SEBA Lab Kickoff WS2023/24

Felix Hoops

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)
www.matthes.in.tum.de

October 2023
Outline

Organization Details

Project Evaluation

Project Proposals

Next Steps
Industry Partners

ALMA PHIL

Allianz

breathment

fusionbase

EclipseSource

MOTIUS

interhypo
# Organization and Timeline

<table>
<thead>
<tr>
<th>What?</th>
<th>When?</th>
<th>Where?</th>
<th>Who?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kickoff + Project Assignment</strong></td>
<td>17.10.2023 – 22.10.2023</td>
<td>Zoom</td>
<td>everyone</td>
</tr>
<tr>
<td><strong>Project work</strong></td>
<td>weekly</td>
<td>self-organize</td>
<td>team and advisor</td>
</tr>
<tr>
<td><strong>Intermediate Presentation + Prototype</strong></td>
<td>13.12.2023</td>
<td>Garching</td>
<td>everyone</td>
</tr>
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<td>self-organize</td>
<td>team and advisor</td>
</tr>
<tr>
<td><strong>Final Presentation + Live Demo</strong></td>
<td>14.02.2024</td>
<td>Garching</td>
<td>everyone</td>
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</tbody>
</table>

*Attendance is mandatory for every student!*
Project Management

We plan, communicate, and manage the project with **agile tools**
Agile Project Management

Each week, we “sprint” to the next

Daily Meeting/Scrum
Organize yourself and discuss the current state
Everyone talks shortly (timeboxed) about his achievements and challenges

Weekly meeting (approx. 60 minutes)
Discuss in team and with your Scrum Master (Advisor) the current work in progress

1. Sprint Planning
   Discuss and define work items for the next sprint
2. Sprint Review
   Present the current prototype to the product owner
3. Sprint Retrospective
   Reflect upon the progress and effort estimates
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 Scrum every team is **self-organized**.

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

3. If the issue persists, talk to the **course organizer**: Felix, felix.hoops@tum.de
Visit the course web page regularly

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

News
• Updates will be posted here.

Contact
• For questions or any feedback on the course, please contact Felix Hoops.

Registration
• Registration per Matching System 27 and Survey 29 between the 14th of July 2023 and the 19th of July 2023.
  (Note: The SEBA Lab course is listed as "Entwicklungspraktikum Software Engineering für betriebliche Informationssysteme (IN2106, IN2129)" in the matching system.)
• Only for Master's students!

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 blockchain, web3/web5, NoSQL databases, Cloud Computing, REST APIs, React.js, NLP, ML, etc.
• Get more practical experience in application development
• Collect team experience and practice presentation skills in English
• Participate in current research projects at sosib and collaborate with industry partners

Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Place</th>
<th>Topic</th>
<th>Attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.07.2023</td>
<td>10:00 - 11:00</td>
<td>Zoom link</td>
<td>Preliminary Discussion</td>
<td>voluntary</td>
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<tr>
<td>17.10.2023</td>
<td>10:00 - 12:00</td>
<td>Zoom (link will be on TUMonline)</td>
<td>Kickoff Meeting - Project Proposals</td>
<td>mandatory</td>
</tr>
</tbody>
</table>

Weekly meetings (on project team level)

<table>
<thead>
<tr>
<th>Date</th>
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<tbody>
<tr>
<td>13.12.2023</td>
<td>10:30 - 16:30</td>
<td>IN2106 (01)</td>
<td>Intermediate Presentations</td>
<td>mandatory</td>
</tr>
</tbody>
</table>

