

Data Science Projekt WS 2023/24

Final Presentation



Overview

1. Topic - Feeding the Academic Appetite

2. Data-Sets & Challenges

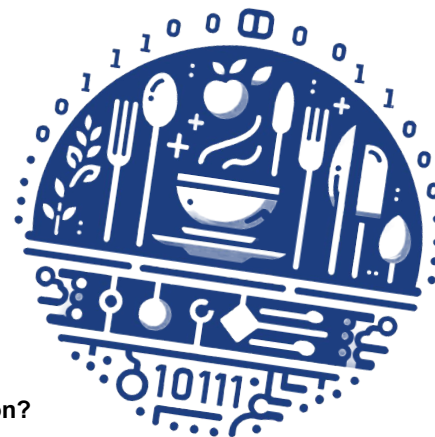
3. Research Questions

- a. 1. How has the average price for a meal in Schleswig-Holstein changed since 2021?
- b. 2. How do average student meal prices compare according to their category?
- c. 3. How does the average price change for visitors in Germany since 2023?
- d. 4. Does the day of the week influence average meal prices?
- e. 5. Does the weekday influence the availability of dietary options in German canteens?
- f. 6. What are the most frequent words in meal names by category and geographic location?
- g. 7. Does a university's location influence the average price of meals for students?

4. Conclusion

5. Website & Git Repository

6. Sources



1. Topic - Feeding the Academic Appetite

Price Dynamics and Dietary Trends of German Canteens:

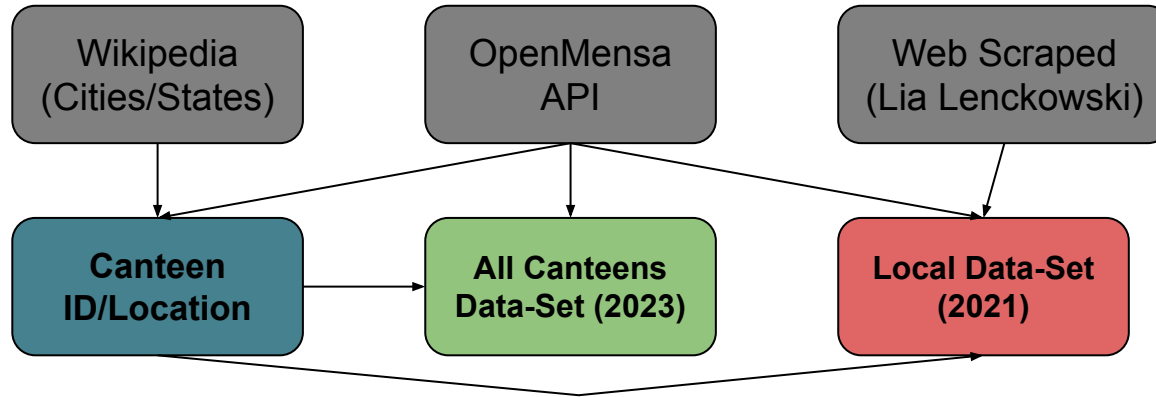
- Canteen at CAU is the second most expensive in Germany. Is that true?

Let's investigate!

- Comparing prices and price changes
- Availability of dietary options in German canteens



