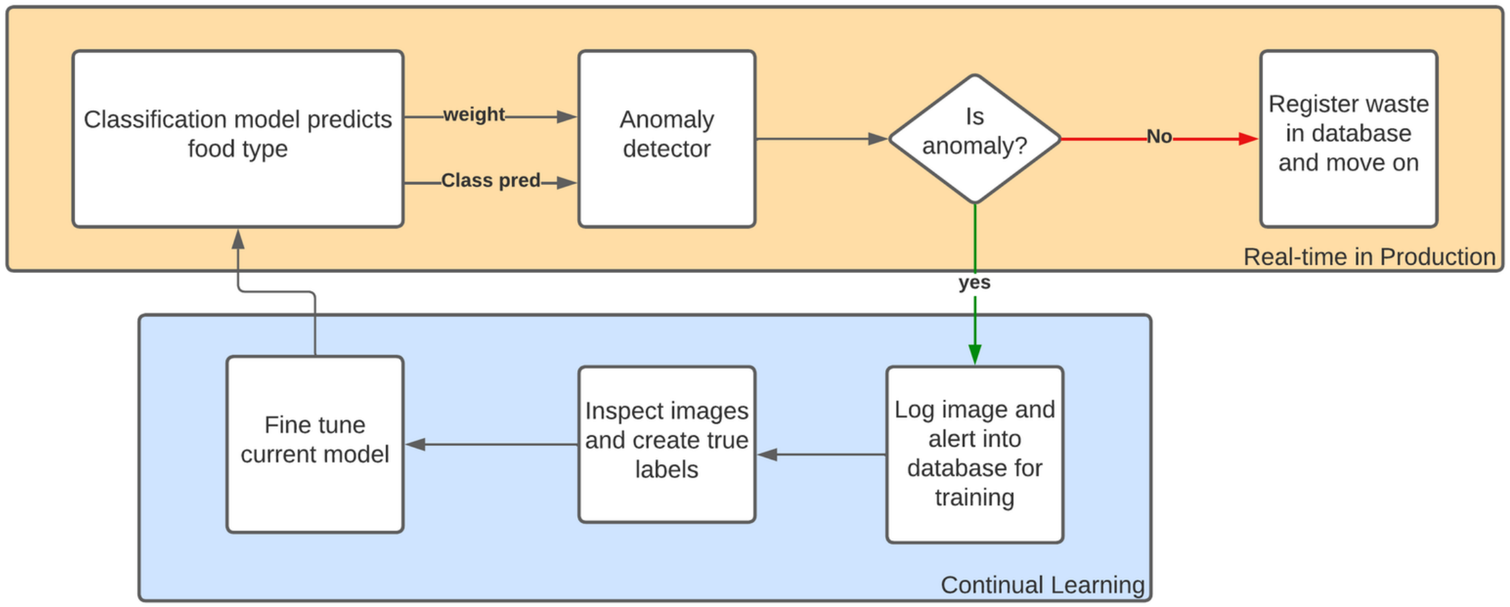
How can we improve the workflow?

- We can alert operators when there is an anomaly so they can re-try waste measurement and classification

- The anomaly data can be used to improve the visual classification model.

