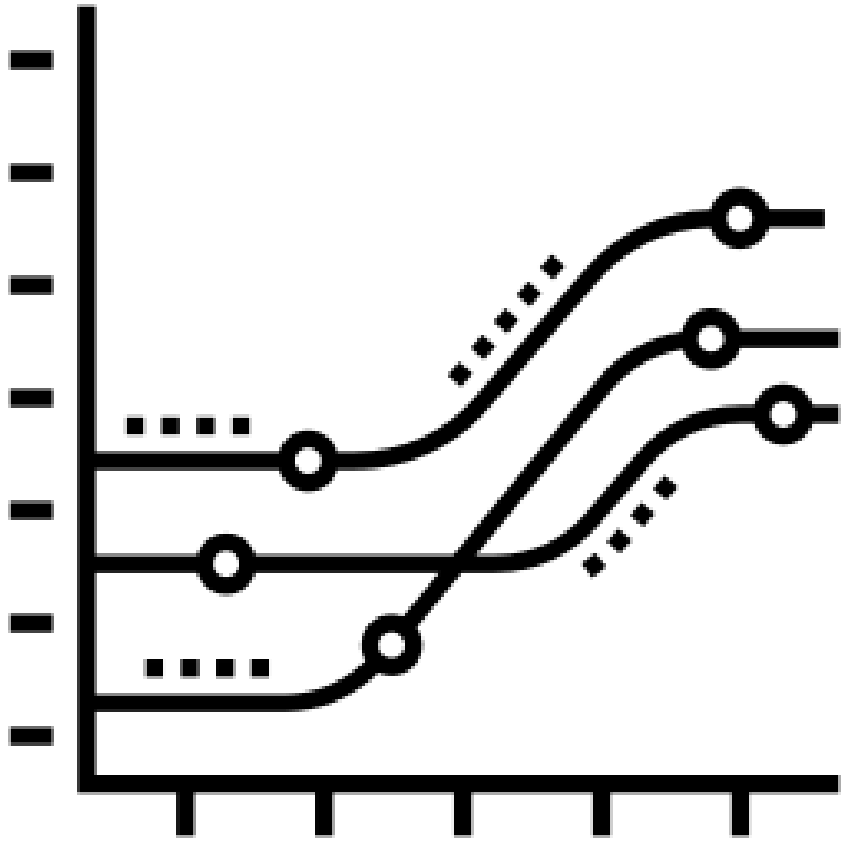
University of Applied Sciences and Arts Northwestern Switzerland
School of Computer Science

Mini-Challenge Kickoff

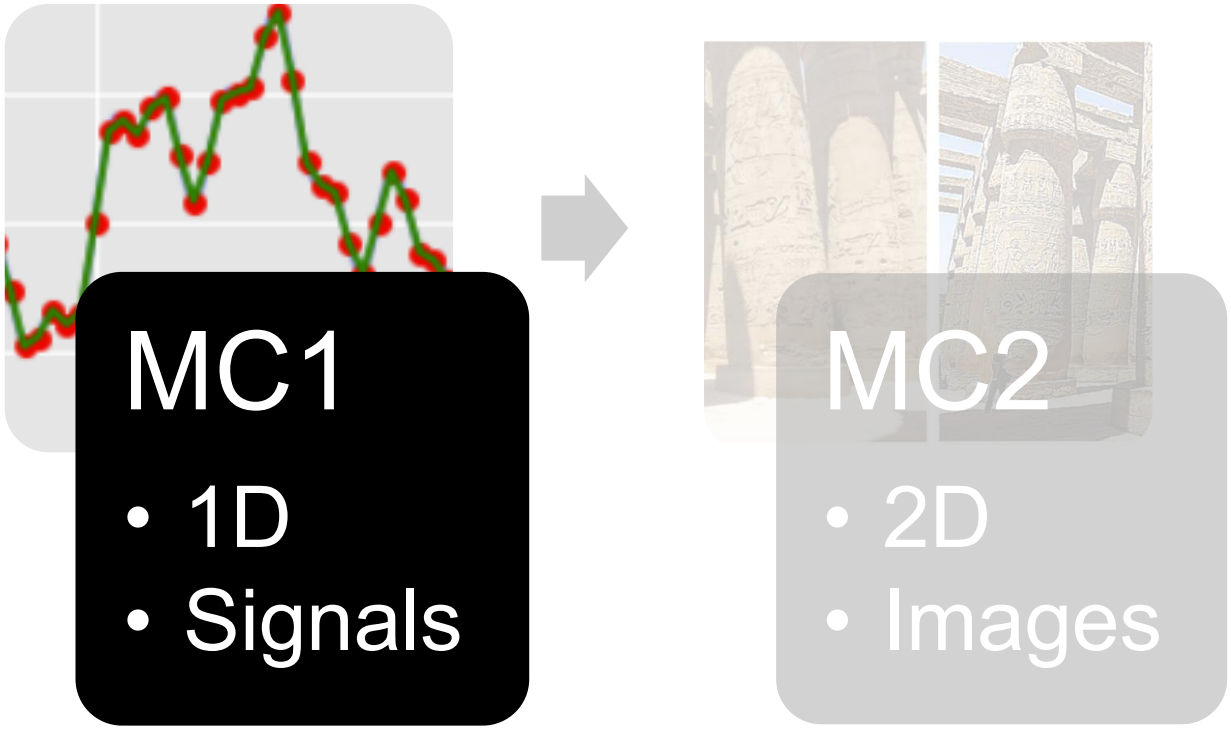
gbsv: Foundation in Image and Signal Processing
HS25



