Data Science Projekt WS 2023/24

Final Presentation

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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**
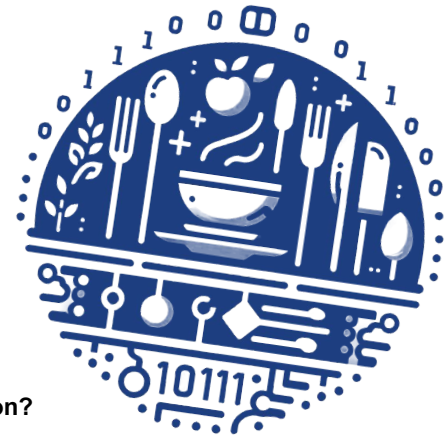
1. Topic - Feeding the Academic Appetite

Price Dynamics and Dietary Trends of German Canteens:
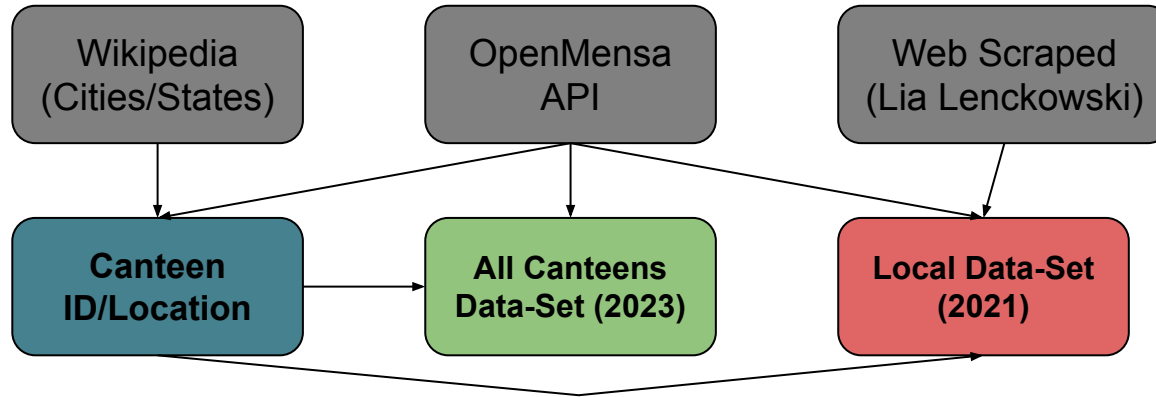
- Canteen at CAU is the second most expensive in Germany. Is that true?

  Let's investigate!

- Comparing prices and price changes

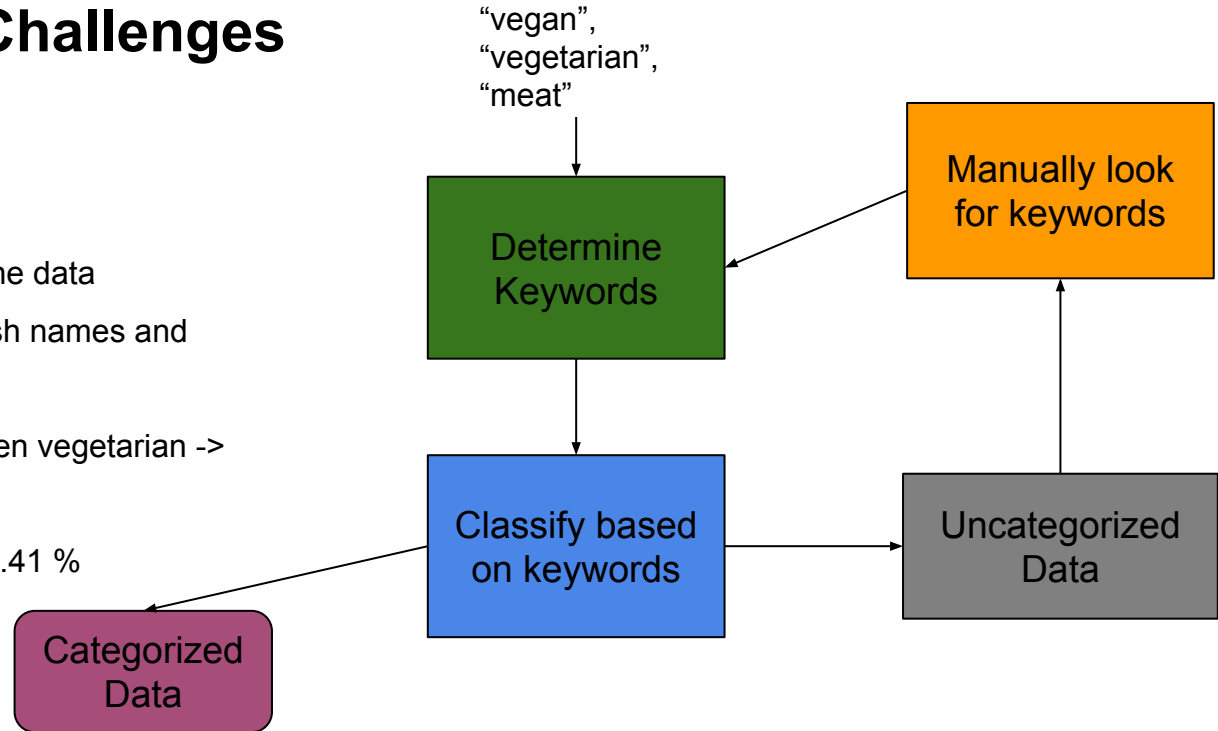- Availability of dietary options in German canteens