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Next Steps
Evaluation

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

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
Outline

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## Project Proposals

<table>
<thead>
<tr>
<th>#</th>
<th>Project</th>
<th>Advisor sebis</th>
<th>Industry Partner</th>
<th>Advisor Industry Partner</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ALPHA-KI: Health Intelligence Platform</td>
<td>Phillip</td>
<td>Alma Phil</td>
<td>Lutz Frick</td>
<td><a href="mailto:lutz.frick@almaphil.com">lutz.frick@almaphil.com</a>&lt;br&gt;<a href="mailto:philipp.schneider@tum.de">philipp.schneider@tum.de</a></td>
</tr>
<tr>
<td>2</td>
<td>Enhancing IVR Systems with LLM Integration</td>
<td>Nektarios, Phillip</td>
<td>Allianz</td>
<td>Ömer Uludag Daniel Faisst</td>
<td><a href="mailto:nektarios.machner@tum.de">nektarios.machner@tum.de</a>&lt;br&gt;<a href="mailto:omer.uludag@allianz.de">omer.uludag@allianz.de</a>&lt;br&gt;<a href="mailto:daniel.faisst@allianz.de">daniel.faisst@allianz.de</a></td>
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<td>EclipseSource</td>
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<td><a href="mailto:anum.afzal@tum.de">anum.afzal@tum.de</a>&lt;br&gt;<a href="mailto:helming@eclipsesource.com">helming@eclipsesource.com</a></td>
</tr>
<tr>
<td>4</td>
<td>Breathment: Web-based Teletherapy Application</td>
<td>Burak</td>
<td>Breathment</td>
<td>Elçin Can Çavuşoğlu</td>
<td><a href="mailto:elcin.cavusoglu@breathment.com">elcin.cavusoglu@breathment.com</a>&lt;br&gt;<a href="mailto:burak.oez@tum.de">burak.oez@tum.de</a></td>
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<td>Tim, Stephen</td>
<td>fusionbase</td>
<td>Patrick Holl</td>
<td><a href="mailto:tim.schopf@tum.de">tim.schopf@tum.de</a>&lt;br&gt;<a href="mailto:stephen.meisenbacher@tum.de">stephen.meisenbacher@tum.de</a>&lt;br&gt;<a href="mailto:patick.holl@fusionbase.com">patick.holl@fusionbase.com</a></td>
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<tr>
<td>6</td>
<td>Natural Language Processing Knowledge Graph</td>
<td>Tim</td>
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<td>-</td>
<td><a href="mailto:tim.schopf@tum.de">tim.schopf@tum.de</a></td>
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<td>Anum</td>
<td>Interhyp</td>
<td>Francisco De las Casas Young Felipe Wieman</td>
<td><a href="mailto:anum.afzal@tum.de">anum.afzal@tum.de</a>&lt;br&gt;<a href="mailto:francisco.delascasasyoung@interhyp.de">francisco.delascasasyoung@interhyp.de</a>&lt;br&gt;<a href="mailto:felipe.wieman@interhyp.de">felipe.wieman@interhyp.de</a></td>
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<td>Cliq – The Social Network</td>
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<td>Motius</td>
<td>Zied Bahrouni Christoph Kipfer</td>
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<tr>
<td>9</td>
<td>A Data Exploration Tool for Blockchain-based Systems</td>
<td>Burak, Filip</td>
<td>-</td>
<td>-</td>
<td><a href="mailto:burak.oez@tum.de">burak.oez@tum.de</a>&lt;br&gt;<a href="mailto:filip.rezabek@tum.de">filip.rezabek@tum.de</a></td>
</tr>
<tr>
<td>10</td>
<td>AI Employment Contract Analysis</td>
<td>Oliver</td>
<td>SYLVENSTEIN Rechtsanwälte</td>
<td>Dr. Dominik Herzog Domenic Böhm</td>
<td><a href="mailto:oliver.wardas@tum.de">oliver.wardas@tum.de</a></td>
</tr>
<tr>
<td>11</td>
<td>XNLP – Explanation Tool for NLP</td>
<td>Mahdi</td>
<td>-</td>
<td>-</td>
<td><a href="mailto:mahdi.dhaini@tum.de">mahdi.dhaini@tum.de</a></td>
</tr>
<tr>
<td>12</td>
<td>Synthesizing Evidence-Based Answers</td>
<td>Juraj</td>
<td>-</td>
<td>-</td>
<td><a href="mailto:juraj.vladika@tum.de">juraj.vladika@tum.de</a></td>
</tr>
<tr>
<td>13</td>
<td>Privacy Analytics with Differentially Private Text Rewriting</td>
<td>Stephen</td>
<td>-</td>
<td>-</td>
<td><a href="mailto:stephen.meisenbacher@tum.de">stephen.meisenbacher@tum.de</a></td>
</tr>
</tbody>
</table>
ALPHA-KI: Health Intelligence Platform