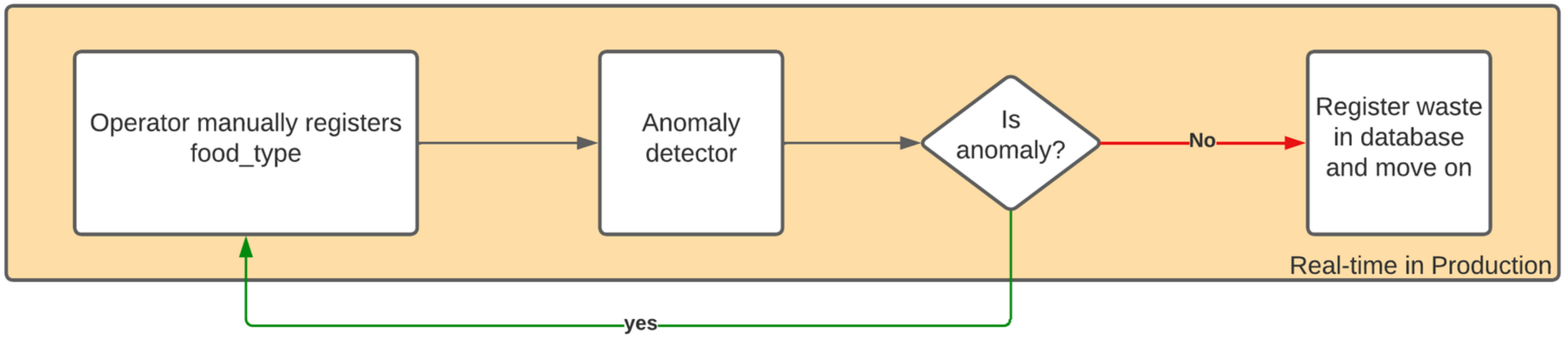
Our proposal!

Continual learning for the classification model



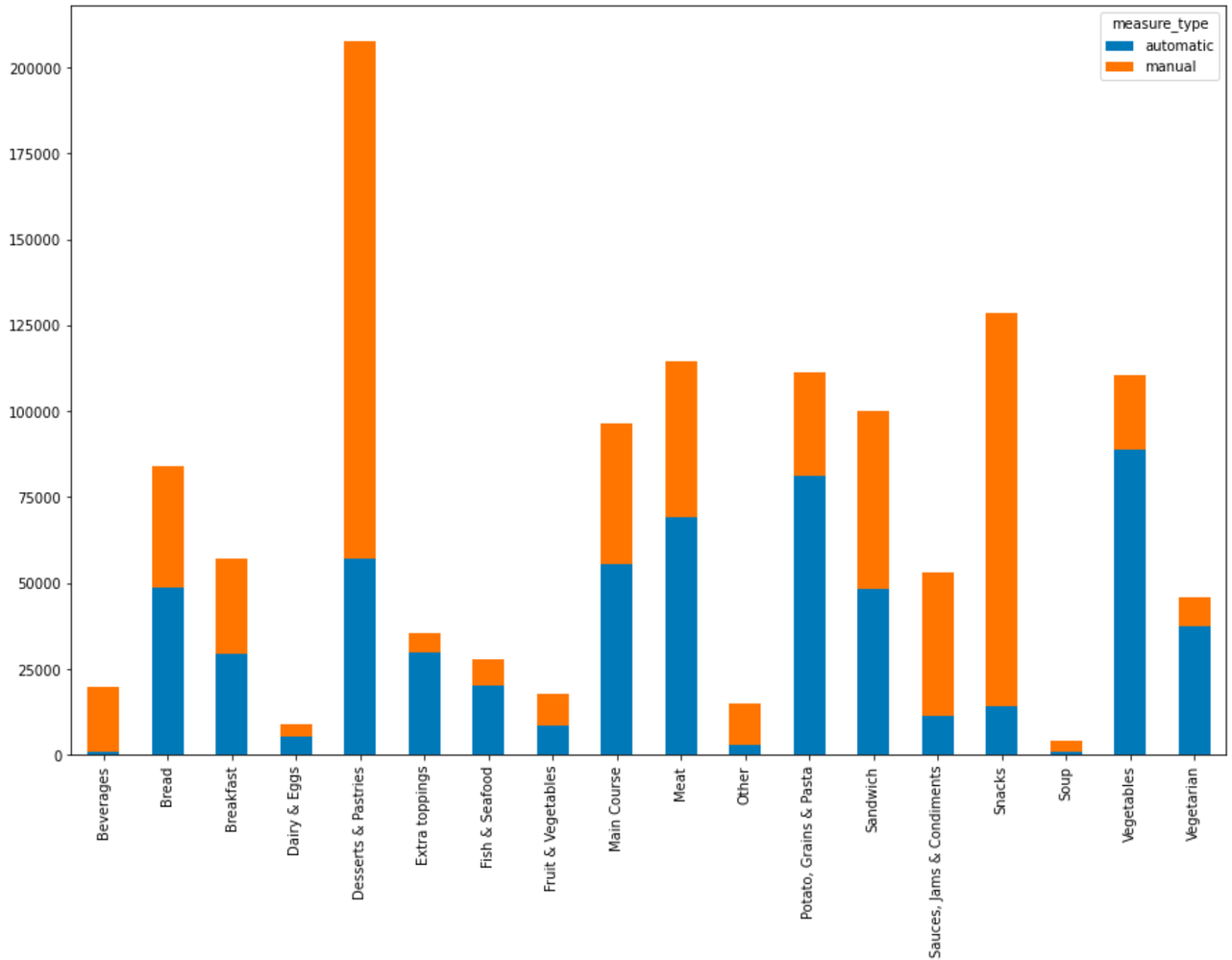
Our proposal!