Mensen im Check

⊕ **Uni-Mensa in Kiel ist die zweitteuerste in Deutschland**

2. Data-Sets & Challenges

Features:

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

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

"vegan",
"vegetarian",
"meat"

Feature Engineering:

- No vvo-categorization in the data
- Search for keywords in dish names and tags
- Filter for omnivorous -> then vegetarian -> rest vegan ?
- Successfully classified: 83.41 %

Determine Keywords

Manually look for keywords

Classify based on keywords

Uncategorized Data

Categorized Data

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 %

Monthly Average Prices by City

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Monthly Average Prices by City

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%
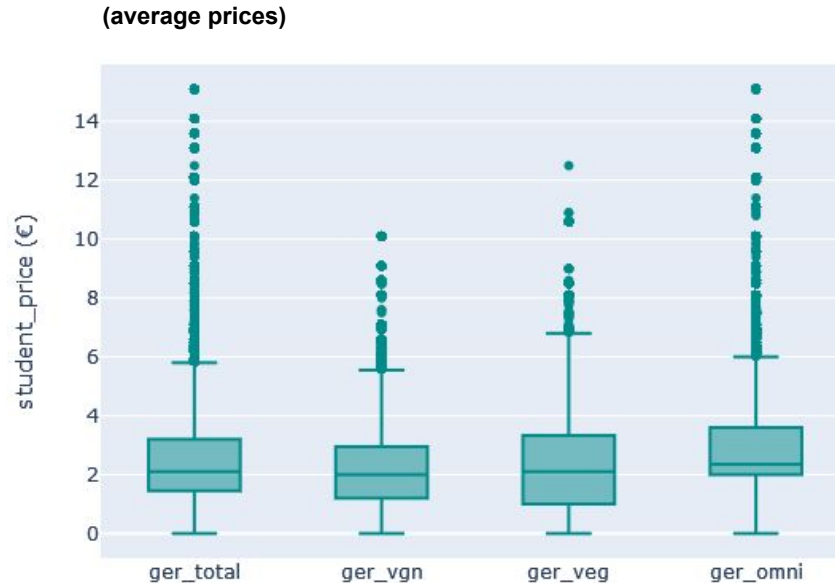
(average prices)

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

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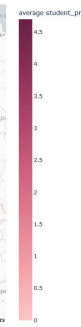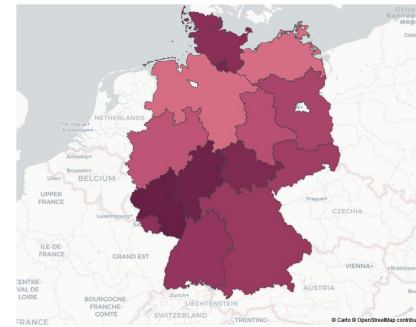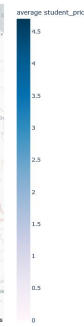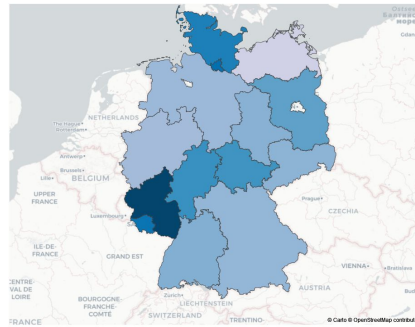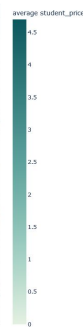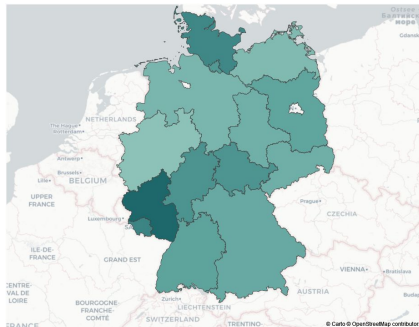
RQ 3 - How does the average price change for visitors in Germany since 2023?