2. Data-Sets & Challenges



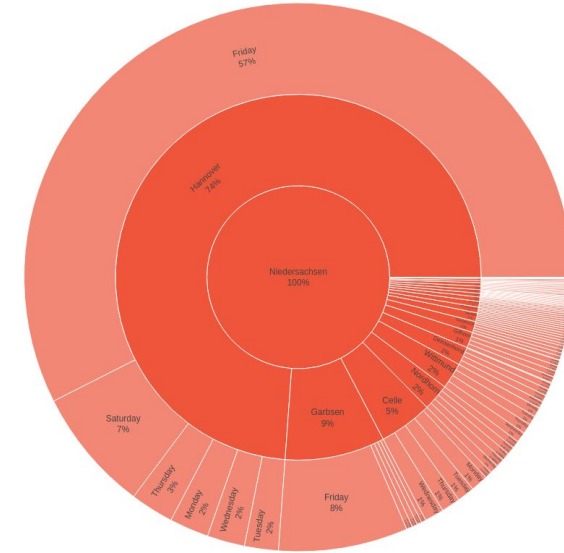
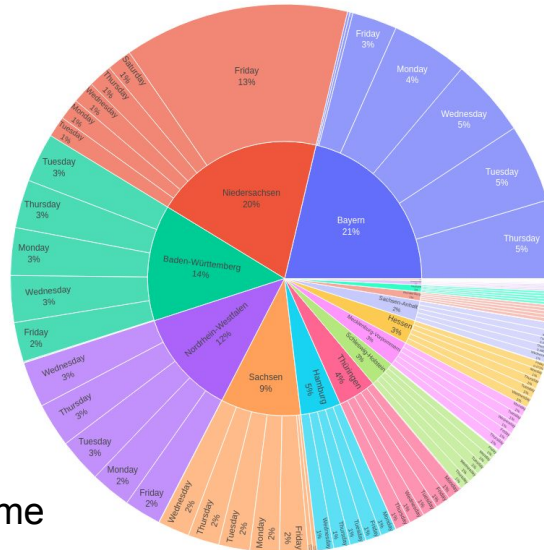
Features:

- canteenID
- city
- dish name
- tag list
- federal state
- mealID
- date
- price (student/employee/others)

2. Data-Sets & Challenges

Data Cleaning:

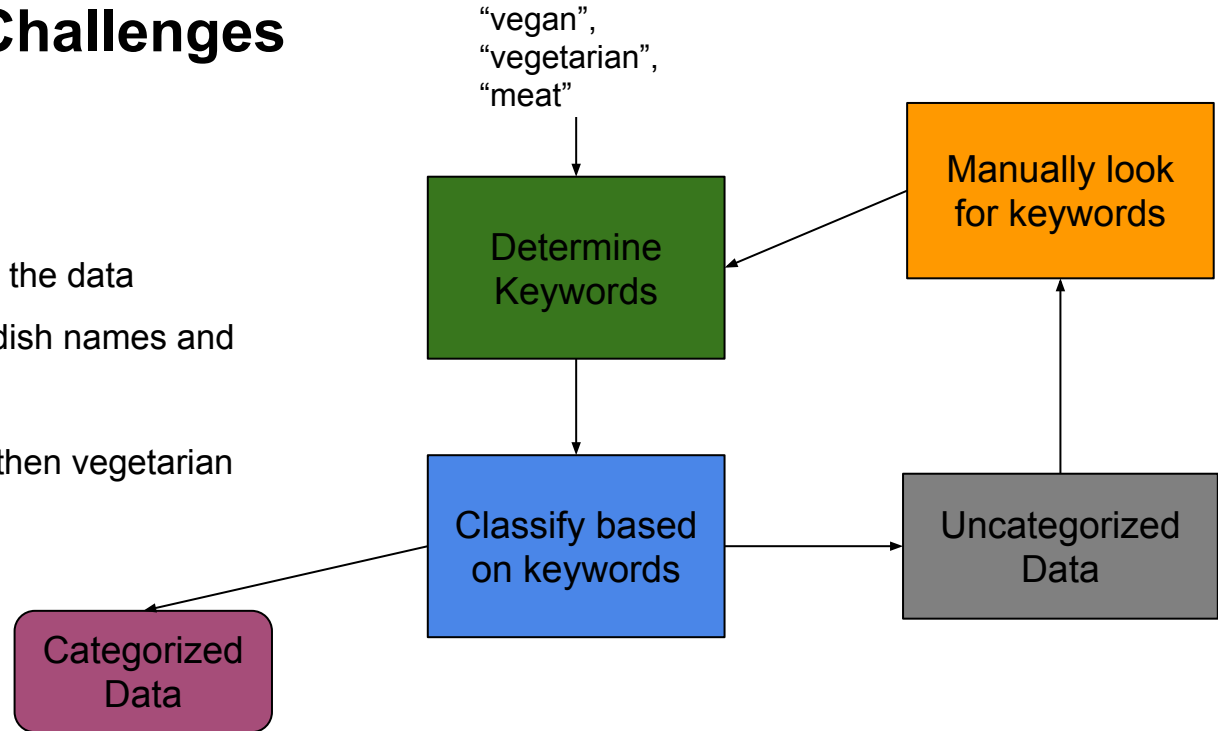
- Names & Tags
 - remove line breaks
 - lowercase
- Lower Saxony Phenomenon
 - No time to figure out cause
 - But enough time to give name



2. Data-Sets & Challenges

Feature Engineering:

- No vvo-categorization in the data
- Search for keywords in dish names and tags
- Filter for omnivorous -> then vegetarian
-> rest vegan ?