Susanne Suter

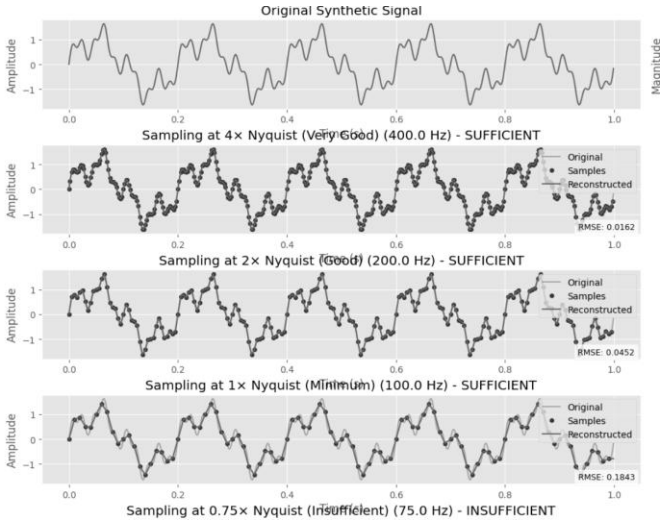
23. Sep 2025

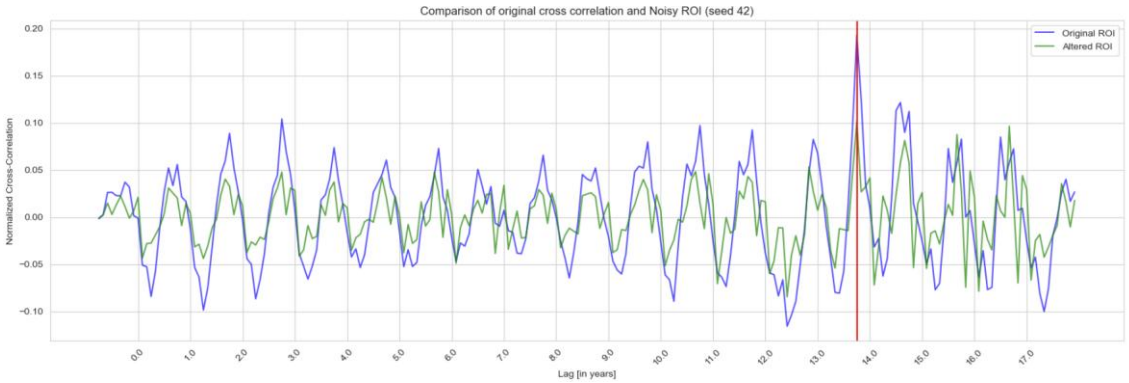
Mini-Challenge 1 (MC1): Signal Processing Methods

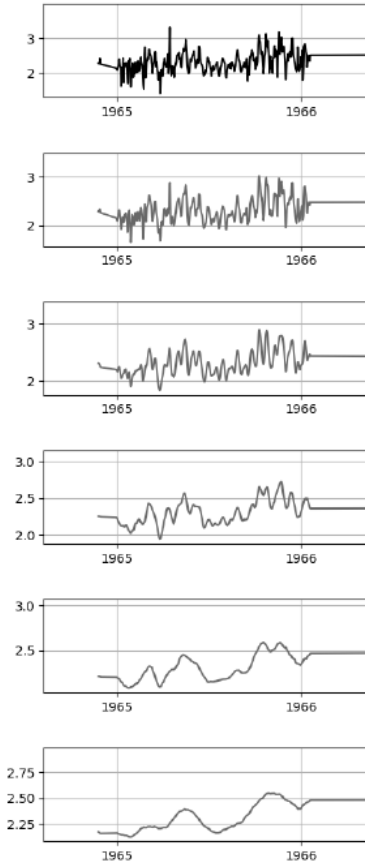


MC1 Topics: Signals

Sampling Theorem → Correlation → Convolution (Spatial Domain)







Connecting the Dots with a Common Theme of a Country

- Choose use cases that are relevant to a specific country
- Identify problems reflecting the country's context
- Select data linked to the chosen country
- Keep elements connected to the country theme
- Ma focus on a single area only
- Enrich with brief insights to give context

Inspiration for Swiss Signals

Time Series	• Swiss train timetables (renowned for punctuality) • Electricity production from Swiss hydro lakes (seasonal peaks in summer meltwater) • Tourism data (ski resort visitor numbers across seasons)
Signal	• Environmental signals like glacier melt, lake levels, or Alpine temperature curves • Stock price signals for Swiss companies (Nestlé, Novartis, Ricola exports, etc.) • Transportation signals - train delays or Zurich airport flight patterns
Audio	• Alphorn sounds (traditional Swiss instrument) • Cowbells (from Swiss alpine pastures) • Ambient sounds - mountain streams, cable cars, ski lifts