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 €)

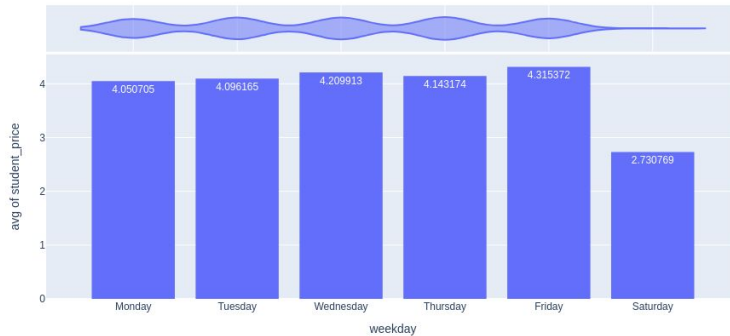- **Guests:** Largest increase of 9.30% (0.33 €)

Bi-Weekly Average Meal Prices in German Canteens Over Time (Outliers Removed)
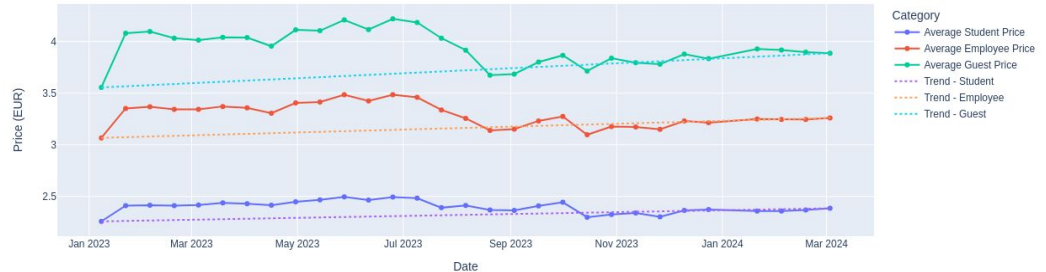
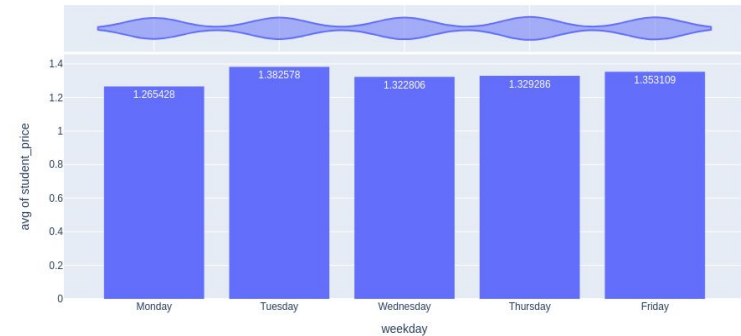# RQ 4 - Does the day of the week influence average meal prices?

Average prices for each day of the week:

Average meal price each weekday in Brandenburg

Average meal price each weekday in Mecklenburg-Vorpommern

- the two states with the greatest deviation from weekly average

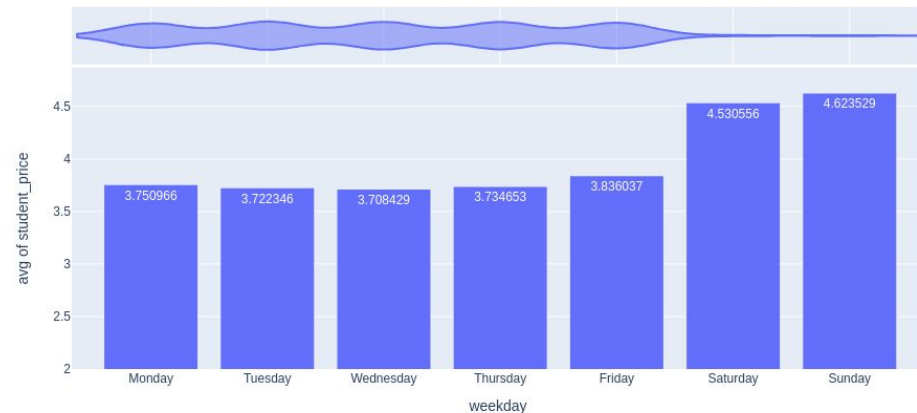- differences statistically insignificant :(