3. Research Questions

Research Questions:

1. How has the average price for a meal in Schleswig-Holstein changed since 2021?
2. How do average student meal prices compare according to their category?
3. How does the average price change for visitors in Germany since 2023?
4. Does the day of the week influence average meal prices?
5. Does the weekday influence the availability of dietary options in German canteens?
6. What are the most frequent words in meal names by category and geographic location?
7. Does a university's location influence the average price of meals for students?



RQ 1 - How has the average price for a meal in Schleswig-Holstein changed since 2021?

Average price change by City:

- Each city in Schleswig-Holstein showed significant price increase
- Overall trend in Schleswig-Holstein showing prices rising below the national food inflation rate

	2022	2023
SH:	9.5 %	10.3 %
Food Inflation: ^[1]	13.4 %	12.4 %



RQ 1 - How has the average price for a meal in Schleswig-Holstein changed since 2021?

Average price change by City:

- Each city in Schleswig-Holstein showed significant price increase
- Overall trend in Schleswig-Holstein showing prices rising below the national food inflation rate

	2022	2023
SH:	9.5 %	10.3 %
Food Inflation: ^[1]	13.4 %	12.4 %



RQ 1 - How has the average price for a meal in Schleswig-Holstein changed since 2021?

Average price change by visitors:

- Meal price changes varied by visitor status
- Students face the highest price increase (10.94 %/Year)

Average price change dietary option:

- Vegan meals saw the highest price adjustments, but seem to be very volatile



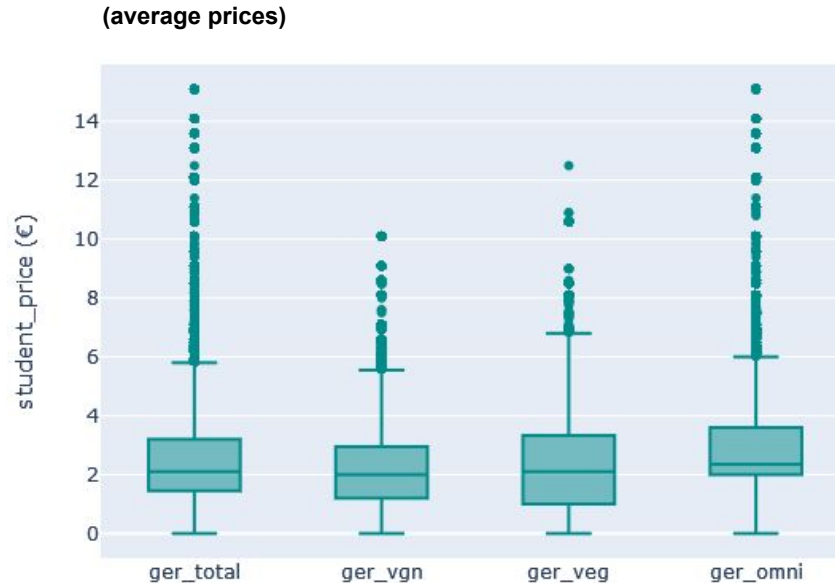
RQ 2 - How do average student meal prices compare according to their category?