Advisor: Phillip Schneider
Product Owner: Lutz Frick

ALMA PHIL
Outcome: Platform that supports:
✓ Intelligent integration of health data
✓ Multi-level information visualization
✓ NLP-Based generation of health insights: patient- and problem-centered

Technologies: (technology stack is flexible)
Pitch: The goal of the project is to develop a health intelligence dashboard for analyzing multi-level patient data extracted from various sources from a distributed platform that implements a digital health assistant.

<table>
<thead>
<tr>
<th>Basic functional requirements:</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Extract and integrate patient data from various sources (e.g., wearables, health records, voice assistant) without compromising scalability and performance</td>
</tr>
<tr>
<td>▪ Perform visual analyses of patient data at different levels, (e.g., patient- and technology-centered)</td>
</tr>
<tr>
<td>▪ Detection of trends or abnormalities and automatic summarization of health reports with large language models</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expected prior knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Knowledge in Flask, React, JavaScript, HTML, CSS</td>
</tr>
<tr>
<td>▪ Strong programming skills in Python and basic knowledge in Natural Language Processing</td>
</tr>
<tr>
<td>▪ Knowledge in data processing and ETL</td>
</tr>
<tr>
<td>▪ Experience in visualization libraries like Plotly, Dash, or Grafana</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bonus</th>
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</thead>
<tbody>
<tr>
<td>▪ Gain knowledge about conversational agents and the future of digital healthcare</td>
</tr>
<tr>
<td>▪ Get guidance and feedback from experienced industry professionals</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact:</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:lutz.frick@almaphil.com">lutz.frick@almaphil.com</a></td>
</tr>
<tr>
<td><a href="mailto:phillip.schneider@tum.de">phillip.schneider@tum.de</a></td>
</tr>
</tbody>
</table>
Enhancing IVR Systems with LLM Integration

Advisor: Nektarios Machner
Phillip Schneider

Product Owner: Ömer Uludag
Daniel Faisst
Enhancing Interactive Voice Response (IVR) Systems with Large Language Model (LLM) Integration

**Today**

- Customer channels
- Call types
- IVR systems
- Allianz agents

**Customer**

- www
- ...

**Our Vision**

- Customer channels
- Call type
- Intelligent routing
- Allianz agents

**Outcome:**

✓ A concept and a prototype that demonstrates a LLM-powered IVR enhancement

Voicebot „Allie" for authenticating Allianz customers
### Pitch:
The goal of the project is (i) to explore the status quo of the usage of large language models (LLMs) in industry and at the Allianz group and (ii) to build a concept and prototype based on LLMs to improve the customer experience in Allianz’s customer care services by simplifying/replacing the existing interactive voice response (IVR) landscape.

### Basic functional requirements:
- Investigate the status quo regarding the usage of LLMs in industry, preferably in the context of customer care services, and at Allianz.
- Evaluate the identified LLMs based on various aspects (adoption scenarios, costs, legal, language, etc.)
- Analyze Allianz’s IVR landscape and develop a concept for using LLMs for an improved routing of Allianz customers.
- Develop a prototype that implements the designed concept.

### Expected prior knowledge:
- Good programming skills and fundamental understanding of machine learning and its various approaches.
- Basic understanding of Large Language Models (LLMs) and related APIs (e.g., OpenAI).
- Experience with common ML frameworks such as PyTorch or TensorFlow.
- Solid knowledge of at least one programming language such as Python or Javascript.
- Experience with Vector Databases (Weaviate / Pinecone) and Cognigy beneficial but optional.

### Basic non-functional requirements:
- Development of an easy-to-understand concept for the integration of LLMs to simplify/replace the existing interactive voice response (IVR) landscape.
- Development of a reusable prototype (based on a build-measure-learn-approach).
- Excellent code documentation.

