SEBA Lab Kickoff WS2025/26

Jonas Gebele

October 2025

Chair of Software Engineering for Business Information Systems (sebis)
Department of Computer Science
School of Computation, Information and Technology (CIT)
Technical University of Munich (TUM)
wwwmatthes.in.tum.de

Outline

Organization Details

Project Evaluation

Project Proposals

Next Steps

SEBA Lab Team

Prof. Dr. Florian Matthes
Head of sebis

Tristan Till
Medical NLP

Marvin Chimeka
Scaling Agile

Katharina Sommer
Medical NLP

Joshua Oehms
Medical NLP

Jonas Gottal
NLP & Causal Reasoning

Alexandre Mercier
Medical NLP

Oliver Wardas
NLP & NLawP

Jonas Gebele
Blockchain & DeFi

Industry Partners

Universitäts Klinikum

ALMA PHIL

Allianz

breathment

fusionbase

MOTIUS
WE R&D.

interhyp

Organization and Timeline

	What?	When?	Where?	Who?
Kickoff + Project Assignment	Team building and project assignment	15.10.2025 – 20.10.2025	Zoom	everyone
Project work	You work on your project and meet your advisor	weekly	self-organize	team and advisor
Intermediate Presentation + Prototype	You present your intermediate results to the rest of the course and staff	19.12.2025	**Garching**	**everyone**
Project work	You work on your project and meet your advisor	weekly	self-organize	team and advisor
Final Presentation + Live Demo	You present your final results to the rest of the course and staff	10.02.2026	**Garching**	**everyone**

Attendance is mandatory for every student!

How to deal with issues?

In case you encounter a technical or personal issue (e.g. team communication):

1. Try to solve the issue **within your team**. In every team is **self-organized**.

2. If the issues persists, talk to **your advisor** (Product Owner).

3. If the issue persists, talk to the **course organizer:** Jonas Gebele (jonas.gebele@tum.de)

Visit the course web page regularly

https://wwwmatthes.in.tum.de/pages/18witnulbiwl6/SEBA-Lab-Course

School of CIT
Technical University of Munich sebis

Find pages, users, groups, ... Login

News

- Upcoming Kickoff Meeting (Project Proposals) meeting on the 15.10.2025.

Contact

- For questions or any feedback on the course, please contact Jonas Gebele.

Registration

- Registration via Matching System between the 18th of July 2025 and the 23th of July 2025.
  (**Note:** The SEBA Lab course is listed as "Entwicklungspraktikum Software Engineering für betriebliche Informationssysteme (IN2106, IN2129)" in the matching system.)
- Only for students who will be in a Master program at the time of the course.

Content and teaching goals

The Master Lab Course Web Applications is an opportunity for students to work on interesting projects in the field of web applications. Students will collaborate in small teams and implement a web application over the course of the term. Each team is advised by one teaching assistant of the chair.

The goals of the lab course are:

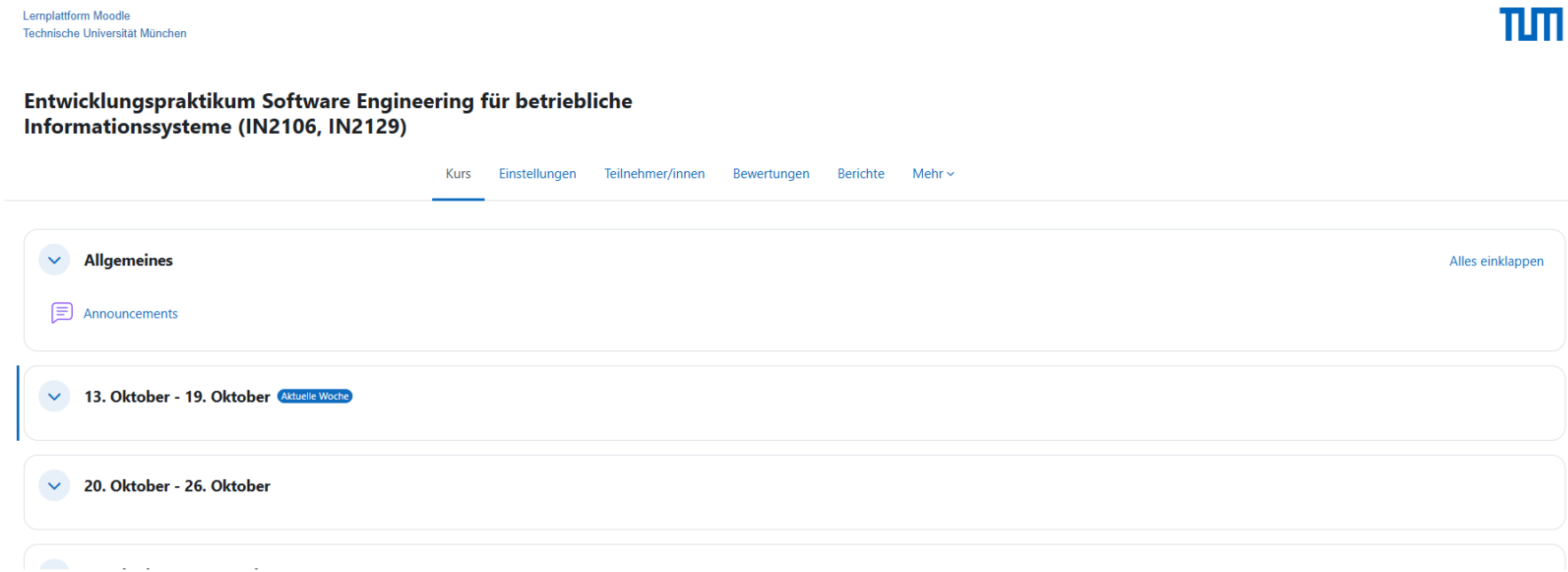
- Deepen your knowledge from the SEBA Master course
- Get familiar with new technologies such as NLP, AI integration, fact checking, on-premise ML deployment, privacy-enhancing technologies, informaton extraction, cas blockchain, web3, NoSQL databases, Cloud Computing, R .
- Get more practical experience in application development for medical, legal and enterprise applications
- Collect teamwork experience and practice presentation skills in English
- Participate in current research projects at sebis and collaborate with partners from industry.

Schedule

Date	Time	Place	Topic	Attendance
16.07.2025	14:00 - 15:00	Zoom	Preliminary Discussion	voluntary
15.10.2025	10:00 - 12:00	Zoom	Kickoff Meeting (Project Proposals)	mandatory
Weekly meetings (on project team level)				
19.12.2025	10:45 - 17:45	5901.01.013	Intermediate Presentations	mandatory
Weekly meetings (on project team level)				
11.02.2025	9:30 - 17:00	5604.EG.011	Final Presentations	mandatory

Moodle Course

https://www.moodle.tum.de/course/view.php?id=111484



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Evaluation

Application

75%

- User-Centered Design
- Documentation (10-30 pages)
- Code Quality
- Team Work & Consistency

Presentation

25%

- Content
- Structure & Style
- Time Management
- Quality of the Answers

For successful completion of the course, both examination modules have to be passed!

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Next Steps

Project Proposals

#	Project	Advisor sebis	Industry Partner	Contact
1	AssistDSpeech – Feature extraction tool for Speech recordings	Alexandre	-	alex.mercier@tum.de
2	GuidelineComp - LLM-powered systematic medical guideline comparisons	Tristan	-	tristan.till@tum.de
3	SEBA Master Course Management (v2)	Oliver	-	oliver.wardas@tum.de
4	Medical Discharge Letter Assistant	Katharina	-	kathi.sommer@tum.de
5	MediDex - AI-powered MEDIcal document inDEXing	Joshua	-	joshua.oehms@tum.de
6	CausalMosaic - Constructing robust causal models from published research	Jonas Gottal	-	jonas.gottal@tum.de
7	ATOSS.AID - Enhancing the workforce management system	Marvin	TUM Clinic	marvin.chimeka@tum.de
8	ConDEX - Conditional Token Cross-Chain Decentralized Exchange	Jonas Gebele	-	jonas.gebele@tum.de
9	Prediction Markets Analytics – Real Time Prediction Market Analytics Platform	Jonas Gebele	-	jonas.gebele@tum.de

Blockchain (Medical) NLP Web Development

AssistDSpeech – Feature extraction tool for Speech recordings

Outcome: App that enables:

- ✓ Feature extraction on audio
- ✓ Custom algorithms
- ✓ Results visualization

Technologies:

mongoDB

PyTorch

Wavesurfer.js

Project profile

Pitch: The goal of the project is to enable audio analysis right in the browser for ML engineers and dementia researchers. It takes audio as input and should display a synchronized view of linguistic features such as pauses, pitches etc. It should support the upload of python scripts for custom features.