Prompt operators to retry when the measure is an anomaly



What is the benefit?

Orange means manual input

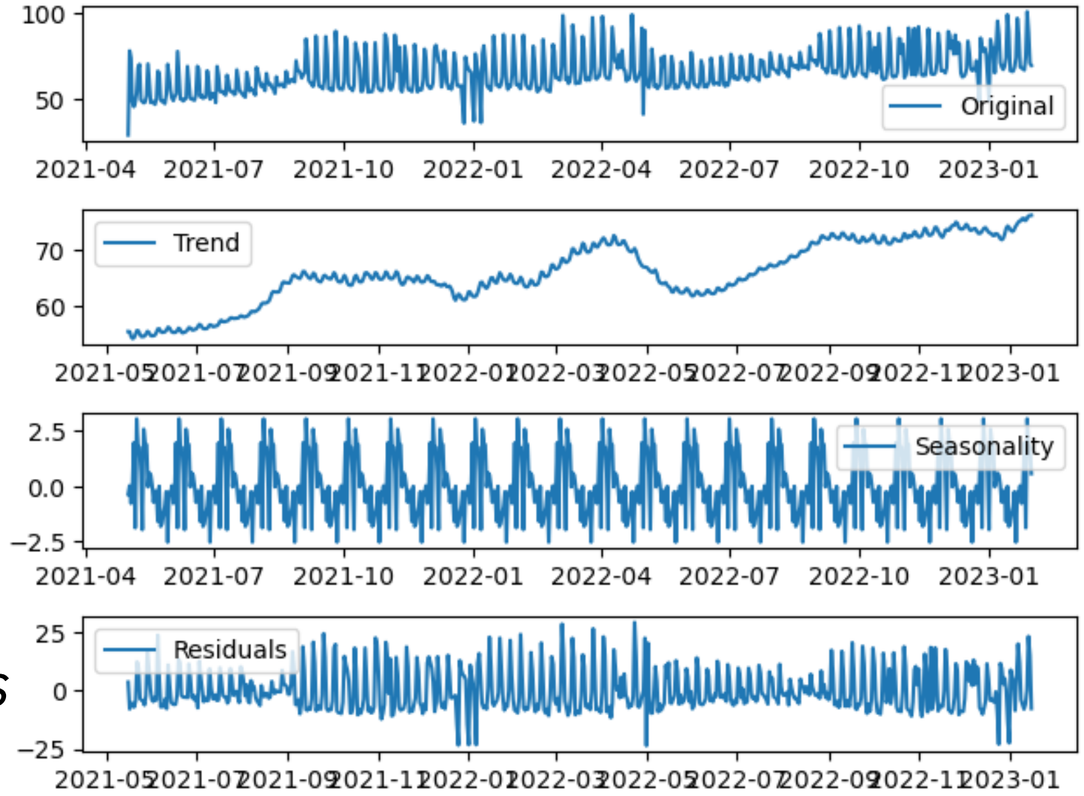


- Better model, less human error.
- Increased efficiency
- Increased data quality that leads to better insights.
- Better insights means better waste management