### Bonus:
- Work on a real-world use case with a high relevance and impact for the Allianz group.
- First-hand experience in software engineering with LLMs.

### Contact:
- omer.uludag@allianz.de
- daniel.faisst@allianz.de
An AI assistant for web-based IDEs for project-specific assistance

Advisor: Anum Afzal
Product Owner: Jonas Helming
An AI assistant for web-based IDEs for project-specific assistance

Outcome: App that supports:
✓ Supporting developers in the IDE via AI
✓ Allow experts to fine tune “on the fly”

Technologies:
- HTML
- CSS
- THEIA

Project context

Generic AI Model

User context

AI Assistant UI
**Pitch:** The goal of the project is to integrate AI into a web-based IDE so that developers get assisted in their development tasks and can also fine-tune the AI with project-specific knowledge.

**Basic functional requirements:**
- Get answers to contextual questions
- Get help with errors (e.g. in the terminal)
- Get assisted in the IDE, e.g. by typing commands
- Improve AI by providing project-specific knowledge

**Expected prior knowledge**
- Knowledge in HTML, CSS, TypeScript and React
- Basic Knowledge in AI
- Basic understanding of web- and cloud based tools (e.g. VS Code)
- Standard “toolbox” including Git and VS Code

**Basic non-functional requirements:**
- All code will be contributed under an Open Source license (EPL+MIT)
- Abstraction layer for the underlying AI
- Reproducible build and set-up

**Contact:**
jhelming@eclipsesource.com
Breathment – Remote Patient Monitoring Application

Advisor: Burak Öz
Product Owner: Elçin Can Çağuşoğlu
Breathment – Remote Patient Monitoring Application

**Outcome:** Integrated video-based vital sign monitoring for a web & mobile app that supports:
- Detection of physiological signs
- Visualization of these measures
- Alert notifications in case of critical conditions
- Comparison & progress over time

**Technologies:**
- Angular
- Flask
- React Native
- MongoDB
- Open Telekom Cloud

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231017 SEBA Lab Kickoff Hoops
**Pitch:** The goal of the project is to build an integrated component to an existing web & mobile application that provides video-based vital sign monitoring.

**Basic functional requirements:**
- Detection of physiological signs using device camera
- Detection of physiological signs using hardware devices
- Visualization of physiological measures
- Alert notifications in case of critical conditions
- Comparison of different dates
- Progress of patient over time

**Expected prior knowledge**
- Knowledge in a JavaScript frontend framework (preferably Angular 2+ and React Native), JavaScript/TypeScript, HTML and CSS
- Basic knowledge in rest APIs
- Basic knowledge in NoSQL databases (preferably MongoDB)

**Basic non-functional requirements:**
- Real time client – server communication
- Design of modular components

**Contact:**
https://breathment.com
elcin.cavusoglu@breathment.com
CD4AI: The Web App

Advisor / Product Owner: Tim Schopf
Stephen Meisenbacher
Patrick Holl
CreateData4AI - Motivation

- Data is today's currency
- AI models (think LLMs) are data hungry
- But ~80% of data is unstructured (e.g., text!)
- How do we obtain meaningful annotated data from unstructured text in an efficient, yet accurate way?

CreateData4AI project at sebis

- In year 1/3
- Performed in collaboration with
- Goal:
  - Created structured, annotated datasets from unstructured text corpora
- Approach:
  - Proposed pipeline to the right
Outcome: App that supports:
✓ Domain experts in defining class-specific keywords and descriptions
✓ Recommendation of keywords and enhanced descriptions
✓ Encapsulation of the CD4AI project

Technologies:
Pitch: The goal of the project is to develop a web application that supports domain experts in defining keywords and descriptions in order to conceptualize classes for structured datasets.