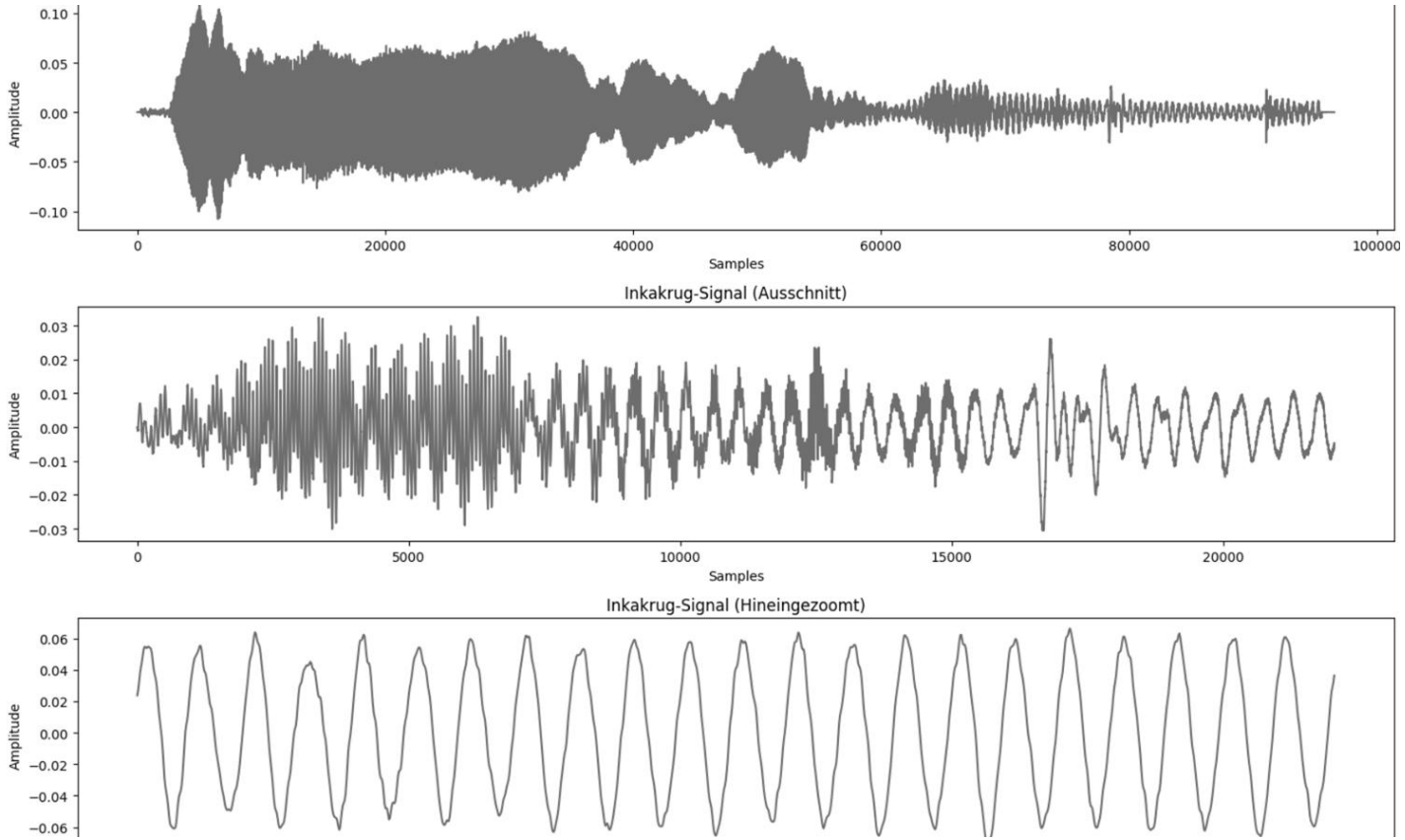
Use Case and Problem Statement Examples

Time Series	• Use case: Swiss train timetables • Problem statement: How predictable is Swiss train punctuality over time, and can anomalies (delays) or recurring patterns be detected from timetable data?
Signal	• Use case: Glacier melt measurements (environmental signals) • Problem statement: Can signal patterns in glacier melt and lake levels be linked to notable climate events (e.g., heatwaves, heavy snow years)?
Audio	• Use case: Alphorn recordings • Problem statement: How can audio signal analysis distinguish between different alphorn tones or playing techniques to preserve traditional Swiss music digitally?

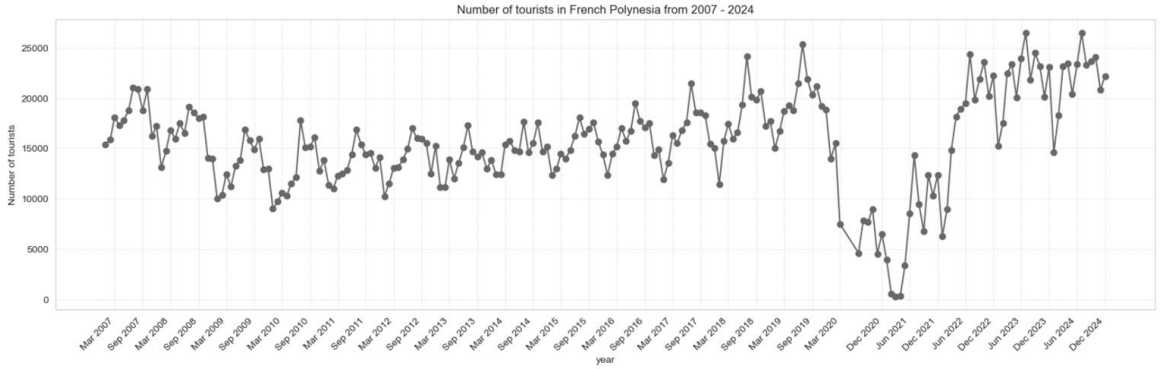
What is important during gbsv MCs?

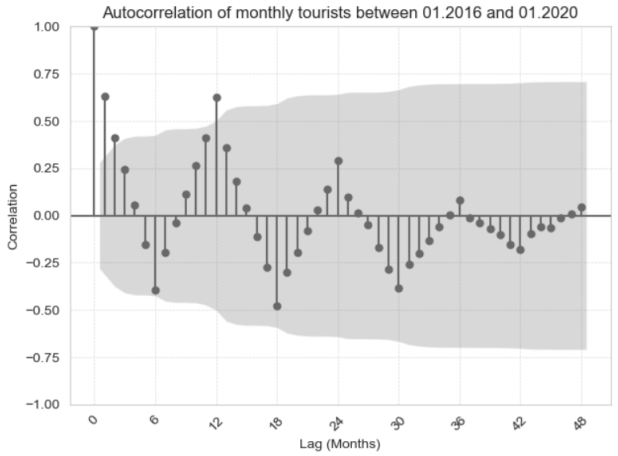
- Use case related experiments
- Data and methods suited to the problem
- Analytical thinking
- Pinpoint creativity
- Moderate diversity
- Critical thinking
- Concise structure with reader guidance

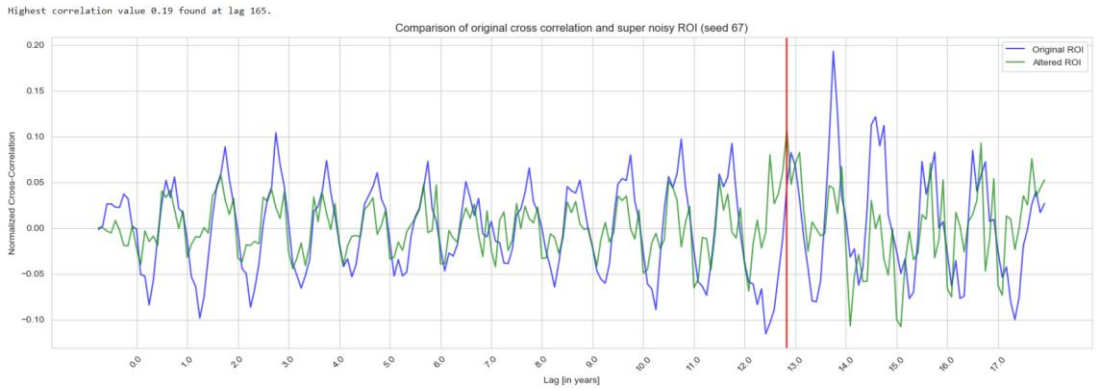
Appropriate Region of Interest Selection