Basic functional requirements:

- Creation of a graphical feature-extraction tool
- Management of audio files and algorithms
- Dockerized algorithm execution
- Visualization of results
- Export and sharing of dataseries

Expected prior knowledge

- Skills in Python, Frontend and Backend Development (MERN Stack)
- Basic ML/NLP knowledge

Desirable:

- Experience with ASR / pytorch

Basic non-functional requirements:

- Intuitive platform for non-tech users
- Resilient architecture ← arbitrary code execution
- Modular and extendable design

Contact:

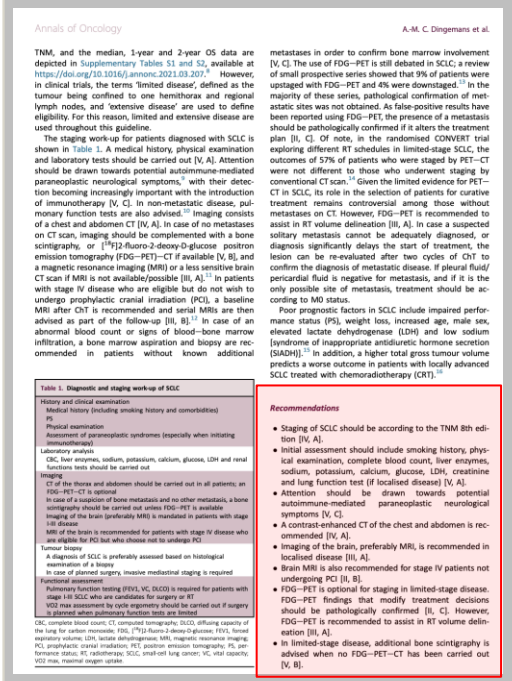
alex.mercier@tum.de

GuidelineComp – LLM-powered systematic medical guideline comparisons

Select guidelines to compare...

ESMO

ASTRO/ASCO



Annals of Oncology — A-M. C. Dingemans et al.

TNM, and the median, 1-year and 2-year OS data are depicted in Supplementary Tables S1 and S2, available at https://doi.org/10.1016/j.annonc.2021.03.207.[9] However, in clinical trials, the terms 'limited disease', defined as the tumour being confined to one hemithorax and regional lymph nodes, and 'extensive disease' are used to define eligibility. For this reason, limited and extensive disease are used throughout this guideline.

The staging work-up for patients diagnosed with SCLC is shown in Table 1. A medical history, physical examination and laboratory tests should be carried out [V, A]. Attention should be drawn towards potential autoimmune-mediated paraneoplastic neurological symptoms,[9] with their detection becoming increasingly important with the introduction of immunotherapy [V, C]. In non-metastatic disease, pulmonary function tests are also advised.[10] Imaging consists of a chest and abdomen CT [IV, A]. In case of no metastases on CT scan, imaging should be complemented with a bone scintigraphy, or ^{18}F]2-fluoro-2-deoxy-D-glucose positron emission tomography (FDG—PET)—CT if available [V, B], and a magnetic resonance imaging (MRI) or a less sensitive brain CT scan if MRI is not available/possible [III, A].[11] In patients with stage IV disease who are eligible but do not wish to undergo prophylactic cranial irradiation (PCI), a baseline MRI after ChT is recommended and serial MRIs are then advised as part of the follow-up [III, B].[12] In case of an abnormal blood count or signs of blood—bone marrow infiltration, a bone marrow aspiration and biopsy are recommended in patients without known additional metastases in order to confirm bone marrow involvement [V, C]. The use of FDG—PET is still debated in SCLC; a review of small prospective series showed that 9% of patients were upstaged with FDG—PET and 4% were downstaged.[13] In the majority of these series, pathological confirmation of metastatic sites was not obtained. As false-positive results have been reported using FDG—PET, the presence of a metastasis should be pathologically confirmed if it alters the treatment plan [II, C]. Of note, in the randomised CONVERT trial exploring different RT schedules in limited-stage SCLC, the outcomes of 57% of patients who were staged by PET—CT were not different to those who underwent staging by conventional CT scan.[14] Given the limited evidence for PET—CT in SCLC, its role in the selection of patients for curative treatment remains controversial among those without metastases on CT. However, FDG—PET is recommended to assist in RT volume delineation [III, A]. In case a suspected solitary metastasis cannot be adequately diagnosed, or diagnosis significantly delays the start of treatment, the lesion can be re-evaluated after two cycles of ChT to confirm the diagnosis of metastatic disease. If pleural fluid/pericardial fluid is negative for metastasis, and if it is the only possible site of metastasis, treatment should be according to M0 status.

Poor prognostic factors in SCLC include impaired performance status (PS), weight loss, increased age, male sex, elevated lactate dehydrogenase (LDH) and low sodium [syndrome of inappropriate antidiuretic hormone secretion (SIADH)].[15] In addition, a higher total gross tumour volume predicts a worse outcome in patients with locally advanced SCLC treated with chemoradiotherapy (CRT).[16]

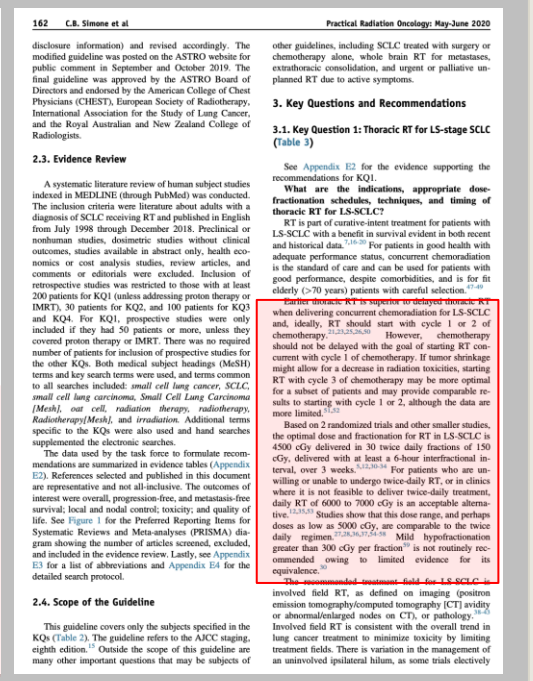
Table 1. Diagnostic and staging work-up of SCLC

History and clinical examination
Medical history (including smoking history and comorbidities)
PS
Physical examination
Assessment of paraneoplastic syndromes (especially when initiating immunotherapy)
Laboratory analysis
CBC, liver enzymes, sodium, potassium, calcium, glucose, LDH and renal functions tests should be carried out
Imaging
CT of the thorax and abdomen should be carried out in all patients; an FDG—PET—CT is optional
In case of a suspicion of bone metastasis and no other metastasis, a bone scintigraphy should be carried out unless FDG—PET is available
Imaging of the brain (preferably MRI) is mandated in patients with stage I-III disease
MRI of the brain is recommended for patients with stage IV disease who are eligible for PCI but who choose not to undergo PCI
Tumour biopsy
A diagnosis of SCLC is preferably assessed based on histological examination of a biopsy
In case of planned surgery, invasive mediastinal staging is required
Functional assessment
Pulmonary function testing (FEV1, VC, DLCO) is required for patients with stage I-III SCLC who are candidates for surgery or RT
VO2 max assessment by cycle ergometry should be carried out if surgery is planned when pulmonary function tests are limited

CBC, complete blood count; CT, computed tomography; DLCO, diffusing capacity of the lung for carbon monoxide; FDG, ^{18}F]2-fluoro-2-deoxy-D-glucose; FEV1, forced expiratory volume; LDH, lactate dehydrogenase; MRI, magnetic resonance imaging; PCI, prophylactic cranial irradiation; PET, positron emission tomography; PS, performance status; RT, radiotherapy; SCLC, small-cell lung cancer; VC, vital capacity; VO2 max, maximal oxygen uptake.