Compared to the average across all states:

- **vegan:** -9.92%
- **vegetarian:** -2.89%
- **meat-based:** +16.94%

Compared to the median across all states:

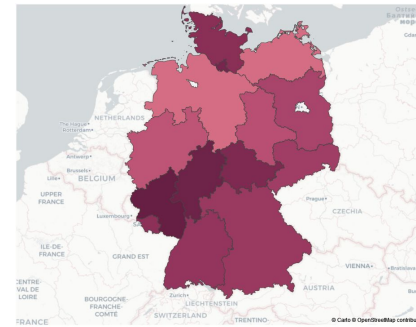
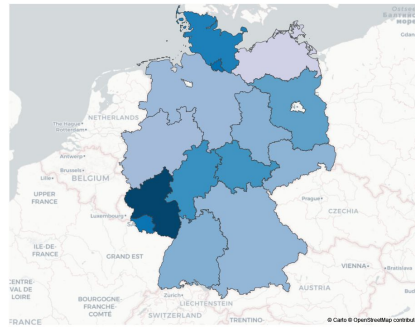
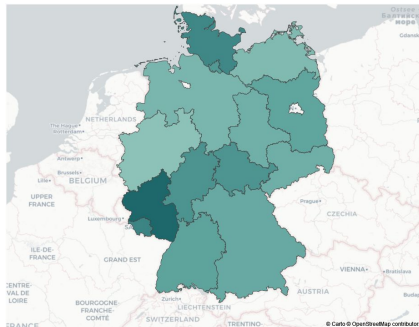
- **vegan:** -4.76%
- **vegetarian:** 0%
- **meat-based:** +11.90%



RQ 2 - How do average student meal prices compare according to their category?

Most expensive states (without Berlin, Bremen):

- **Vegan:** Rhineland-Palatinate, Saarland, Schleswig-Holstein
- **Vegetarian:** Rhineland-Palatinate, Hamburg, Saarland
- **Omnivorous:** Rhineland-Palatinate, Hesse, Hamburg



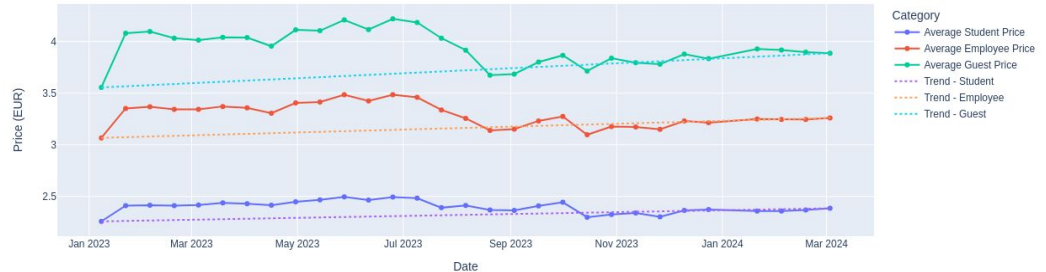
RQ 3 - How does the average price change for visitors in Germany since 2023?

Average price change for visitors:

Since 2023, canteen meal prices in Germany have risen for all visitors:

- **Students:** Increase of 5.60% (0.13 €)
- **Employees:** Increase of 6.30% (0.19 €)
- **Guests:** Largest increase of 9.30% (0.33 €)

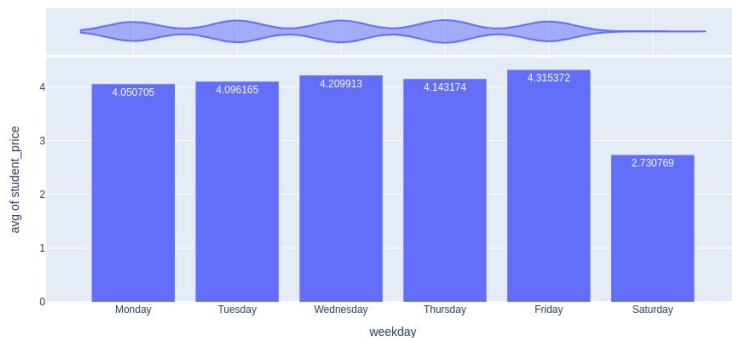
Bi-Weekly Average Meal Prices in German Canteens Over Time (Outliers Removed)



RQ 4 - Does the day of the week influence average meal prices?