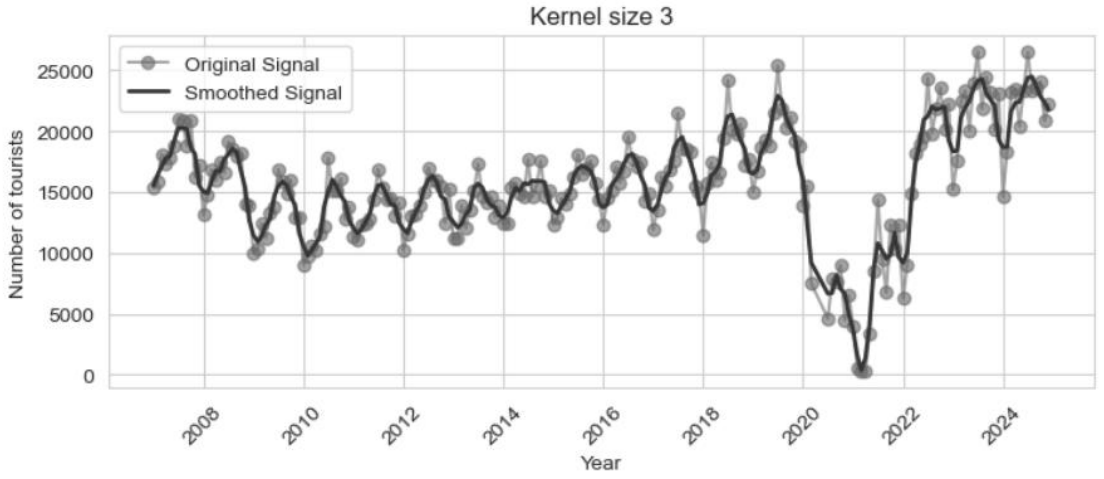


Data May Be Reused for Varying Sub Tasks

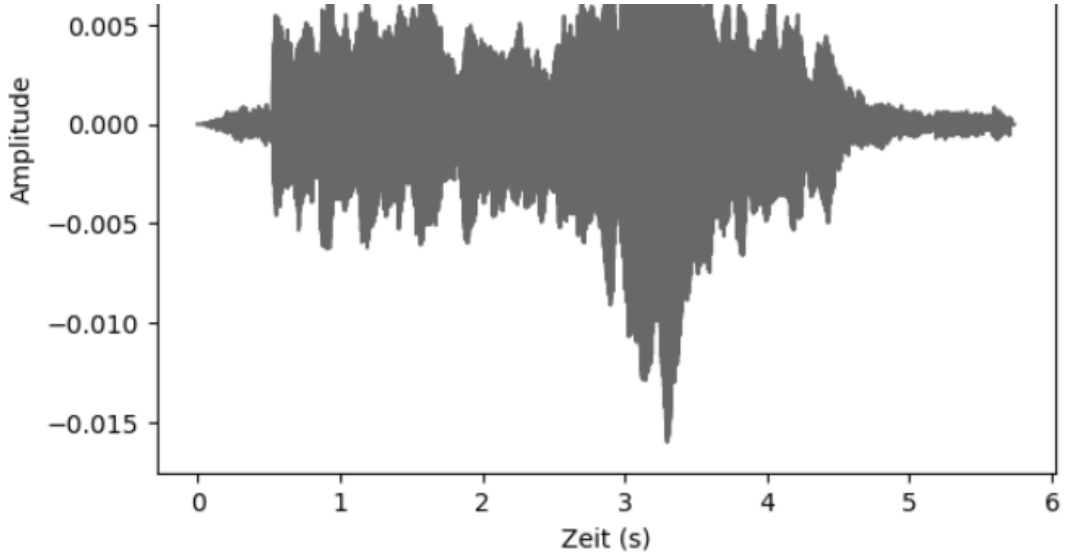








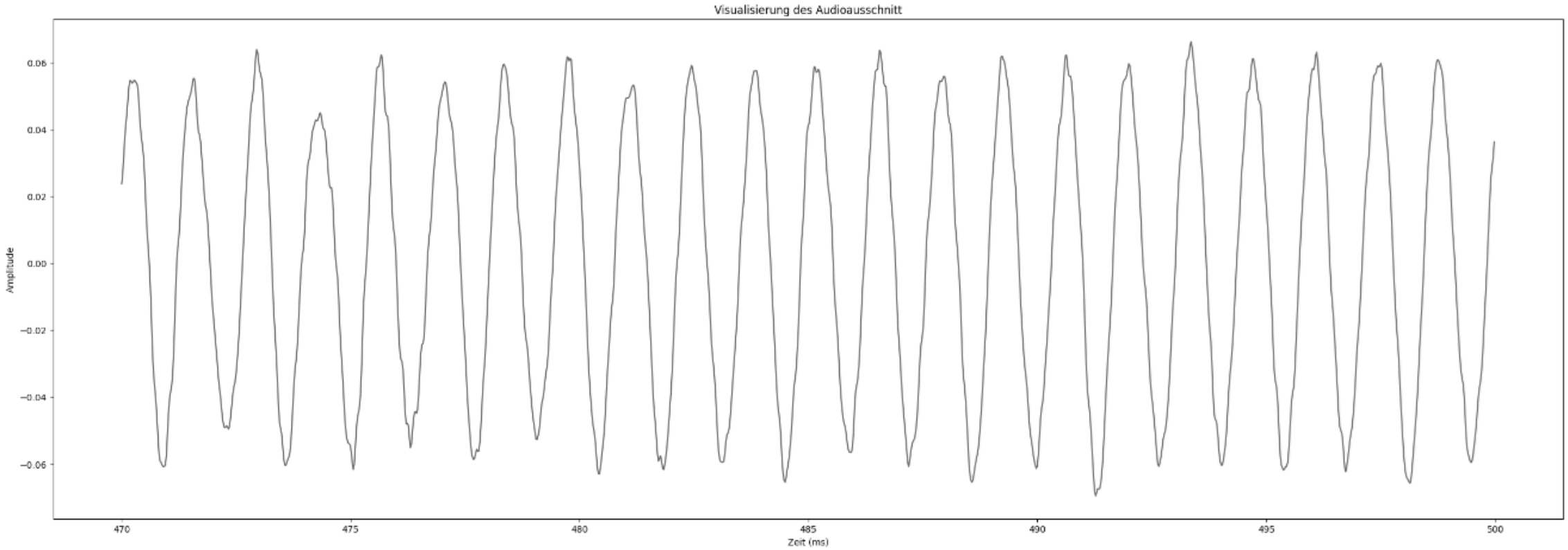
Accompanying KPIs with Figures




```
audio_info(feuerwehr_quiet, sample_rate_f)
```