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

weekday	meat	vegan	veget.
Monday	38.74867	25.828	35.422
Tuesday	38.876	26.24533	34.878
Wednesday	37.70733	26.64067	35.65333
Thursday	39.94333	26.06267	33.994
Friday	41.51533	25.86467	32.62067

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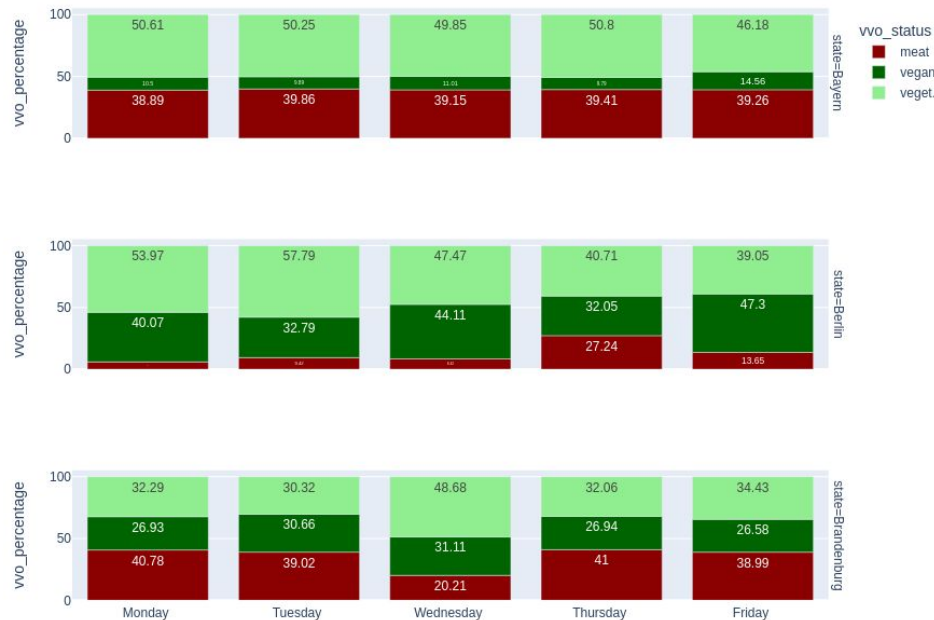
RQ 5 - Does the weekday influence the availability of dietary options in German canteens?

**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?
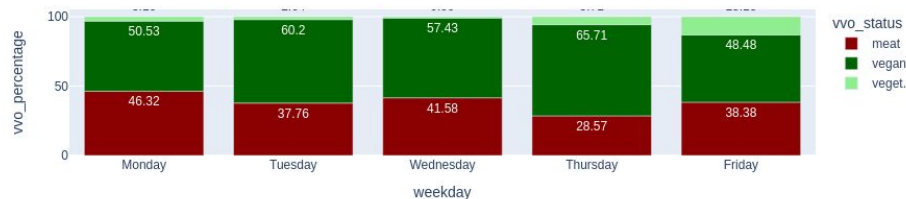
Impact of weekdays at local canteen level:

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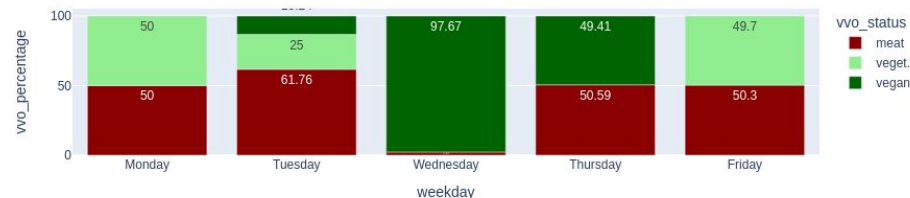

Percentage of v/v/o meals each Weekday for Husum, TSS Theodor-Storm-Schule (max_std=23.51)
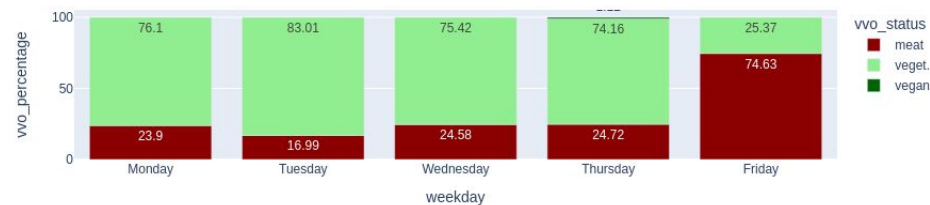
Percentage of v/v/o meals each Weekday for Cafeteria Musikhochschule (max_std=7.06)