Basic functional requirements:
- Domain experts can create profiles and define classes using keywords and textual descriptions
- Domain experts get recommendations for further keywords and suggestions for enhanced description based on their initial definitions

Basic non-functional requirements:
- Interactive, user-friendly, and responsive
- Low latency with API calls / LLM outputs
- Consistent color scheme with CD4AI project
- Clean and commented code base, allowing for future extensions and improvements

Expected prior knowledge
- Knowledge in React.js, Vue.js, and Python
- Basic knowledge in NLP beneficial
- Experience with data pipelines a plus

Contact:
tim.schopf@tum.de
stephen.meisenbacher@tum.de
patrick.holl@fusionbase.com
Natural Language Processing Knowledge Graph (NLP-KG)

Advisor / Product Owner: Tim Schopf
Natural Language Processing – Knowledge Graph

Outcome: App that supports:
✓ Personalized profiles for organization and sharing of research papers
✓ Personalized recommendation engine for relevant papers

Technologies:

BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding
TLDR: We introduce a new language representation model called BERT, which is designed to pre-train deep bidirectional representations from unlabeled text by jointly conditioning on both left and right context in all layers.
Show Abstract
52,660 ⋆ DOI

Attention Is All You Need
TLDR: We propose a new simple network architecture, the Transformer, based solely on attention mechanisms, dispensing with recurrence and convolutions entirely.
Show Abstract
68,331 ⋆ arXiv

Top Fields of Study
Sort by Publication

Top Publications
Sort by Citation

Top Researchers
Sort by Citation

Christopher D. Manning
#publications 248
h-index 109
citations 113666

Tomas Mikolov
#publications 24
h-index 19
citations 85541

Noam M. Shazeer
#publications 24
h-index 20
citations 73996

Lukasz Kaiser
#publications 17
h-index 16
citations 69645

Kenton Lee
#publications 39

Search Publications, Researchers, Fields of Study...
Pitch: The goal of the project is to extend an existing web application for NLP paper search with personalized profile and recommendation features.

Basic functional requirements:
- Users can manage their profiles to organize and share lists of NLP papers, assisted by ChatGPT
- Development of a personalized recommendation engine of papers based on the interest of users
- Additional features for paper exploration

Expected prior knowledge
- Knowledge in Next.js, TypeScript, and Python
- Basic Knowledge in Neo4j and vector databases beneficial

Basic non-functional requirements:
- Intuitive profile design
- Useful recommendations
- Realtime client – server communication
- Design of modular components

Contact:
tim.schopf@tum.de
ChatHyp: Providing mortgage information in an easy way

Advisor: Anum Afzal
Product Owner: Francisco De las Casas Young
Felipe Wieman

interhyp
ChatHyp - Providing mortgage information in an easy way

Outcome – Web platform that supports:
- Integration of communication and financing API
- Finding the mortgage twin for each customer
- Realtime chat function with more features than just texting
- Reactivate customer through chat - CRM
- Personalized mortgage recommendations

Technologies:
- TypeScript (TS)
- JavaScript (JS)
- Spring Boot
- HTML
- CSS
- Twilio
Pitch: The goal of the project is to develop a web platform to provide mortgage information and services in an easy way to our customers via WhatsApp.

Basic functional requirements:
- Personalized recommendations for mortgages based on our collected data (Machine Learning)
- Enabling our consultants to chat with the customer via the web platform (Twilio)
- Communication with customer via WhatsApp (Appointment, CRM, Document Upload)

Expected prior knowledge
- Knowledge in Frontend Technologies
  - HTML, CSS, JavaScript, TypeScript, React
- Knowledge in Backend Technologies
  - Java, Node, Kotlin, Spring Boot
- Bonus: Knowledge of Twilio API and Machine Learning

FYI: If you want to choose another technology that is not listed here, just let us know! :)

Basic non-functional requirements:
- Intuitive, performant and real time user interface
- Design of modular and reusable components
- Security (2FA, Access token)

Contact:
francisco.delascasasyoung@interhyp.de
felipe.wieman@interhyp.de
CLIQ – The Social Network

Advisor: Felix Hoops
Product Owner: Zied Bahrouni
Christoph Kipfer
Motius

5+ Downloads | USK: Ages 12+

Install | Share | Add to wishlist

Cliq - social capital network

Outcome: App that supports:
✓ Forwarding of requests
✓ Real-time processing & transactions
✓ Network path-finding
✓ Conceptualizing suitable user flow

Technologies:
- Native
- GitLab
- Grafana
- React Native
- Redux
- PostgreSQL
- Python
- Docker
- REST Framework
Pitch: The goal is to enable the "cross-clique" functionality, allowing users to act as "brokers" by mediating transactions between two cliques.