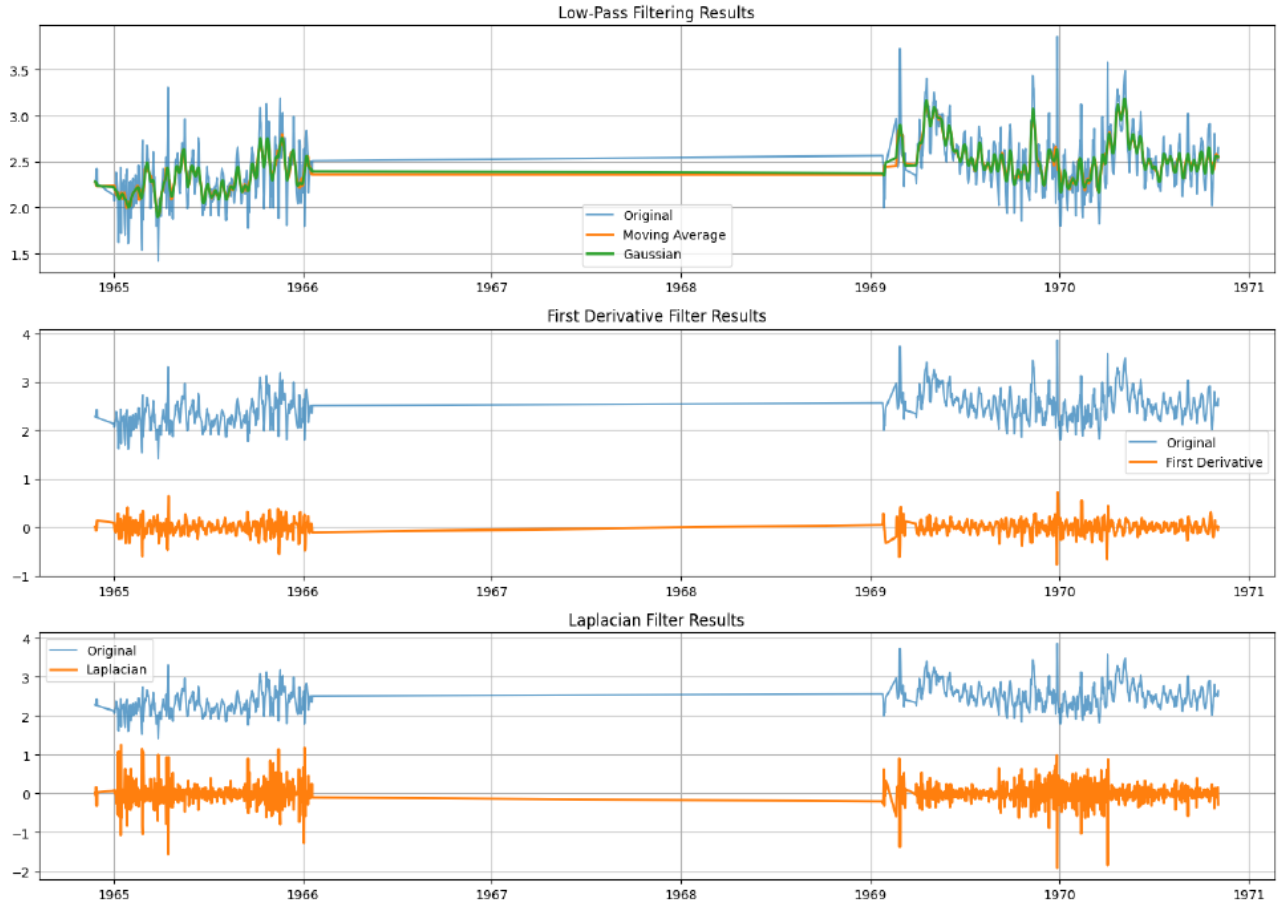
```
Länge: 126479
Abtastrate (Sample Rate): 22050 Hz
Dauer: 5.736009070294784 Sekunden
Amplitudenbereich: -0.0160134956240654 bis 0.014689575880765915
RMS-Rauschen: 0.0023657497949898243
```