Recommendations

- Staging of SCLC should be according to the TNM 8th edition [IV, A].
- Initial assessment should include smoking history, physical examination, complete blood count, liver enzymes, sodium, potassium, calcium, glucose, LDH, creatinine and lung function test (if localised disease) [V, A].
- Attention should be drawn towards potential autoimmune-mediated paraneoplastic neurological symptoms [V, C].
- A contrast-enhanced CT of the chest and abdomen is recommended [IV, A].
- Imaging of the brain, preferably MRI, is recommended in localised disease [III, A].
- Brain MRI is also recommended for stage IV patients not undergoing PCI [II, B].
- FDG—PET is optional for staging in limited-stage disease. FDG—PET findings that modify treatment decisions should be pathologically confirmed [II, C]. However, FDG—PET is recommended to assist in RT volume delineation [III, A].
- In limited-stage disease, additional bone scintigraphy is advised when no FDG—PET—CT has been carried out [V, B].



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disclosure information) and revised accordingly. The modified guideline was posted on the ASTRO website for public comment in September and October 2019. The final guideline was approved by the ASTRO Board of Directors and endorsed by the American College of Chest Physicians (CHEST), European Society of Radiotherapy, International Association for the Study of Lung Cancer, and the Royal Australian and New Zealand College of Radiologists.

2.3. Evidence Review

A systematic literature review of human subject studies indexed in MEDLINE (through PubMed) was conducted. The inclusion criteria were literature about adults with a diagnosis of SCLC receiving RT and published in English from July 1998 through December 2018. Preclinical or nonhuman studies, dosimetric studies without clinical outcomes, studies available in abstract only, health economics or cost analysis studies, review articles, and comments or editorials were excluded. Inclusion of retrospective studies was restricted to those with at least 200 patients for KQ1 (unless addressing proton therapy or IMRT), 30 patients for KQ2, and 100 patients for KQ3 and KQ4. For KQ1, prospective studies were only included if they had 50 patients or more, unless they covered proton therapy or IMRT. There was no required number of patients for inclusion of prospective studies for the other KQs. Both medical subject headings (MeSH) terms and key search terms were used, and terms common to all searches included: *small cell lung cancer, SCLC, small cell lung carcinoma, Small Cell Lung Carcinoma [Mesh], oat cell, radiation therapy, radiotherapy, Radiotherapy[Mesh],* and *irradiation*. Additional terms specific to the KQs were also used and hand searches supplemented the electronic searches.

The data used by the task force to formulate recommendations are summarized in evidence tables (Appendix E2). References selected and published in this document are representative and not all-inclusive. The outcomes of interest were overall, progression-free, and metastasis-free survival; local and nodal control; toxicity; and quality of life. See Figure 1 for the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) diagram showing the number of articles screened, excluded, and included in the evidence review. Lastly, see Appendix E3 for a list of abbreviations and Appendix E4 for the detailed search protocol.

2.4. Scope of the Guideline

This guideline covers only the subjects specified in the KQs (Table 2). The guideline refers to the AJCC staging, eighth edition.[15] Outside the scope of this guideline are many other important questions that may be subjects of other guidelines, including SCLC treated with surgery or chemotherapy alone, whole brain RT for metastases, extrathoracic consolidation, and urgent or palliative unplanned RT due to active symptoms.

3. Key Questions and Recommendations

3.1. Key Question 1: Thoracic RT for LS-stage SCLC (Table 3)

See Appendix E2 for the evidence supporting the recommendations for KQ1.

What are the indications, appropriate dose-fractionation schedules, techniques, and timing of thoracic RT for LS-SCLC?

RT is part of curative-intent treatment for patients with LS-SCLC with a benefit in survival evident in both recent and historical data.[7,16-20] For patients in good health with adequate performance status, concurrent chemoradiation is the standard of care and can be used for patients with good performance, despite comorbidities, and is for fit elderly (>70 years) patients with careful selection.[47-49]

Earlier thoracic RT is superior to delayed thoracic RT when delivering concurrent chemoradiation for LS-SCLC and, ideally, RT should start with cycle 1 or 2 of chemotherapy.[21,23,25,26,50] However, chemotherapy should not be delayed with the goal of starting RT concurrent with cycle 1 of chemotherapy. If tumor shrinkage might allow for a decrease in radiation toxicities, starting RT with cycle 3 of chemotherapy may be more optimal for a subset of patients and may provide comparable results to starting with cycle 1 or 2, although the data are more limited.[51,52]

Based on 2 randomized trials and other smaller studies, the optimal dose and fractionation for RT in LS-SCLC is 4500 cGy delivered in 30 twice daily fractions of 150 cGy, delivered with at least a 6-hour interfractional interval, over 3 weeks.[5,12,30-34] For patients who are unwilling or unable to undergo twice-daily RT, or in clinics where it is not feasible to deliver twice-daily treatment, daily RT of 6000 to 7000 cGy is an acceptable alternative.[12,35,53] Studies show that this dose range, and perhaps doses as low as 5000 cGy, are comparable to the twice daily regimen.[27,28,36,37,54-58] Mild hypofractionation greater than 300 cGy per fraction[59] is not routinely recommended owing to limited evidence for its equivalence.[60]

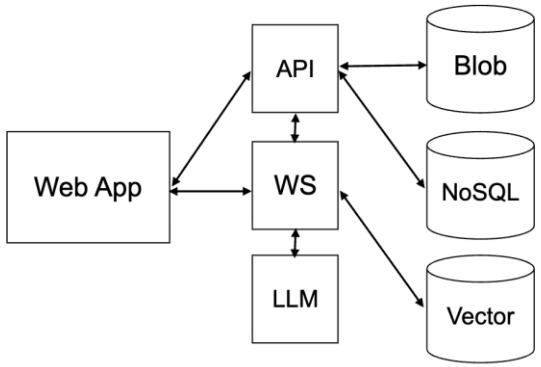
The recommended treatment field for LS-SCLC is involved field RT, as defined on imaging (positron emission tomography/computed tomography [CT] avidity or abnormal/enlarged nodes on CT), or pathology.[61-63] Involved field RT is consistent with the overall trend in lung cancer treatment to minimize toxicity by limiting treatment fields. There is variation in the management of an uninvolved ipsilateral hilum, as some trials electively

What are common recommendations for the treatment of small-cell lung cancer?

- Both ESMO and ASTRO/ASCO agree that **chemotherapy + RT** (for LS-SCLC) is standard of care, with early RT (first or second chemo cycle).
- Both favour cisplatin + etoposide as chemo backbone; allow carboplatin when needed.
- Both endorse PCI in LS-SCLC for patients who respond to treatment and have good PS, while cautioning in older...

Ask anything...

Example



Outcome: App that enables:

- ✓ Document comparison
- ✓ Knowledge extraction
- ✓ Response explanation

Technologies:

FastAPI

PyTorch

Chroma

Project profile

Pitch: The goal of the project is to develop a graphical tool for systematic comparison of (medical) guideline documents. It takes a query as input and extracts relevant content from a select number of guidelines. Based on the retrieved chunks, an LLM-based summary of similarities and differences should be given.