Basic functional requirements:
- Enable forwarding of Requests (either Favor or Call to Actions) from one clique to another.
- Allow users to mediate transactions between two cliques.
- Conceptualizing a suitable user flow and designing frontend elements

Basic non-functional requirements:
- Real-time forwarding of requests.
- Scalability to handle multiple transactions across various cliques.
- Reliable "Path Finding" mechanism to efficiently determine the best route for requests.

Expected prior knowledge
- Knowledge in Django, Django Rest Framework, PostgreSQL, Docker.
- Experience in working on published apps and an existing code-base would be beneficial.
- Understanding of network pathfinding algorithms.
- Experience in real-time data processing and transaction handling.

Contact:
- zied.bahrouni@motius.de
- christoph.kipfer@motius.de
TUMChainBook - A Data Exploration Tool for Blockchain-based Systems

Advisor / Product Owner: Burak Öz
Filip Rezabek
Caching of results
Storing additional data
If not present, contact the server endpoints

Outcome: App that supports:
✓ Data Visualization
✓ Realtime result change
✓ Complex Event Processing
✓ Data aggregation and querying

Preferred Technologies:
- Dune Analytics
- pandas
- NumPy
- docker
- jupyter
- GitLab
- mongoDB
Pitch: Our project aims to create a comprehensive platform for executing and analyzing on-chain and off-chain data in blockchain systems, with an initial emphasis on Algorand and Ethereum blockchains.

Basic functional requirements:
- Setup a Jupyter notebook server and introduce authentication mechanisms
- Connect the notebook with backend indexers containing blockchain data
- Setup a proxy functionality to load balance the requests (e.g., in an additional database)

Expected prior knowledge
- Knowledge in Python and Jupyter or similar notebook setups
- Basic Knowledge working with REST APIs, RPCs
- Basic Knowledge of Socket.io or similar realtime client – server communication frameworks
- Knowledge of databases and deployment infrastructure
- Knowledge of blockchains is a plus

Basic non-functional requirements
- Reusable data queries
- Realtime client – server communication
- Caching of results in the server
- Reusable codebase components

Resources
Dune Analytics - https://dune.com/home
Hex.tech - https://hex.tech/

Contact
Burak Öz | burak.oez@tum.de
Filip Rezabek | filip.rezabek@tum.de
AI Employment Contract Analysis

Advisor / Product Owner: Oliver Wardas
Dr. Dominik Herzog
Domenic Böhm

SYLVENSTEIN Rechtsanwälte
Im Falle der schuldhaften Nichtaufnahme oder vertragswidrigen Beendigung der Tätigkeit verpflichtet sich der/die ARBEITNEHMER/IN, dem Arbeitgeber eine Vertragsstrafe in Höhe eines Gesamtmonatseinkommens zu bezahlen. Die FIRMA ist berechtigt, einen weitergehenden Schaden geltend zu machen.

§ 7 Leistungen

Die Arbeitnehmerin hat die ihr obliegenden Aufgaben sorgfältig und gewissenhaft nach Maßgabe der Gesetze und der ihm vom Arbeitgeber erteilten Weisungen zu erfüllen.

—

Sofern die aktuelle Vergütung oberhalb der jeweils gültigen Beitragsbemessungsgrenze der gesetzlichen Rentenversicherung liegt, sind sämtliche Tätigkeiten des Arbeitnehmers aus diesem Vertrag inklusive Überstunden und Mehrarbeit abgegolten.