Accompanying KPIs with Figures

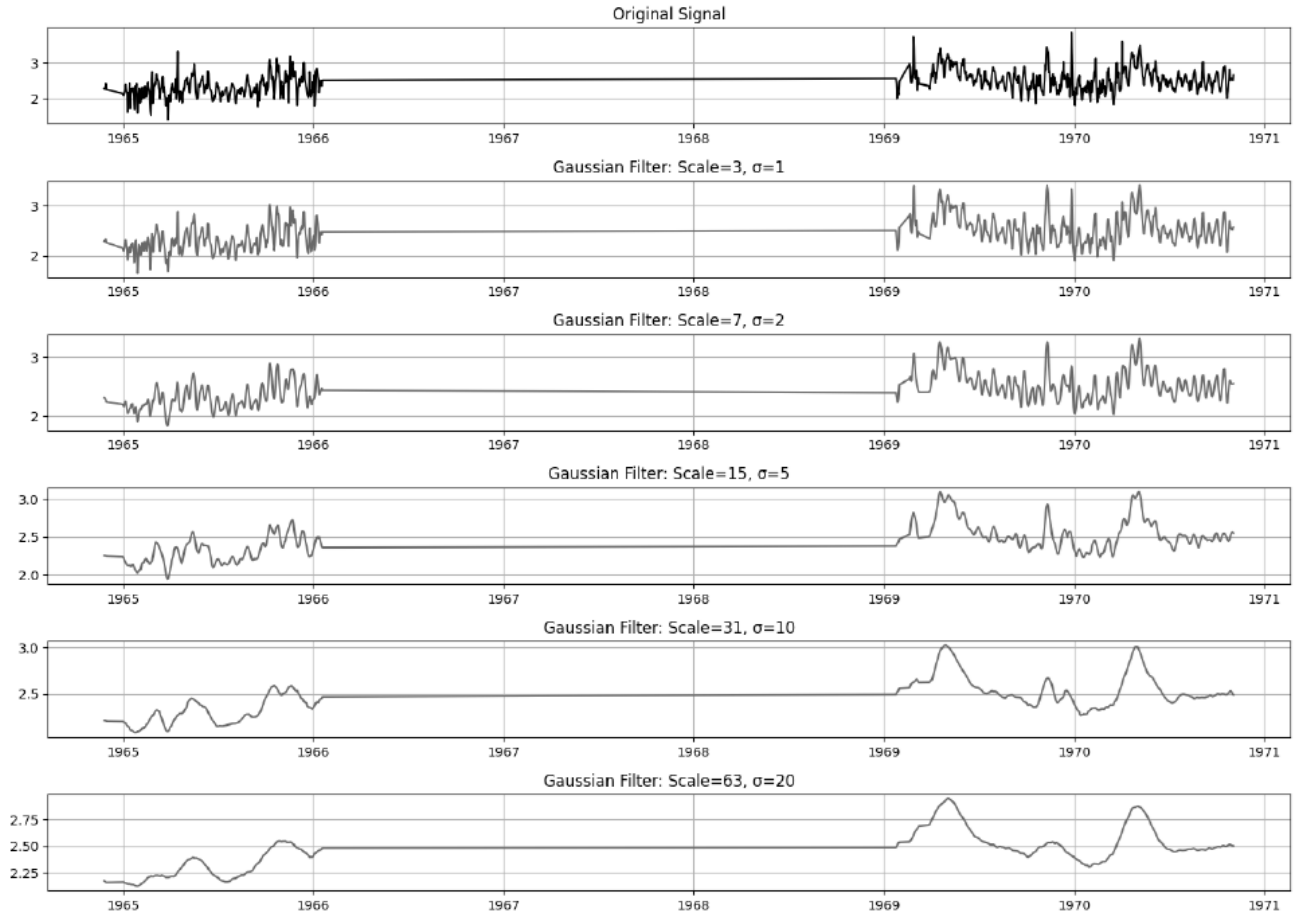


Durchschnittliche Amplitude: 0.06
Durchschnittliche Frequenz: 737 Hz
Durschnittliche Periodendauer: 1.36 ms