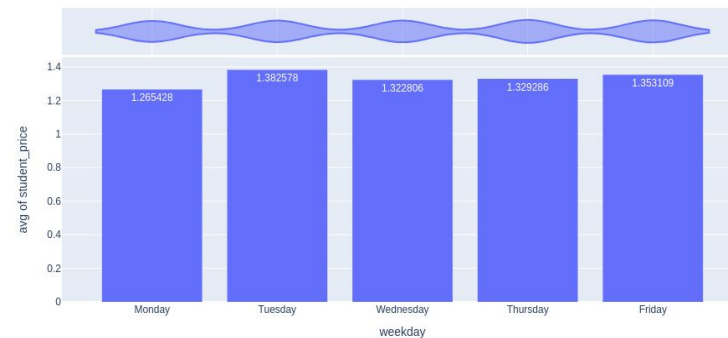
Average prices for each day of the week:

Average meal price each weekday in Brandenburg



- the two states with the greatest deviation from weekly average

Average meal price each weekday in Mecklenburg-Vorpommern



- differences statistically insignificant :(

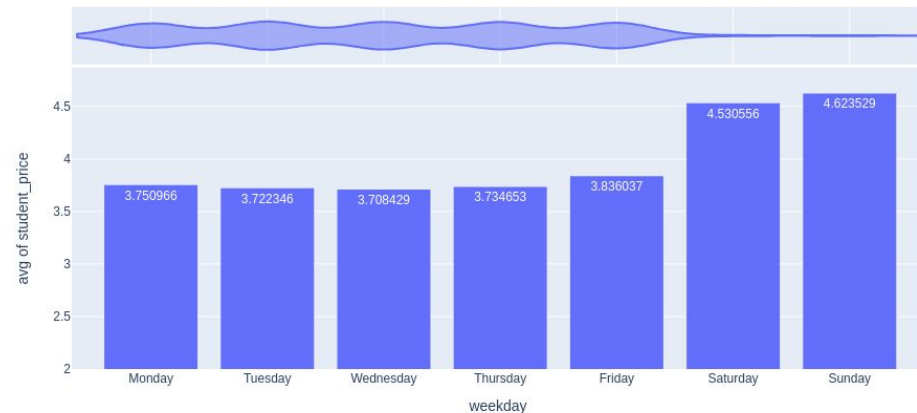
RQ 4 - Does the day of the week influence average meal prices?

What implications does this have for us?

- **!!NEVER!!** eat at Mensa I on Fridays
- **8 cents** more expensive than the average cost during work week!!!



Average meal price for Kiel, Mensa I per weekday in euro



RQ 5 - Does the weekday influence the availability of dietary options in German canteens?

Impact of weekdays on the availability of dietary options at the national level:

- No discernible patterns observed at the national level
- Trends in individual canteens neutralize one another
- **Solution:** A more detailed analysis is required

Percentage of v/v/o meals each Weekday over all states

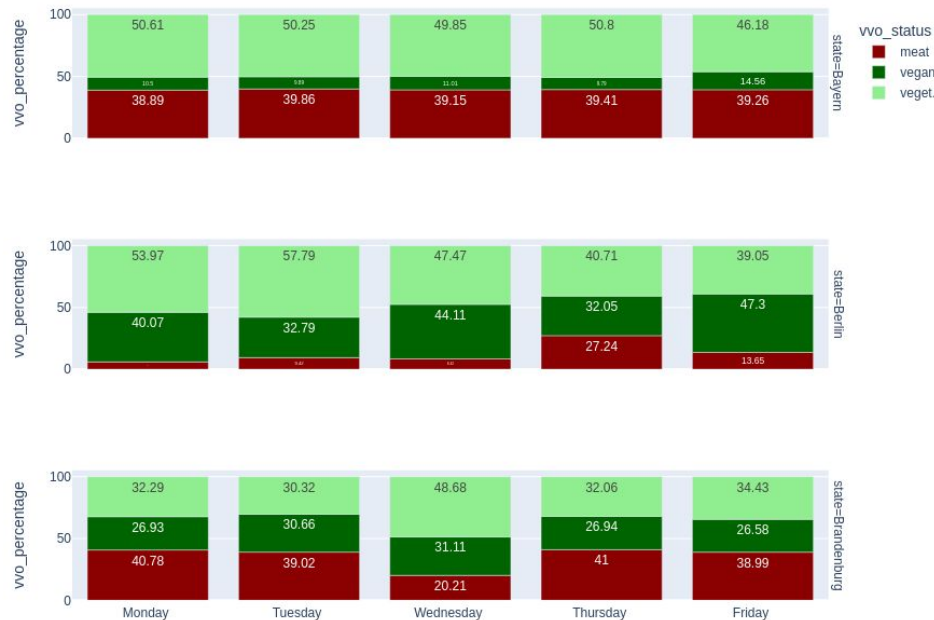


RQ 5 - Does the weekday influence the availability of dietary options in German canteens?