Basic functional requirements:

- Creation of an intuitive and compact user interface for visualization of results
- Develop a scalable extraction and inference pipeline using RAG and LLMs.
- Optimize pipeline hyperparameters for speed and accuracy

Expected prior knowledge

- Skills in Python, Frontend and Backend Development (React / Angular, FastAPI)
- Basic Understanding of Natural Language Processing (NLP) Methodologies

Desirable:

- Experience with RAG, NLP, and LLMs

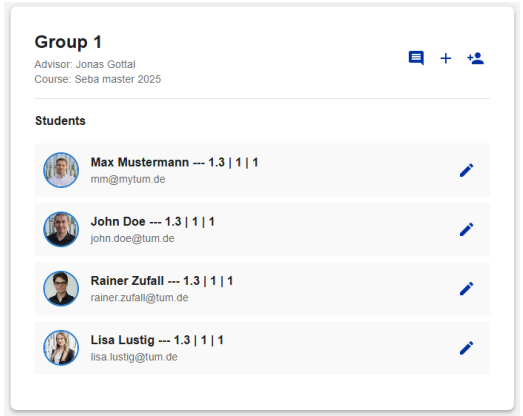
Basic non-functional requirements:

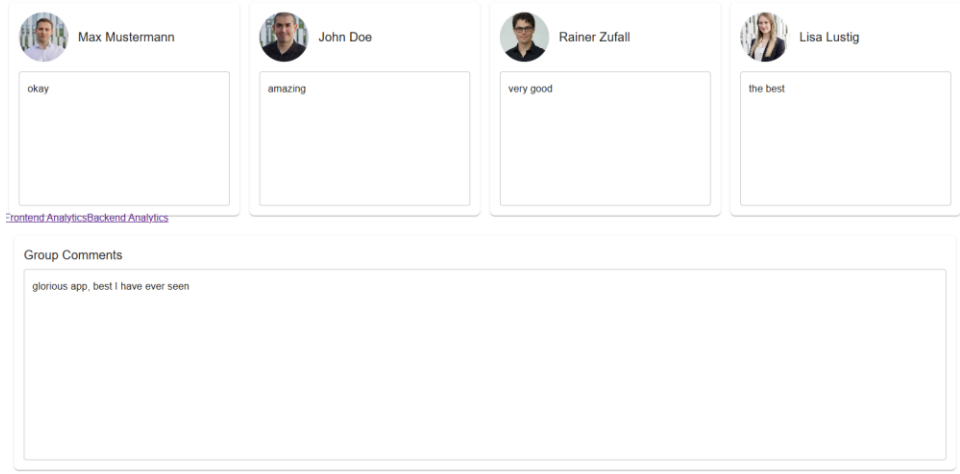
- Cost-effective processing of user queries
- Intuitive platform for non-tech users
- Realtime client – server communication
- Modular and extendable design

Contact:

tristan.till@tum.de

SEBA Master Course Management (v2)

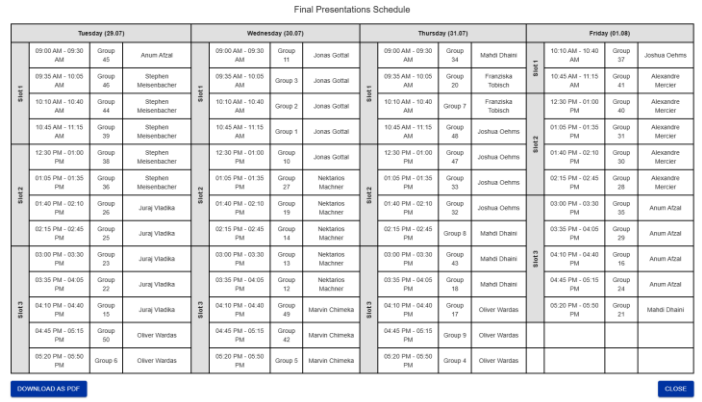




Outcome: App that supports:
- ✓ Adv. Presentation Scheduling
- ✓ GitLab Integration (Metrics)
- ✓ Visual Slot Creation & Nav.
- ✓ Adv. Excuse Submition

Technologies:

Slot ID	Start Time	End Time	Date	Actions
Slot-17526585051...	09:00	11:15	2025-07-29	
Slot-1752658552...	12:30	14:45	2025-07-29	
Slot-1752658617...	15:00	17:50	2025-07-29	
Slot-1752658660...	09:00	11:15	2025-07-30	
Slot-1752658682...	12:30	14:45	2025-07-30	
Slot-1752658708...	15:00	17:50	2025-07-30	
Slot-1752658733...	09:00	11:15	2025-07-31	
Slot-1752658765...	12:30	14:45	2025-07-31	
Slot-1752658792...	15:00	17:50	2025-07-31	
Slot-1752658873...	10:10	11:15	2025-08-01	
Slot-1752658922...	12:30	14:45	2025-08-01	
Slot-1752658942...	15:00	17:50	2025-08-01	



Project profile

Pitch: The goal of the project is to extend the SEBA Master course administration web app with advanced scheduling tools, GitLab integration, improved presentation workflows, and enhanced user experience features.

Basic functional requirements:

- Infeasibility Resolution for Schedules
- GitLab Integration & In-App Contribution Metrics
- Visual Schedule & Slot Creation and Navigation
- Overhauled Excuse Submission

& more

Basic non-functional requirements:

- Role-based authorization
- Automatic regular DB backups
- Resistance to most basic attacks (e.g. *XSS*)
- Design of modular components

Expected prior knowledge

- Good knowledge in *React, NodeJS, Express, MongoDB*
- Basic knowledge of typical attack patterns and how to prevent them (e.g. *XSS*)