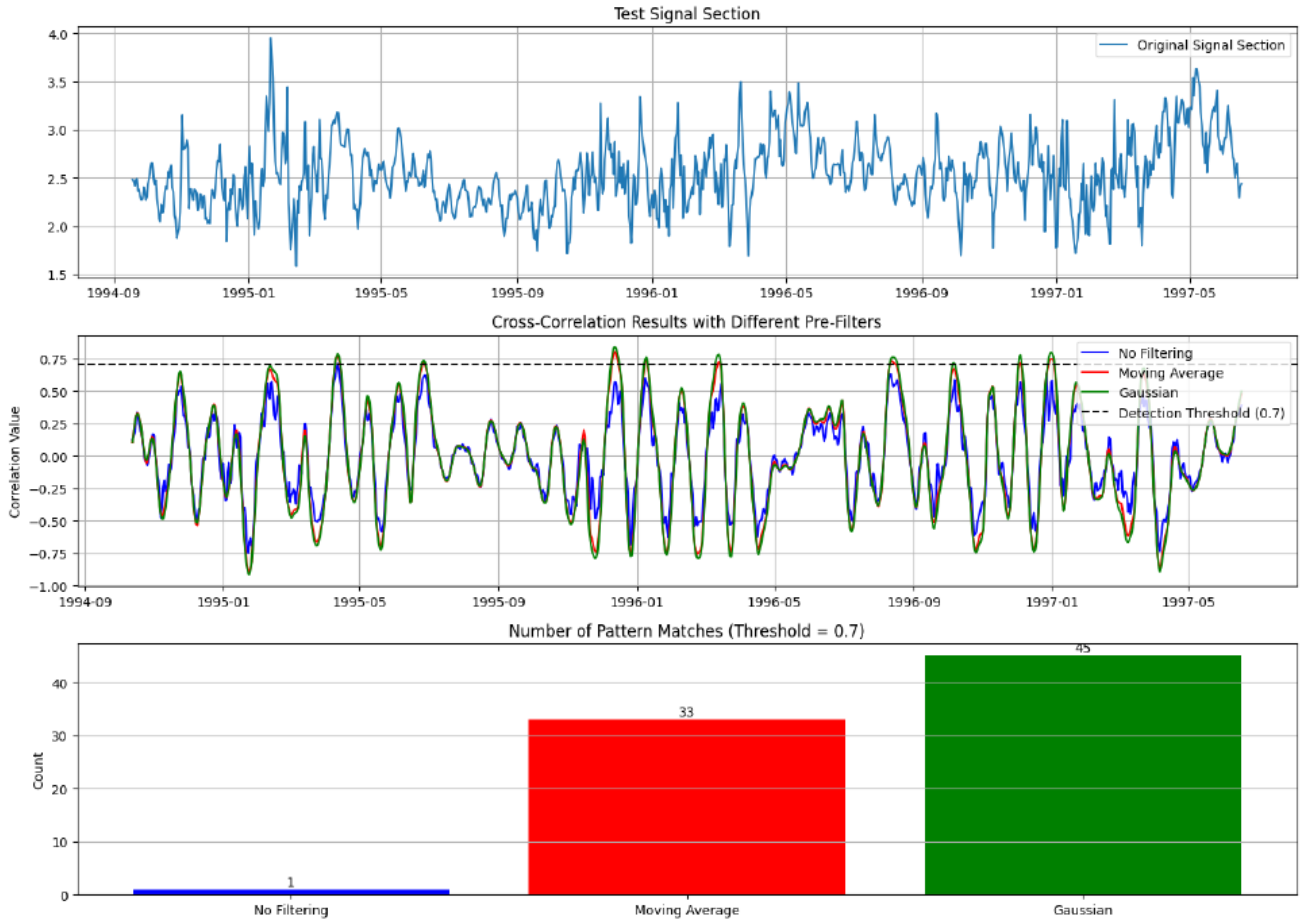
Convolution Examples



Explore Parameter Spaces

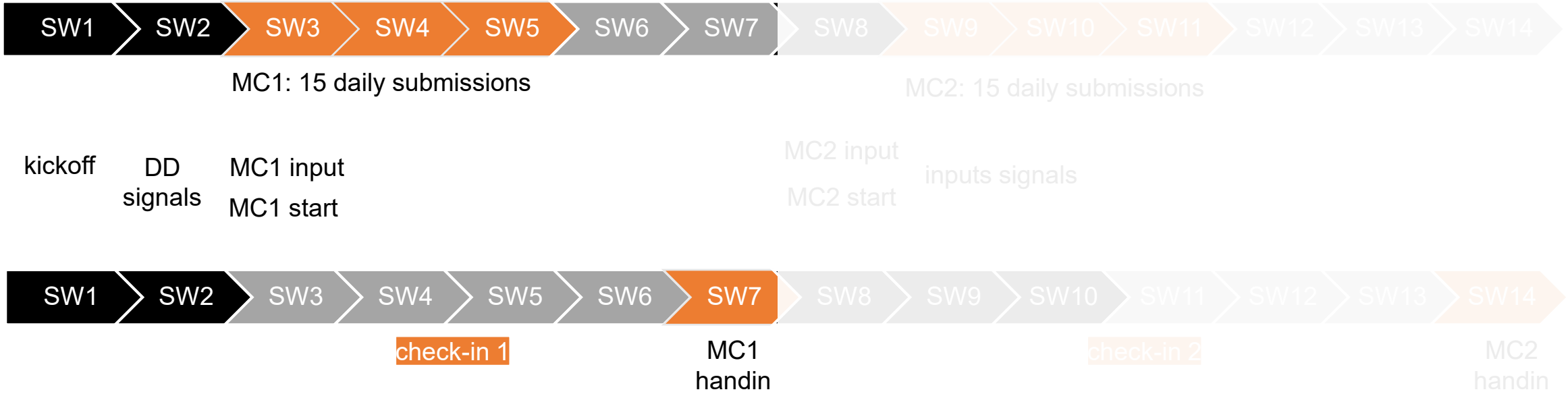


Analyze Performance



Mini-Challenge Versions

Version: 15-day-challenges



Version: individual MC rhythm

15-Day-Challenges Per Mini-Challenge

- Daily progress from Mondays to Fridays
- Regular feedback
- Bonus points if you submit at least 12 days on time
- Revisions possible on day 15 (only highlighted changes are graded)

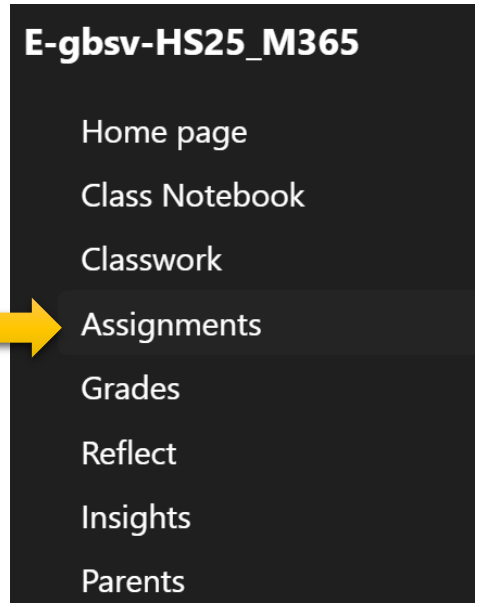
Check-Ins

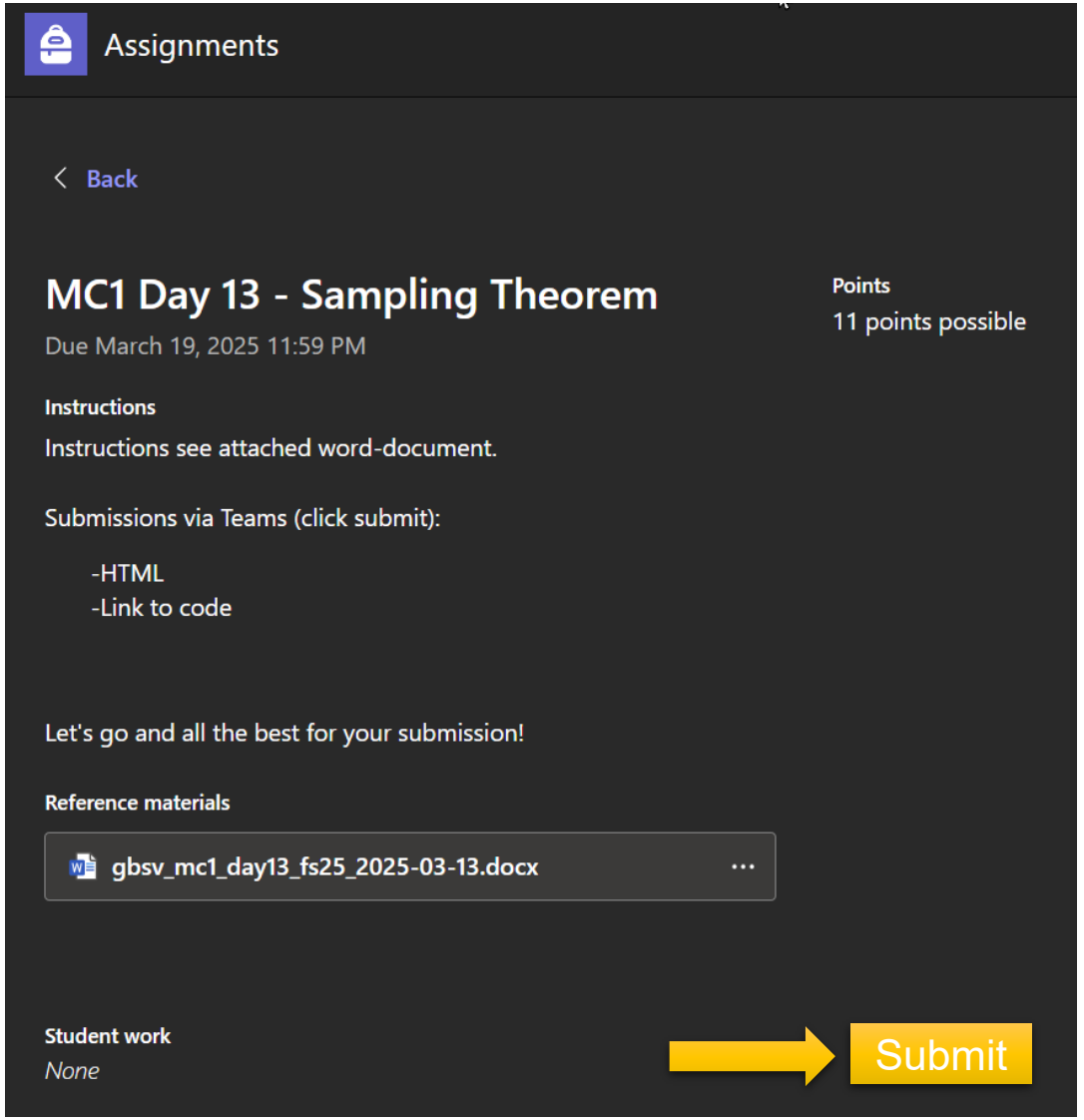
- **Mandatory for individual MC rhythm**
- 15 min review meetings (see Video: Warum Check-Ins (German))
- One per MC and a third one if things don't go smooth
- During contact hours with subject matter expert → enrollment via Calendly