§ 5 Kündigung/Beendigung

Kündigungen müssen schriftlich erfolgen. Eine außerordentliche Kündigung aus wichtigem Grund gilt im Falle ihrer etwaigen Unwirksamkeit hilfsweise vorsorglich als ordentliche Kündigung zum nächst zulässigen Termin.

§ 6 Pfändung/Abtreten

Die Arbeitnehmerin/der Arbeitnehmer darf ihre/seine Vergütungsansprüche weder verpfänden noch abtreten.

§ 8 Vertragsstrafe/Wettbewerbsverbot

Im Falle der schuldhaften Nichtaufnahme oder vertragsträgigen Beendigung der Tätigkeit verpflichtet sich der/die ARBEITNEHMER/IN, dem Arbeitgeber eine Vertragsstrafe in Höhe eines Gesamtmonatseinkommens zu bezahlen. Die FIRMA ist berechtigt, einen weitergehenden Schaden geltend zu machen.

—

Outcome: App that supports:
✓ Upload of PDF documents
✓ OCR 3rd party API calls
✓ AI & DB backend service
✓ User-friendly interface

Technologies: node.js, PyTorch, React, HTML, CSS
Pitch: The goal of the project is to develop a web app for AI analysis of employment contracts, supporting document OCR and segmentation, AI legal reviews, management of conflicting reviews (AI & human) and new contract creation.

Basic functional requirements:
- Upload, OCR and segmentation of Contract Docs.
- Using AI service for classifying clauses
- Presenting (conflicting) review annotations (+Input)
- Vector DB search for clause alternatives + user select (optional)

Basic non-functional requirements:
- UI with loading indicators and user feedback
- Intuitive controls for uploading, annotating etc.
- Design of modular components and services

Expected prior knowledge:
- Good Knowledge in React, NodeJS
- Basic Knowledge in Python
- Basic NLP understanding

Beneficial but NOT expected:
- NLP/Machine Learning programming experience

Contact:
oliver.wardas@tum.de
XNLP – Explanation Tool for NLP

Advisor / Product Owner: Mahdi Dhaini
XNLP – Explanation Tool for NLP

Input Text
The movie is awful for kids

Output
- Prediction: negative
- Confidence: 0.98

Counterfactual Explanations
- The movie is not awful for kids (positive)
- The movie is awful for kids (negative)
- A movie is awful for kids (negative)
- The movie is great for kids (negative)
- The movie is awful for adults (negative)

Saliency Maps
- SHAP
- LIME

Human Feedback
- Are the explanations helpful?

EXAMPLE

EXAMPLE
**Pitch:** The goal of the project is to develop an interactive analysis and explainability tool for the behavior and predictions of natural language processing models.

**Basic functional requirements:**
- Creation of a graphical user interface for input and navigation
- Interactive explanations of model output based on different inputs
- Visualization of different feature-based and counterfactual explanations
- Managing different models and datasets.
- Generating reports summarizing the models’ analysis

**Expected prior knowledge**
- Knowledge and skills in web development.
- Good knowledge of Python programming language
- Desirable:
  - Understanding of NLP methods and applications.
  - Knowledge or interest in Explainable AI methods.

**Basic non-functional requirements:**
- Realtime processing of predefined and new queries
- Adaption of the result set in real-time
- Modular and reusable components
- Scalable system architecture

**Outcome:** App that supports:
- ✓ Realtime explanation of models
- ✓ Visualized explanations

**Contact:**
Mahdi.dhaini@tum.de

**Technologies Pool:**
- Flask
- HTML
- CSS
- FastAPI
- Hugging Face
Synthesizing Evidence-Based Answers

Adviser / Product Owner: Juraj Vladika
The immediate effect of the abdominal drawing-in maneuver technique on stature change in seated sedentary workers with chronic low back pain.