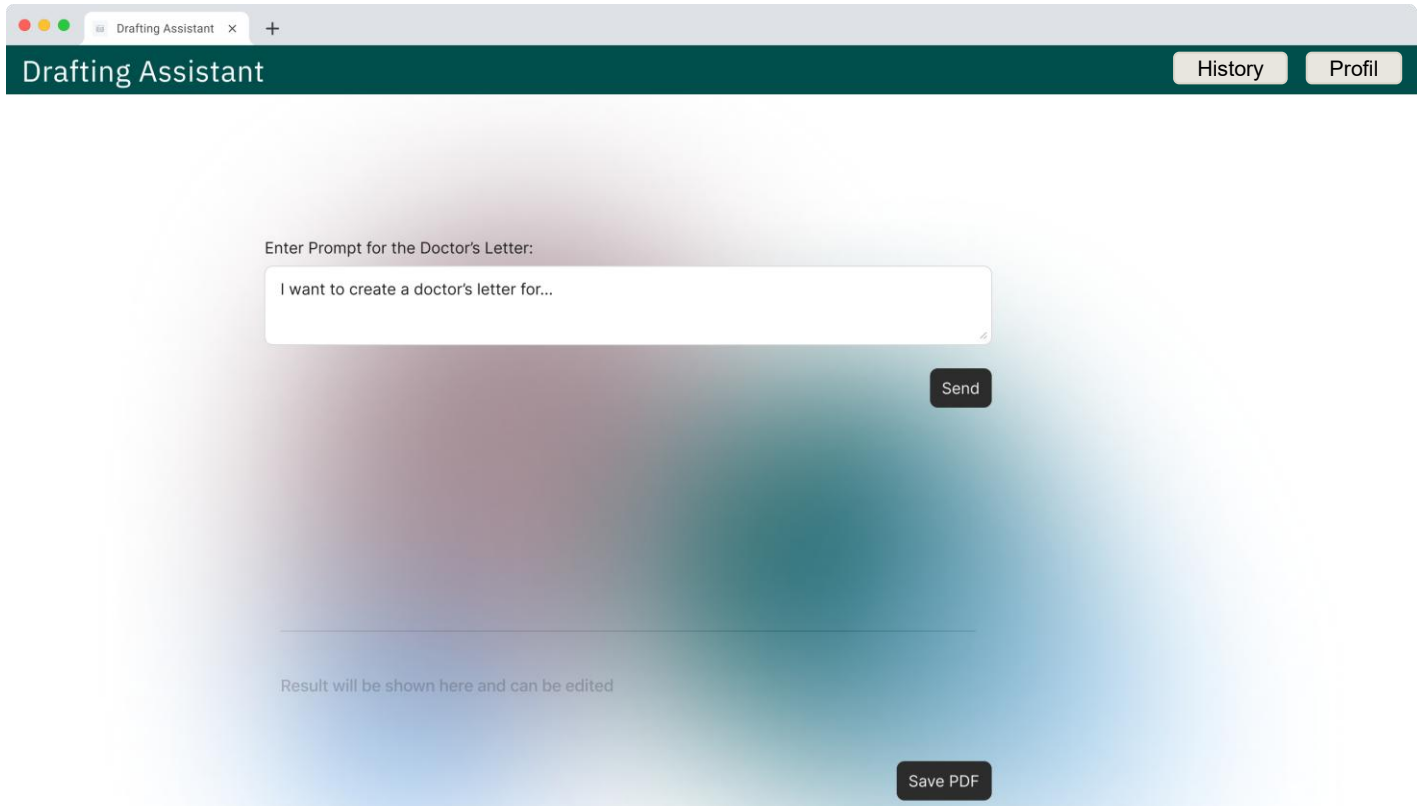
Optional prior knowledge

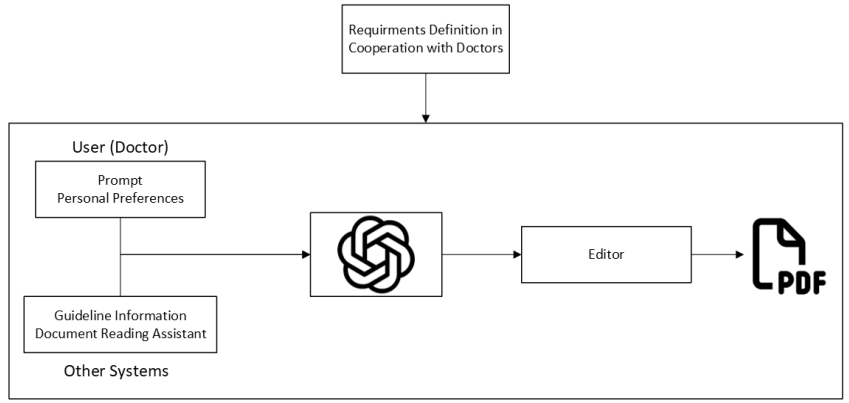
- Experience with solving Linear Optimization Problems using OR libraries (*Google OR-Tools*)
- Familiarity with GitLab API

Contact:

oliver.wardas@tum.de

Medical Discharge Letter Assistant





Example

Outcome: App that enables:
- ✓ Creation of Doctor's Letter
- ✓ Edit of Letters
- ✓ User and History Management

Technologies:

FastAPI

Project profile

Pitch: The goal of the project is to develop (part of) a system that automatically drafts different medical documents based on established guidelines and the doctor's own preferences.

Basic functional requirements:

- User can Edit Response of LLM
- Create and Save a Properly Formatted PDF File
  - Including Letter Head etc.
- User Management
  - History of Previously Generated Files/Prompts
- Basic Functionality of Creating Doctor's Letters using LLMs

Basic non-functional requirements:

- Gather Information from Different Doctors
- Build Architecture According to the Requirements of the Doctors
- Intuitive UI for non-tech Users
- Expandable Design for Potential Different Languages/Documents

Expected prior knowledge

- Skills in Python
- Knowledge of Frontend and Backend Development (Next.js/ React, TailwindCSS, Fast API)

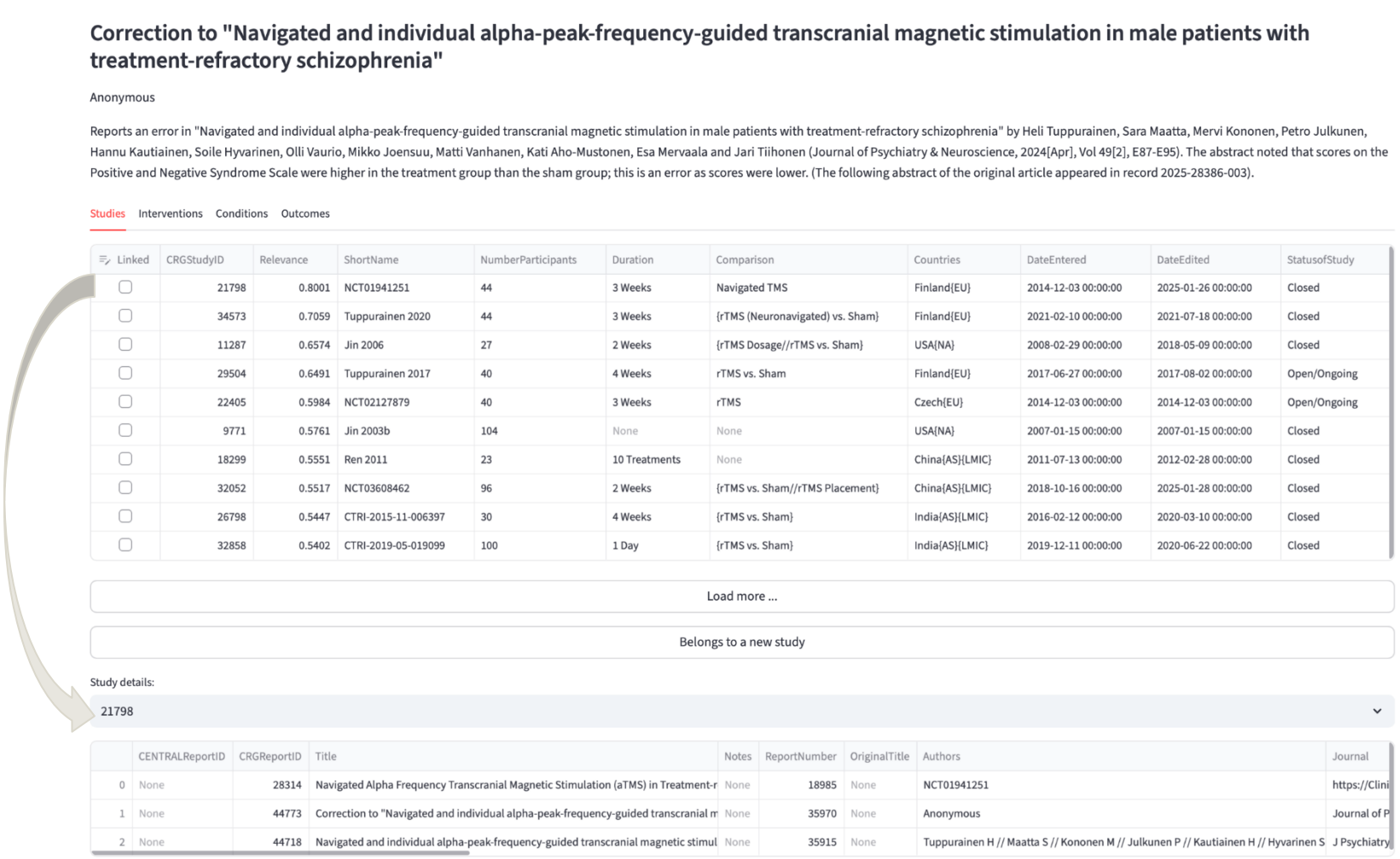
Desirable:

- Experience with LLMs

Contact:

kathi.sommer@tum.de

MediDex – AI-powered MEDIcal document inDEXing



Correction to "Navigated and individual alpha-peak-frequency-guided transcranial magnetic stimulation in male patients with treatment-refractory schizophrenia"

Anonymous

Reports an error in "Navigated and individual alpha-peak-frequency-guided transcranial magnetic stimulation in male patients with treatment-refractory schizophrenia" by Heli Tuppurainen, Sara Maatta, Mervi Kononen, Petro Julkunen, Hannu Kautiainen, Soile Hyvarinen, Olli Vaurio, Mikko Joensuu, Matti Vanhanen, Kati Aho-Mustonen, Esa Mervaala and Jari Tiihonen (Journal of Psychiatry & Neuroscience, 2024[Apr], Vol 49[2], E87-E95). The abstract noted that scores on the Positive and Negative Syndrome Scale were higher in the treatment group than the sham group; this is an error as scores were lower. (The following abstract of the original article appeared in record 2025-28386-003).