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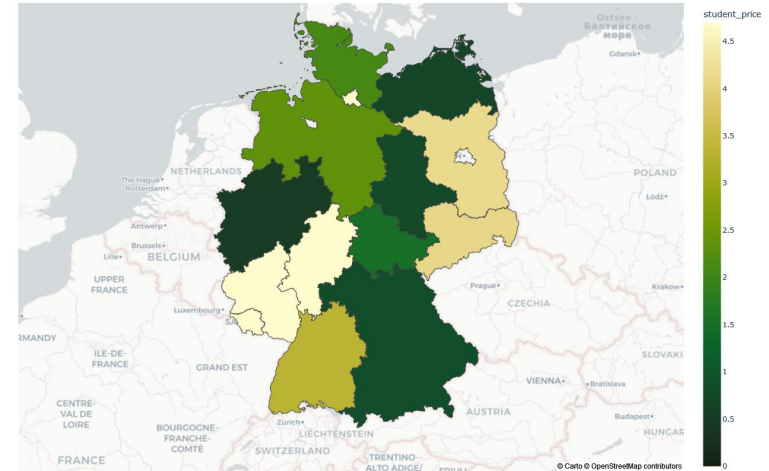
RQ 7 - Does a university's location influence the average price of meals for students?

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 €
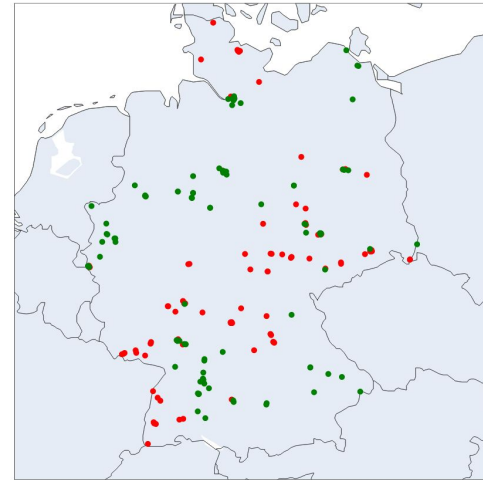
Top 100 Most Expensive and Affordable Canteens in Germany

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:

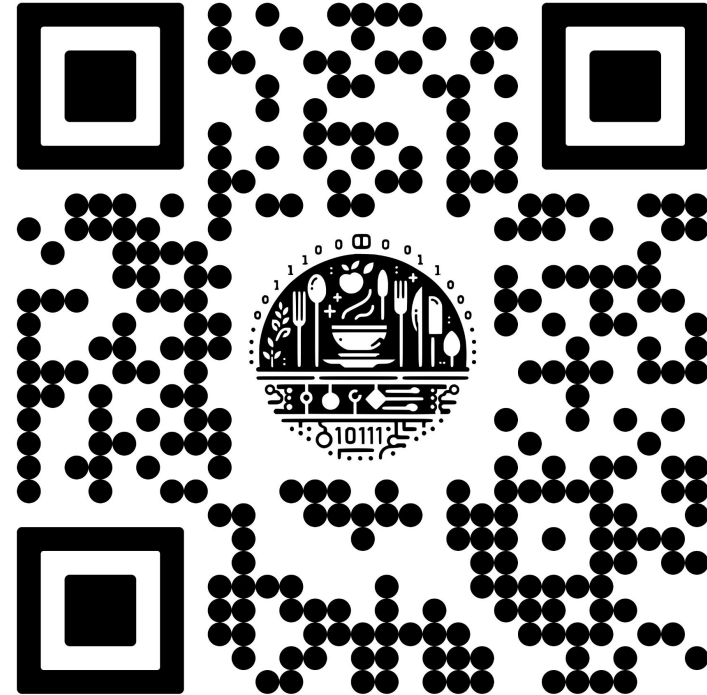- https://data-science-projekt.onrender.com/

5.   Website & Git Repository

Git Repository:

- Code documentation

- Research Questions

- Additional information

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

Sources

Images:

- Slides 1-2, 4, 7, 23, 26 and 27, logo created by promt 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-zweitteuerste-in-deutschland-VBBYJE5H5VG3
  3DIMXHA7OT4VEY.html, last accessed on 29.02.2024

- Slide 15,
  https://similarpng.com/danger-sign-warning-sign-attention-sign-danger-warning-attention-icon-on-transparent-background-
  png/, last accessed on 21.03.2024

Sources

Literature:

- [1] Statistisches Bundesamt (2024). 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