Impact of weekdays at the state level:

- First patterns become visible
- However, we can do better!
- Shifting focus to individual canteens

Fun-fact: Berlin only state where outlying day contains more meat than regular days



RQ 5 - Does the weekday influence the availability of dietary options in German canteens?

Impact of weekdays at local canteen level:

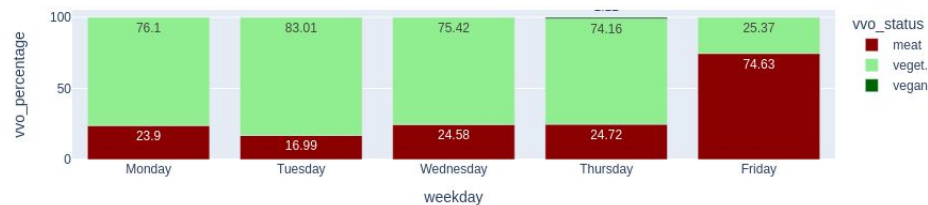
- **Challenge:** The dataset includes over 600 canteens
- **Approach:** Calculate the standard deviation for each dietary category across the weekdays
- **Method:** Select the maximum category standard deviation of a canteen as the benchmark for day-based dietary policy

RQ 5 - Does the weekday influence the availability of dietary options in German canteens?

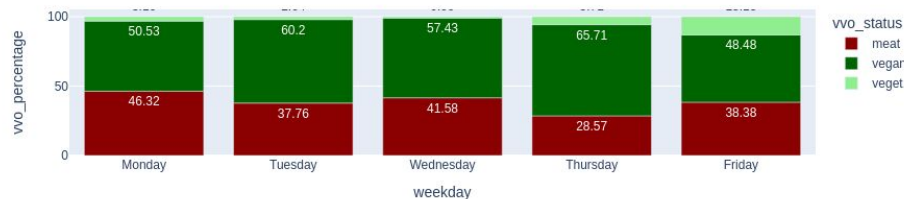
Impact of weekdays at local canteen level:

- **Challenge:** The dataset includes over 600 canteens
- **Approach:** Calculate the standard deviation for each dietary category across the weekdays
- **Method:** Select the maximum category standard deviation of a canteen as the benchmark for day-based dietary policy

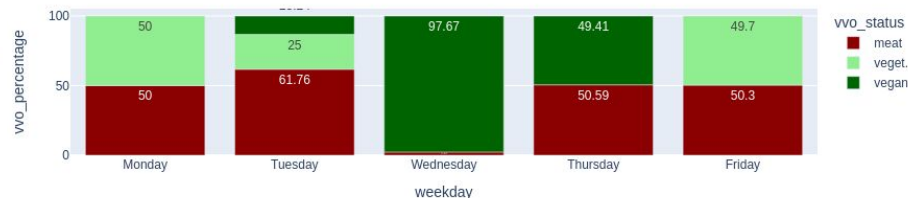
Percentage of v/v/o meals each Weekday for Husum, TSS Theodor-Storm-Schule (max_std=23.51)



Percentage of v/v/o meals each Weekday for Cafeteria Musikhochschule (max_std=7.06)



Percentage of v/v/o meals each Weekday for Cafeteria Wedel (max_std=42.36)



RQ 6 - What are the most frequent words in meal names by category and geographic location?