Studies | Interventions | Conditions | Outcomes

Linked	CRGStudyID	Relevance	ShortName	NumberParticipants	Duration	Comparison	Countries	DateEntered	DateEdited	StatusofStudy
☐	21798	0.8001	NCT01941251	44	3 Weeks	Navigated TMS	Finland{EU}	2014-12-03 00:00:00	2025-01-26 00:00:00	Closed
☐	34573	0.7059	Tuppurainen 2020	44	3 Weeks	{rTMS (Neuronavigated) vs. Sham}	Finland{EU}	2021-02-10 00:00:00	2021-07-18 00:00:00	Closed
☐	11287	0.6574	Jin 2006	27	2 Weeks	{rTMS Dosage//rTMS vs. Sham}	USA{NA}	2008-02-29 00:00:00	2018-05-09 00:00:00	Closed
☐	29504	0.6491	Tuppurainen 2017	40	4 Weeks	rTMS vs. Sham	Finland{EU}	2017-06-27 00:00:00	2017-08-02 00:00:00	Open/Ongoing
☐	22405	0.5984	NCT02127879	40	3 Weeks	rTMS	Czech{EU}	2014-12-03 00:00:00	2014-12-03 00:00:00	Open/Ongoing
☐	9771	0.5761	Jin 2003b	104	None	None	USA{NA}	2007-01-15 00:00:00	2007-01-15 00:00:00	Closed
☐	18299	0.5551	Ren 2011	23	10 Treatments	None	China{AS}{LMIC}	2011-07-13 00:00:00	2012-02-28 00:00:00	Closed
☐	32052	0.5517	NCT03608462	96	2 Weeks	{rTMS vs. Sham//rTMS Placement}	China{AS}{LMIC}	2018-10-16 00:00:00	2025-01-28 00:00:00	Closed
☐	26798	0.5447	CTRI-2015-11-006397	30	4 Weeks	{rTMS vs. Sham}	India{AS}{LMIC}	2016-02-12 00:00:00	2020-03-10 00:00:00	Closed
☐	32858	0.5402	CTRI-2019-05-019099	100	1 Day	{rTMS vs. Sham}	India{AS}{LMIC}	2019-12-11 00:00:00	2020-06-22 00:00:00	Closed

Load more ...

Belongs to a new study

Study details:

21798

	CENTRALReportID	CRGReportID	Title	Notes	ReportNumber	OriginalTitle	Authors	Journal
0	None	28314	Navigated Alpha Frequency Transcranial Magnetic Stimulation (aTMS) in Treatment-r	None	18985	None	NCT01941251	https://Clini
1	None	44773	Correction to "Navigated and individual alpha-peak-frequency-guided transcranial m	None	35970	None	Anonymous	Journal of P
2	None	44718	Navigated and individual alpha-peak-frequency-guided transcranial magnetic stimul	None	35915	None	Tuppurainen H // Maatta S // Kononen M // Julkunen P // Kautiainen H // Hyvarinen S	J Psychiatry

simple streamlit prototype

Outcome: App that enables:

- ✓ Semantic document indexing
- ✓ Semantic document search
- ✓ High recall item2item retrieval

Technologies:

Project profile

Pitch: The goal of the project is to develop a graphical interface to manage and search medical scientific documents and for clustering similar documents. It takes scientific documents (title/abstract or PDF) and recommends similar documents. Moreover, it should be possible to filter for certain aspects like specific interventions or outcomes.

Basic functional requirements:

- Creation of a graphical search / recommender system
- Visualization of document similarity / clusters
- Efficient filtering by certain aspects
- (optional) Implement expert feedback loop (online learning)

Basic non-functional requirements:

- Low-latency for runtime processing
- Ergonomic/efficient workflow for non-tech users
- Modular and extendable software architecture

Expected prior knowledge

- Skills in Python, Frontend and Backend Development (React / Angular, Django / Flask)
- Basic Understanding of Natural Language Processing (NLP) methodologies (Huggingface / LLM APIs)

Desirable Experience:

- Embedding approaches / vectorstores
- (UI design)

Contact:

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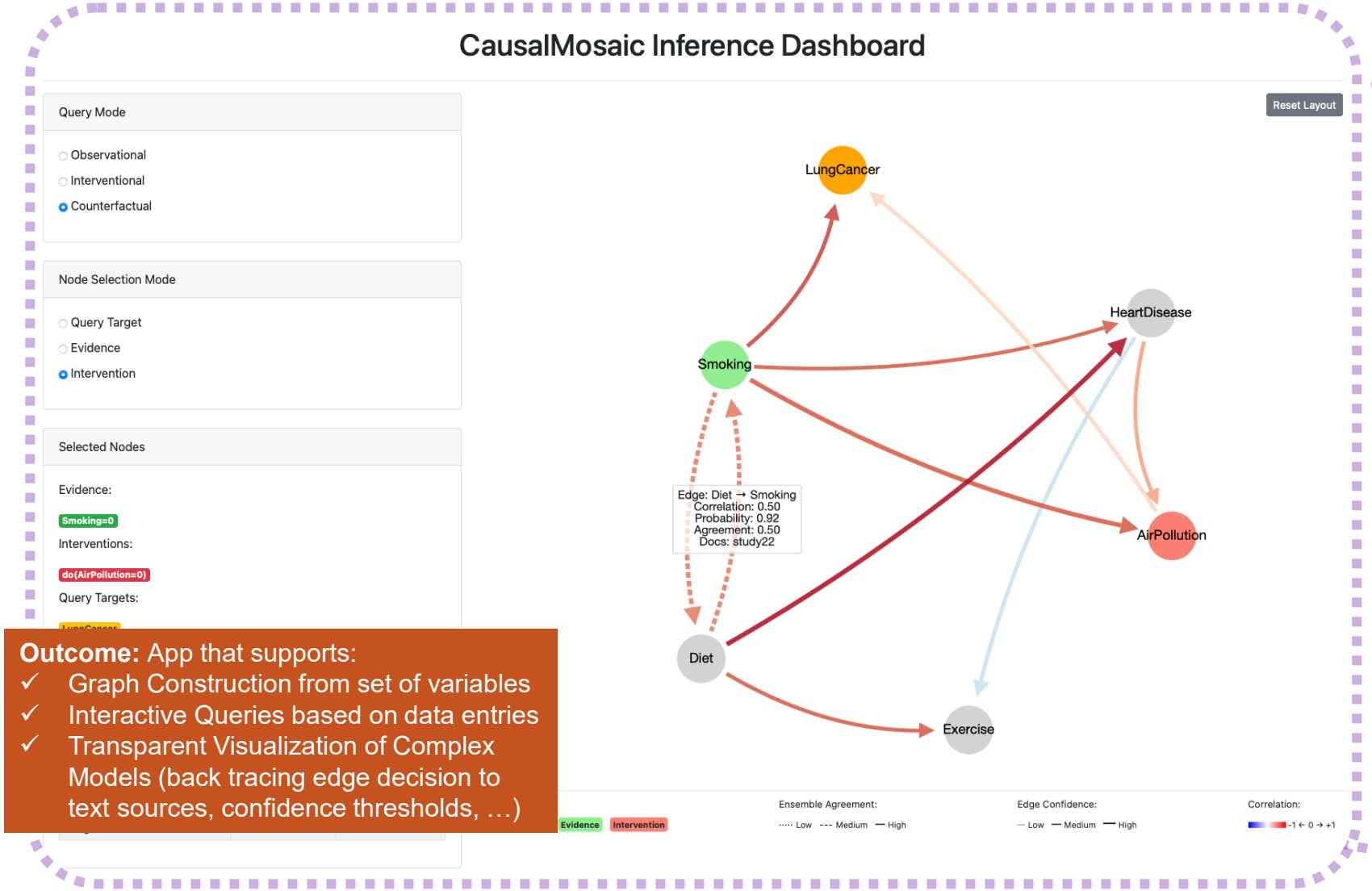
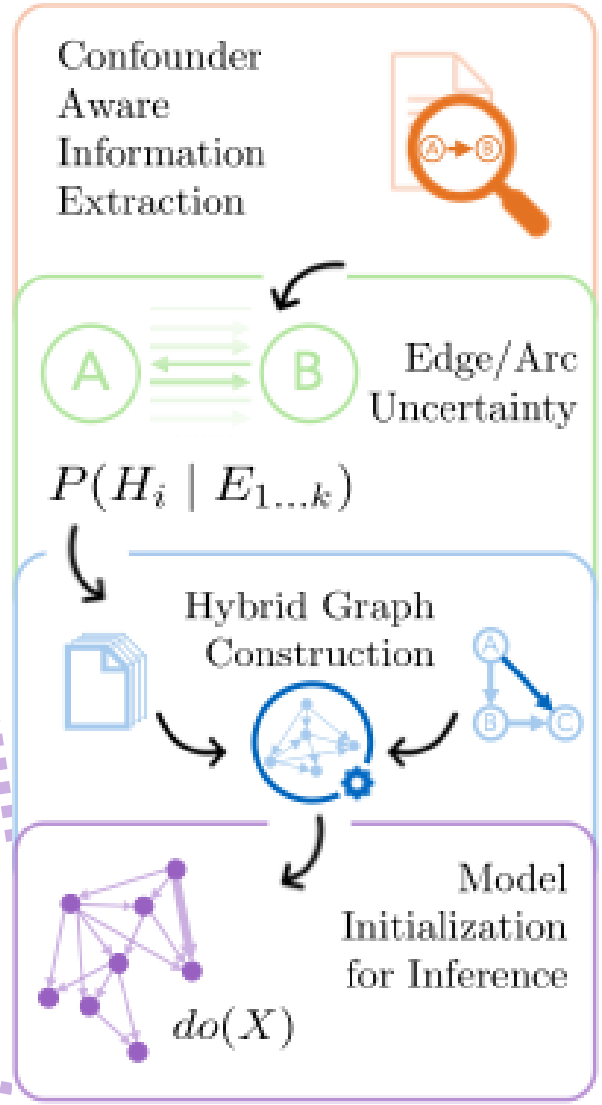
CausalMosaic – Constructing robust causal models from published research