Visit Data: Forecasting of March 2023

Methodology

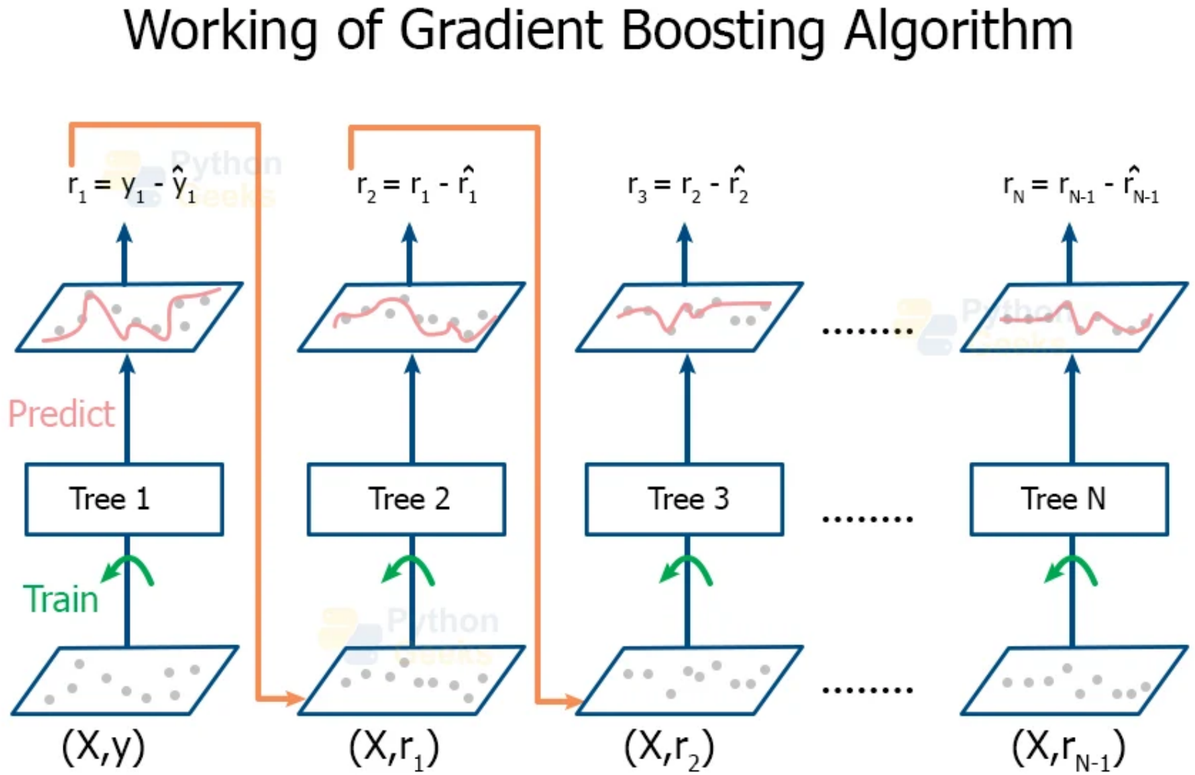
1. Exploratory Data Analysis
    - *Two data distributions*
    - *Closed days*
2. Component analysis of the time series
    - *Trend, Seasonality & noise*
    - *Thursday, Friday and Saturday top days*



Methodology

3. Model selection

- *SARIMAX*
- *Random Forest*
- ⭐ ***Gradient Boosting***



Methodology

4. Hyperparameter optimisation

- *Grid Search => Backtesting with refit and increasing training size*
- *Check over fitting => February 2023 as test data*

⭐ Hyperparameter found:

+ Lags => 7

+ N_estimators => 100

+ Max_depth => 3

Methodology

5. Kaggle submission

- *Root mean square error (RMSE):* ***2.27***

But wait... What is this actually for?

How this makes you money?

Better understanding of how many visitors will have next week

Better stock provisioning

Better human capital needs

How this makes you money?

Further challenges

- Improve model accuaracy on top days and holidays
- Discounts and marketing strategies based on the visits forecasts