Frequent terms on state level:

- Each state has its unique characteristics
- Terms such as 'french fries', 'pasta', and 'currywurst' frequently appear



German wide wordcoud

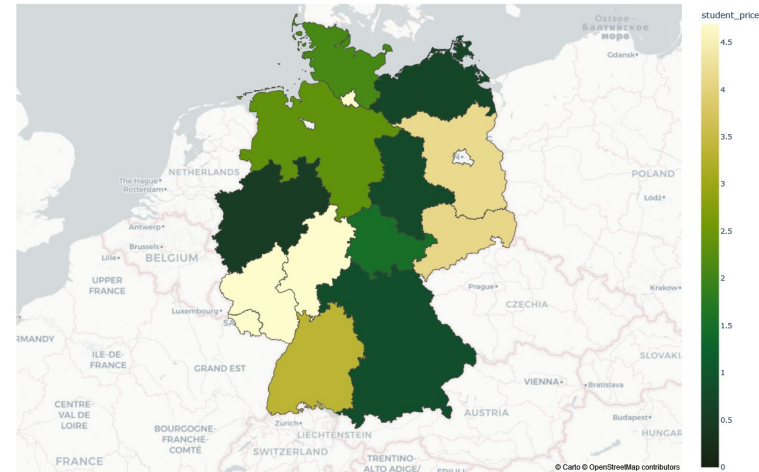
RQ 7 - Does a university's location influence the average price of meals for students?

Impact of university location on student meal prices:

- **Most expensive:** Saarland
- **Most budget-friendly:** North Rhine-Westphalia

Key finding:

- Significant disparities exist in student meal prices across different German states



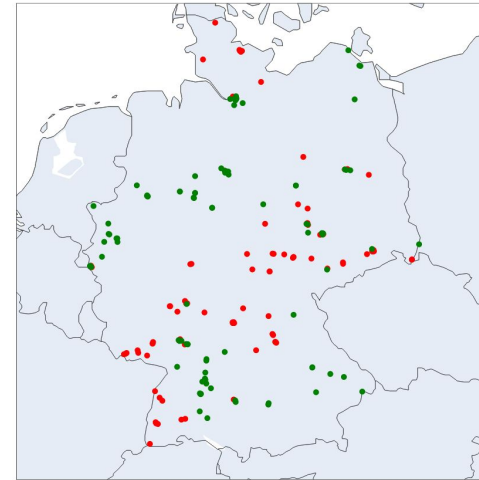
RQ 7 - Does a university's location influence the average price of meals for students?

Cheapest university canteens:

- | | | |
|----|---|--------|
| 1. | Heidelberg, Zeughaus-Mensa im Marstall: | 1.09 € |
| 2. | Mensa Hochschule für Musik, Detmold: | 1.26 € |
| 3. | Künzelsau, Mensa Reinhold-Würth-Hochschule: | 1.29 € |
| 4. | Mensa HSBI, Minden: | 1.42 € |
| 5. | Mensa TH OWL, Höxter: | 1.45 € |

Most expensive university canteens:

- | | | |
|----|---------------------------|--------|
| 1. | Mensa Trossingen: | 5.66 € |
| 2. | Mannheim, Mensa Wagon: | 5.59 € |
| 3. | Mensa Lörrach: | 5.54 € |
| 4. | Mensagarten Saarbrücken: | 5.52 € |
| 5. | Mensa HTW Saar Rotenbühl: | 5.45 € |



Top 100 Most Expensive and Affordable Canteens in Germany

4. Conclusion

Analysis:

- The increase in meal prices at Schleswig-Holstein's canteens was below the national food inflation rate
- Meat-based meals are notably more expensive than the average, with vegan ones being way cheaper
- Weekdays typically do not affect prices
- Meat, Veggie, and Vegan Days are common occurrences at the canteen level
- There's a considerable price variance among canteens in Germany
- Price increases were modest in comparison to the food inflation rate

Key finding:

- Kiel has **not** the second most expensive university canteen - **Misleading title!!**
This conclusion was based on only the top 3 canteens of the 40 biggest universities