Outcome: App that supports:

- ✓ Graph Construction from set of variables
- ✓ Interactive Queries based on data entries
- ✓ Transparent Visualization of Complex Models (back tracing edge decision to text sources, confidence thresholds, …)



Project profile

Pitch: The goal of the project is to develop an interactive tool to build custom causal models based on user input set of variables for counterfactual and interventional queries based on specific observational data (e.g., personalized medicine).

Basic functional requirements:

- Full integration of existing backend
- Creation of an interactive variable search
- Creation of a graphical query builder
- Design of intuitive result visualization

Basic non-functional requirements:

- Realtime processing of user queries
- Efficient parallelized API calls (GPT)
- Realtime client – server communication
- Design of modular components

Expected prior knowledge

- Knowledge in Python (Backend)
- Basic knowledge in FastAPI, React, Node.js, MongoDB
- Interest in design of modular, scalable system
- Experience in UI/UX
- Preferred: Knowledge in Statistics, Machine Learning and Causal Inference

Contact:

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ATOSS.GPT – Assisting the workforce management system @ TUM Klinikum

Intelligent onboarding assistant for MRI's ATOSS platform
An **AI-powered web app** that simplifies staff onboarding for the ATOSS system with an **interactive chatbot** and **automated learning content creation**.

Outcome: Chatbot supporting:
- ✓ Provide answers to typical key questions
- ✓ Retrieve important guideline requests
- ✓ Translating ATOSS specific terms into plain language
- ✓ Creating learning materials regarding the ATOSS system

Technologies:

Project profile

Pitch: The goal of this project is to implement an independent chatbot that answers key and guideline specific questions in plain language and create semi-automated learning material to simplify onboarding to the Atoss platform.

Basic functional requirements:

- Automated communication by creating a chatbot
- Read docx. And xlsx. Files for information retrieval
- Semi-automated generation of training materials from manuals and videos
- Escalation mechanisms for admins

Basic non-functional requirements:

- User-friendly interface with intuitive navigation for different user groups
- Scalability to accommodate increasing user numbers and data volume
- Adaption of the result set in realtime
- On-premise setup to ensure data privacy and confidentiality of sensitive information

Expected prior knowledge

- Fundamental knowledge in Mern Stack (MongoDB, Express.js, React.js and Node.js)
- Basic Knowledge in Retrieval Augmented Generation (RAG)
- Experience in NLP
- Basic Knowledge in Open-Source LLMs
- Experience in programming Chatbots

Contact:

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ConDEX- Conditional Token Cross-Chain Decentralized Exchange

Outcome: DApp that supports:
- ✓ AMM Creation
- ✓ Cross-Chain Swaps
- ✓ LP Management

Idea

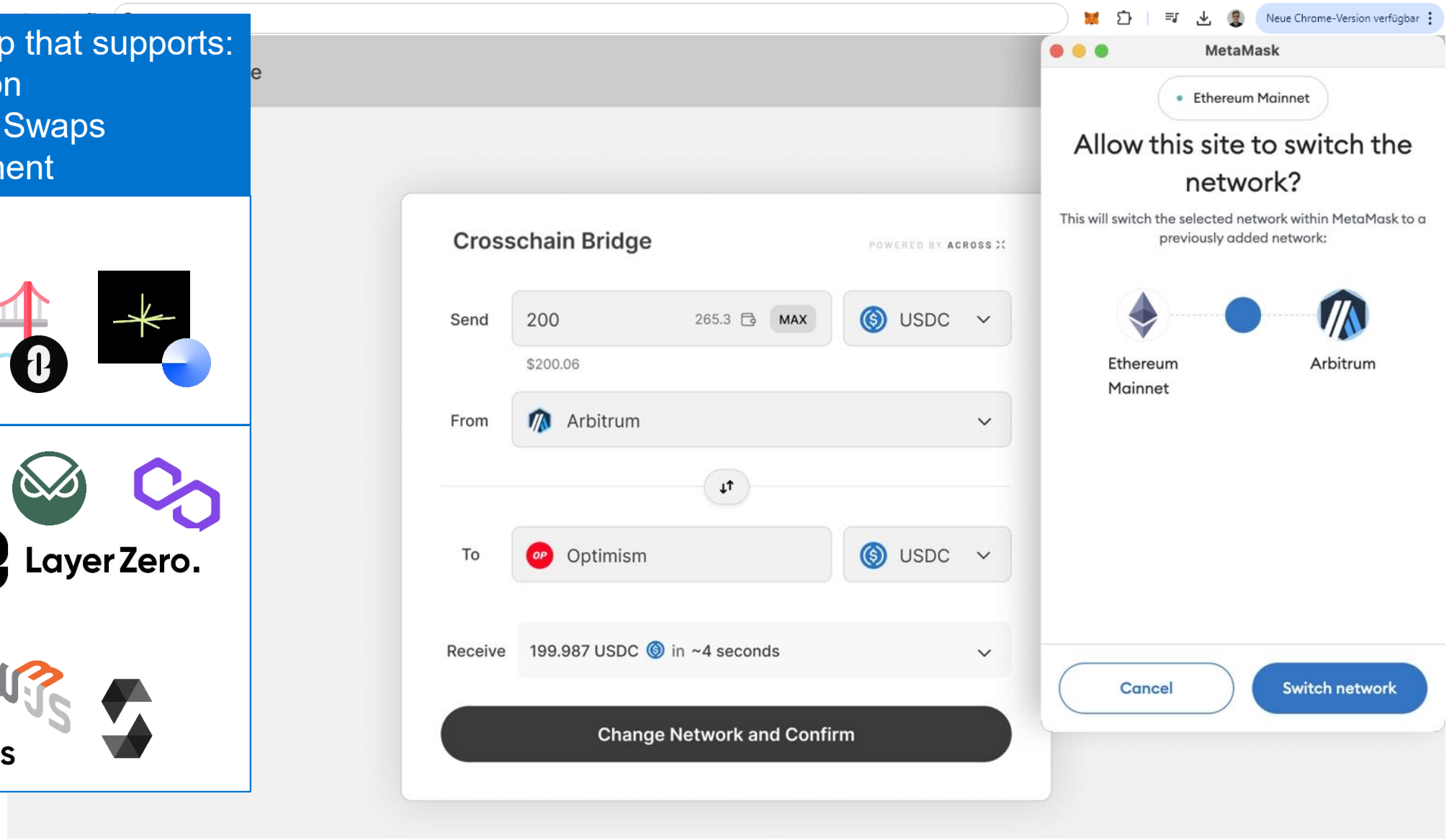
Blockchains

BASE

LayerZero.

Technologies

tailwindcss



ConDEX- Conditional Token Cross-Chain Decentralized Exchange

Pitch: A cross-chain bridge for prediction markets that unifies liquidity across Base, Polygon, and Gnosis. Users can trade, swap, and provide liquidity on equivalent markets (Polymarket, Seer, Limitless, Omen) with secure, low-cost cross-chain operations and consistent resolution information.