_Practitioner Summary:_ Prolonged sitting seemingly harms sedentary workers’ health, particularly affecting the lower back. (…)

P. Saiklang et al. | 2020 | Citations: 48 | *Journal of Ergonomics* (Impact Score: 7.8)

Sitting patterns at work: objective measurement of adherence to current recommendations

Long uninterrupted sedentary periods, independent of total sedentary time, are risk factors for poor health (…)

C. Ryan et al. | 2011 | Citations: 190 | *Journal of Accident Analysis and Prevention* (Impact Score: 6.3)

Sedentary behaviour and risk of mortality from all-causes and cardiometabolic diseases in adults: evidence from the HUNT3 population cohort

However, prolonged sitting in specific contexts (ie, watching TV, at work) do not adversely impact health in the same timeframe. (…)


**Summary**

Some studies suggest that prolonged sitting is negatively associated with health, affecting the lower back and increasing cardiovascular disease risk factors, while other studies do not support the hypothesis that occupational sitting is associated with health problems.
Pitch: The goal of the project is to develop a tool that for a given scientific question aims to find evidence and arguments in a database of scientific publications and provide an overview and analysis of the synthesized results, based on ML & NLP technology.

Expected prior knowledge
- Knowledge of HTML, JavaScript, CSS
- Skills in Python, Flask / Django, Angular / React
- Integration with databases, cloud deployment

Desirable:
- Understanding of NLP methods & models
- Knowledge of frameworks for LLM-based apps (like LangChain) and vector databases (like Weaviate)

Basic functional requirements:
- Preparation and processing of textual data and documents
- Creation of a graphical UI for input and navigation
- Synthesis and visual presentation of discovered results
- Construction and configuration of machine learning pipelines with underlying NLP models

Basic non-functional requirements:
- Realtime processing of predefined and new queries
- Efficient retrieval of documents from a large database
- Modularity and reusability of components

Contact:
juraj.vladika@tum.de
PATER
Privacy Analytics with Differentially Private Text Rewriting

Advisor / Product Owner: Stephen Meisenbacher
PATER – Private Text Rewriting with Analytics

Goal: to develop an interface that allows users not only to privatize their text via Differential Privacy mechanisms, but also to tailor the privatization to individual privacy risk tolerances.

Outcome: App that supports:
✓ Interactive dashboard
✓ Real-time calculations
✓ Complex data visualization
✓ Rich analytics backend

Technologies:
Flask
plotly
Dash
JS

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Pitch: The goal of this project is to develop an interface that allows users not only to privatize their text via Differential Privacy (DP) mechanisms, but also to tailor the privatization to individual privacy risk tolerances.

Basic functional requirements:
- Creation of an interactive text privatization dashboard
- Adaptation of calculations to user-given parameters
- Display of results with interactive text and adaptable parameters
- “Gamification” of privatization to incentivize use
- Providing global statistics on user privacy preferences

Basic non-functional requirements:
- Real-time execution of DP mechanisms
- Real-time capturing of user preferences and production of corresponding visualizations
- Design of custom components to facilitate the UI
- Code readability and quality

Expected prior knowledge:
- Knowledge in Flask, React, Javascript, HTML, CSS
- Strong programming skills in Python
  - Useful: high-performance computing / data engineering skills
- Basic knowledge in Natural Language Processing
- Solid knowledge in Probability & Statistics
- Genuine interest in (data) privacy and Privacy-Enhancing Technologies!
- Experience in JavaScript / Python visualization libraries like D3, Chart, Plotly, etc.

Contact:
stephen.meisenbacher@tum.de
Next Steps

1. If you have any questions about a particular project, get in touch with the according advisor or industry partner.

2. Submit your preferences via e-mail to felix.hoops@tum.de until 22.10.2023

Subject:
SEBA Lab 23 - Preferences - #Your Last Name#, #Your First Name#

Body:

Prio 1: #Project Name#
Prio 2: #Project Name#
Prio 3: #Project Name#
Prio 4: #Project Name#
Prio 5: #Project Name#

Preferences for fellow team members (max. team size of 4):
#Last Name#, #First Name#
#Last Name#, #First Name#
#Last Name#, #First Name#

3. You will receive your final team and project information via e-mail latest 25.10.2023
M.Sc.
Felix Hoops

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TUM School of CIT
Department of Computer Science (CS)
Chair of Software Engineering for Business Information Systems (sebis)

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