- Optional in 15-day-MC versions

Assignments - Submissions

– **Submit HTMLs and link to sources** in designated Teams assignment: E-gbsv-HS25_M365
(late or email hand-ins get malus points)



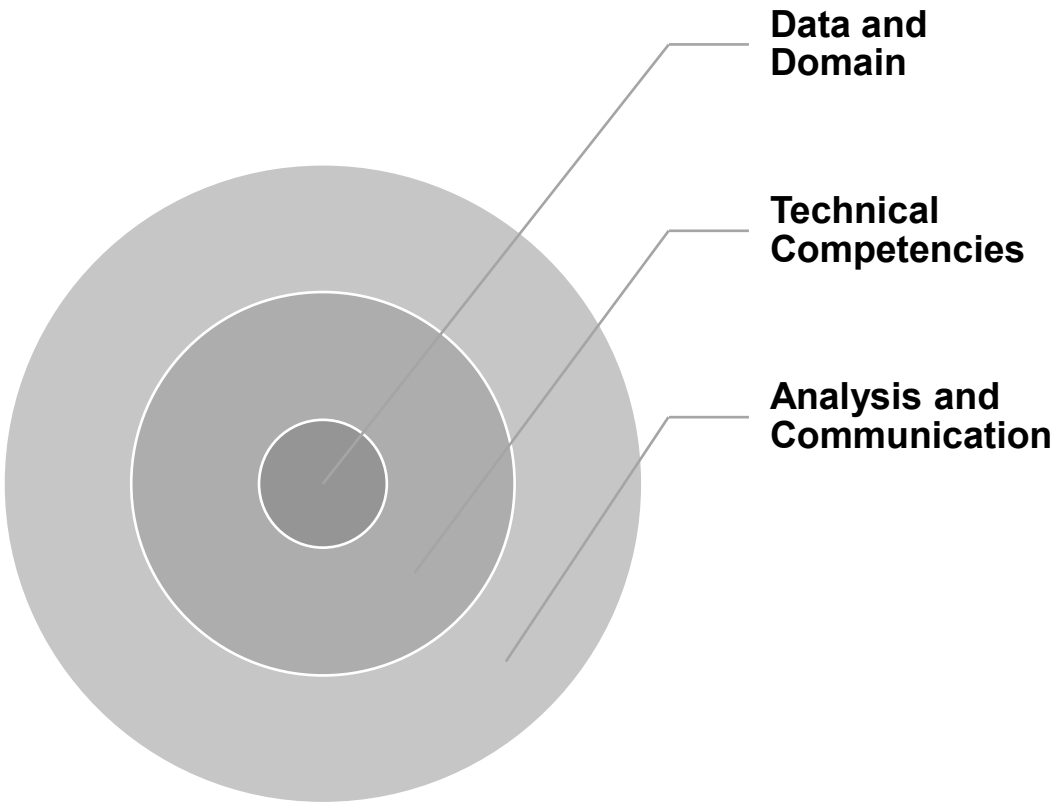


Submissions

- Individualized, personalized, unique contributions
- HTML exports of your notebooks (one notebook per subtask, no zip files)
- Link to code and data: e.g., git repository, sharepoint
- Submissions may be in German or English

Grading

- According to criteria in of three aspects
- Explicit grading criteria per task
- MCs 1:1 ratio



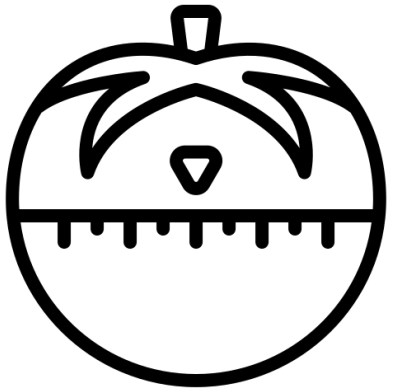
How much time should I spend on daily submissions?

- Certain tasks are intentionally kept open-ended
- Set your own frame for limitations, or ask if the boundaries are unclear
- As a rule of thumb: one day's task should take around 2 hours (+/- 30 minutes)
- Extensive submissions/texts are neither required nor expected

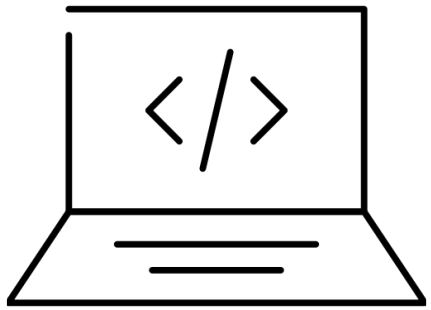
The Pomodoro Technique

- Work in focused intervals: 25 minutes (“1 Pomodoro”)
- Take a short break: 5 minutes after each Pomodoro
- Repeat: 4 pomodoros in a row
- Longer break: 15–30 minutes after 4 pomodoros
- Goal: Boost focus, reduce fatigue, and keep productivity high

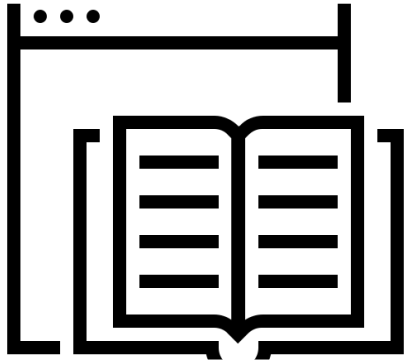
- MC:
  - Stop after 3-5 pomodoros - don’t overwork in one go
  - Keep your submission time-boxed - focus on essentials
  - Revise later - e.g., on day 15 after a break



Suggested Resources: your Swiss pocket knife for the MC



Tutorial notebooks



Digital Signals Theory Website

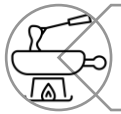
FAQ videos (German)

Lesespuren: escape room style short learning quizzes (German)

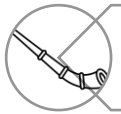
A Recipe for MC Quality, à la Swiss-made

Glide through your assignment like a skier on Swiss slopes!

Melt your ideas together like a Swiss raclette!



Match data, methods, and problems like bread in Swiss fondue - a perfect fit!



Let your creativity echo like an alphorn and flow like a mountain lake!

Make your assignment as refreshing as Ricola and as solid as Swiss cheese!

Sharpen your analysis to be as precise as a Swiss watch!

Sweeten your work with Swiss chocolate!

Acknowledgments

– Signal examples are from previous students taking the MC