Basic functional requirements:

- Liquidity provision: deposit into liquidity pools and monitor share across chains
- Market details (liquidity, TVL in USDC, fees, APY, resolution information)
- Cross-chain operations (swaps, transfers)

Basic non-functional requirements:

- Cross-Chain Capabilities
- Unified account view
- Real-time Data Sync
- Admin System *(verified pools)*
- Permissionless market creation

(Expected) prior knowledge

- Proficiency in **JavaScript / TypeScript** (*Next.js* and **Tailwind CSS** preferred)
- Experience with **Solidity** and cross-chain smart contract interaction
- Familiarity with **DeFi primitives** (DEXs, bridges, stablecoins, liquidity pools)
- Understanding of **prediction markets & conditional tokens** (*Polymarket, Seer, Limitless, Omen*)
- *Bonus*: knowledge of **cross-chain messaging protocols** (e.g., LayerZero, Wormhole)

Contact:

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PM Analytics – Real Time Prediction Market Analytics Platform

Outcome: Web-App with:
- ✓ User Management
- ✓ Live Prediction Market Data
- ✓ Equ. Market Matching

Blockchains

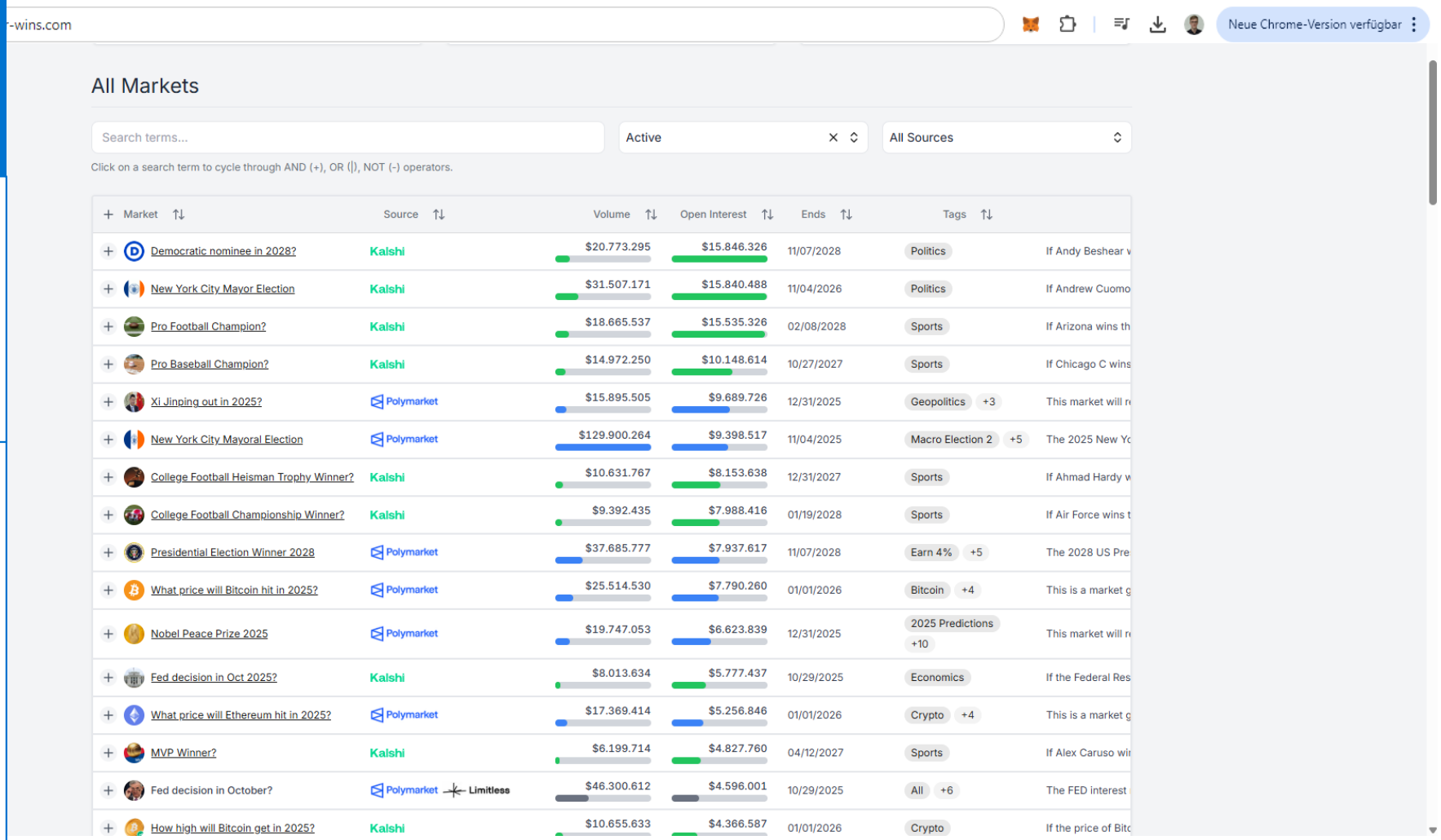
BASE

Technologies

tailwindcss

FastAPI

mongoDB



PM Analytics – Real Time Prediction Market Analytics Platform

Pitch: A unified analytics platform that aggregates, normalizes, and analyzes prediction market data to deliver insights, enhance market transparency, and streamline resolution information for users data consumers.

Basic functional requirements:

- Data Aggregation & Storage (Historical Data Archiving & Real-Time Data Fetching)
- Market View & Display (Consolidated Market Listing, Professional Charting, News Overlays)
- User Management & Notifications Equivalent Market
- Creation and Administration

Basic non-functional requirements:

- Real-Time Data Sync
- Consistent Source Data Normalization
- Admin Access Control
- External API Resilience

(Expected) prior knowledge

- Proficiency in **JavaScript / TypeScript** (*Next.js* and **Tailwind CSS** preferred)
- Experience interacting with **Blockchain and Blockchain Data** (e.g., web3.py and web3.js)
- Expertise in **Data Visualization** (e.g. chart.js)
- Understanding of **Prediction Markets & Conditional Tokens**

Contact:

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Outline

Organization Details

Project Evaluation

Project Proposals

Next Steps

Next Steps

Questions?

If you have questions about a project, contact its **respective advisor**.

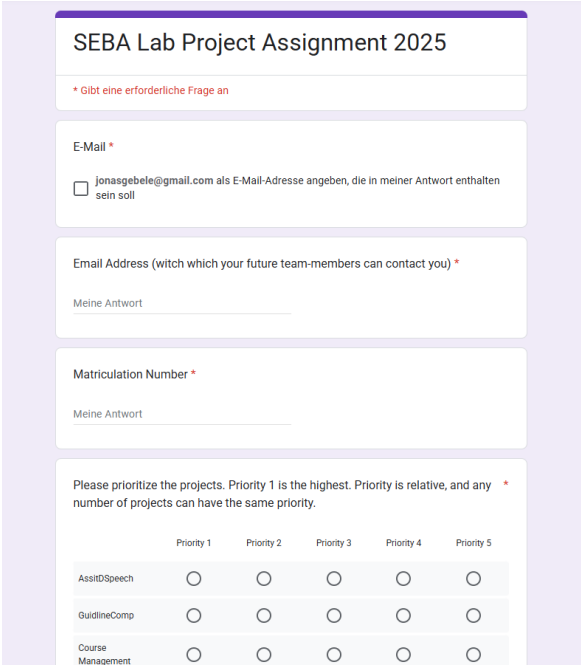
Submit your preferences

Fill out the **Google Form** with your project preferences.

Link: https://docs.google.com/forms/d/16g44uBp83BaREZHKgks91rdbs7dDfvlZc8XxitWemvM

No Google account? Email your preferences to **jonas.gebele@tum.de**

Deadline: 17.10.2025, 23:59



Assignment & kickoff

You will receive your final team members
and project assignment via email by **19.10.2025.**

Afterwards, self-organize with your teammates and proactively
contact your advisor to schedule a first meeting next week.

M.Sc.

Jonas Gebele

Research Associate

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