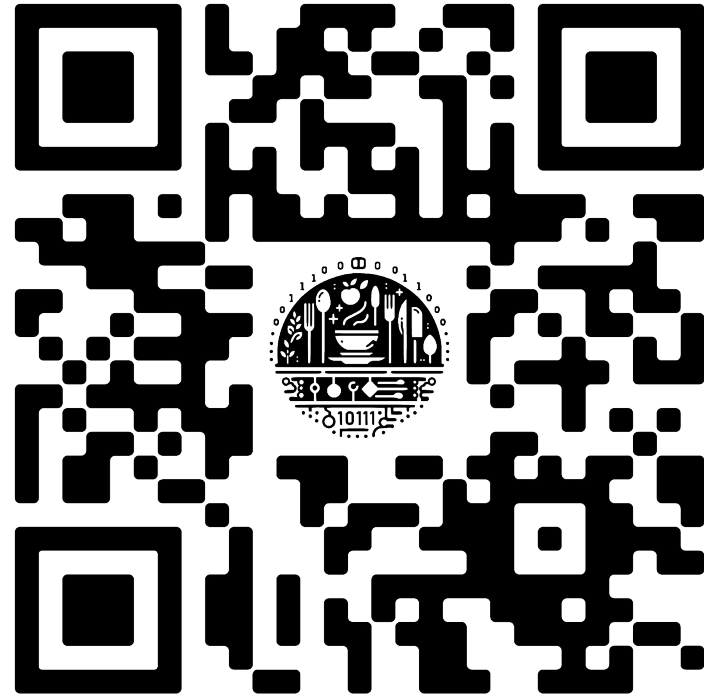
5. Website & Git Repository

Challenges:

- Formatting
- RAM limitations
- Very slow server (Render)
- Mobile view

Link:

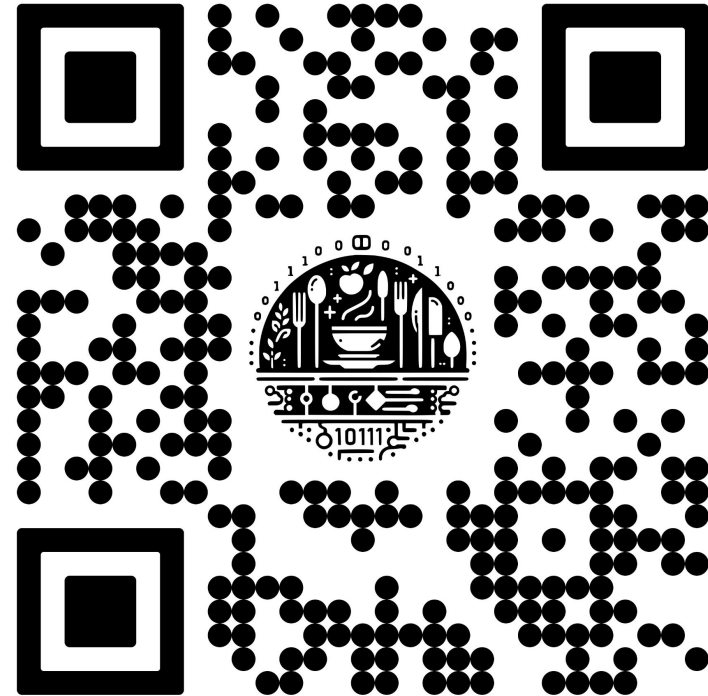
- <https://data-science-projekt.onrender.com/>



5. Website & Git Repository

Git Repository:

- Code documentation
- Research Questions
- Additional information



https://github.com/jonasweinschuetz/data_science_projekt/

Sources

Images:

- Slides 1-3 and 7-9, logo created by prompt on <https://openai.com/>, last accessed on 13.03.2024
- Slide 3,

<https://www.kn-online.de/lokales/kiel/mensa-der-universitaet-in-kiel-ist-die-zweiteuerste-in-deutschland-VBBYJE5H5VG33DIMXHA7OT4VEY.html>, last accessed on 29.02.2024



Sources

Literature:

- [1] Statistisches Bundesamt (2022). Verbraucherpreisindex - Preisentwicklung für Nahrungsmittel - Januar 2020 bis Februar 2024. DEstatis. last accessed on 21.03.2024, on <https://www.destatis.de/DE/Themen/Wirtschaft/Preise/Verbraucherpreisindex/Tabellen/sonderauswertung-nahrungsmittel.html>

