SEBA Lab WS2022/23

Felix Hoops, Munich, 18th of October 2022

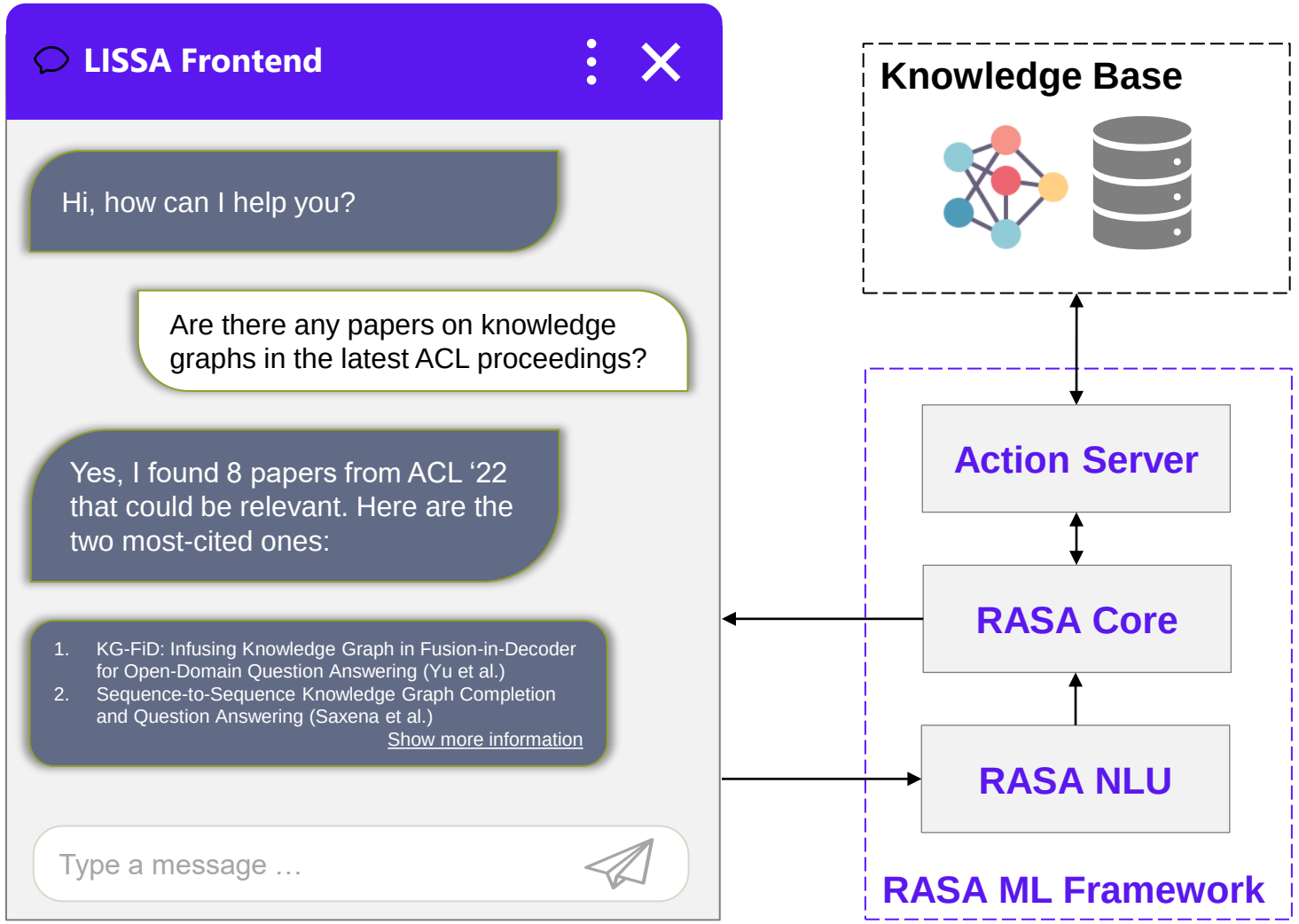
Chair of Software Engineering for Business Information Systems (sebis)
Faculty of Informatics
Technische Universität München
wwwmatthes.in.tum.de

Industry Partners

Language Interface for Semantic Search Assistance (LISSA)

Advisor / Product Owner: Phillip Schneider

Language Interface for Semantic Search Assistance (LISSA)



Outcome: Conversational interface that provides:

- ✓ Assistance for semantic search
- ✓ Intelligent dialog management
- ✓ Retrieval of structured and unstructured data

Technologies

RASA, Python, Flask, neo4j, Hugging Face, haystack by deepset, RDF

Language Interface for Semantic Search Assistance – Project Profile

Pitch: The goal of the project is to develop a conversational interface that supports semantic search for unstructured as well as structured data in scientific knowledge bases.

Basic functional requirements

- Interactive navigation through data source by means of a simple, text-based dialog interface
- Information retrieval of structured as well as unstructured data records
- Intelligent NLU and dialog management for enabling information-providing conversations

Basic non-functional requirements

- Self-explanatory UI and engaging UX & dialog design
- Modular and reusable components
- Efficient query processing in realtime
- Scalable system architecture

Expected prior knowledge

- Good knowledge of Python programming language
- Ability to manage and query different data structures
- Strong interest in NLP and at least basic NLP knowledge

Bonus

- Gain knowledge about state-of-the-art NLP techniques
- Learn how to engineer conversational interfaces with widely-used open-source tool stacks
- Get guidance and feedback from experienced industry professionals

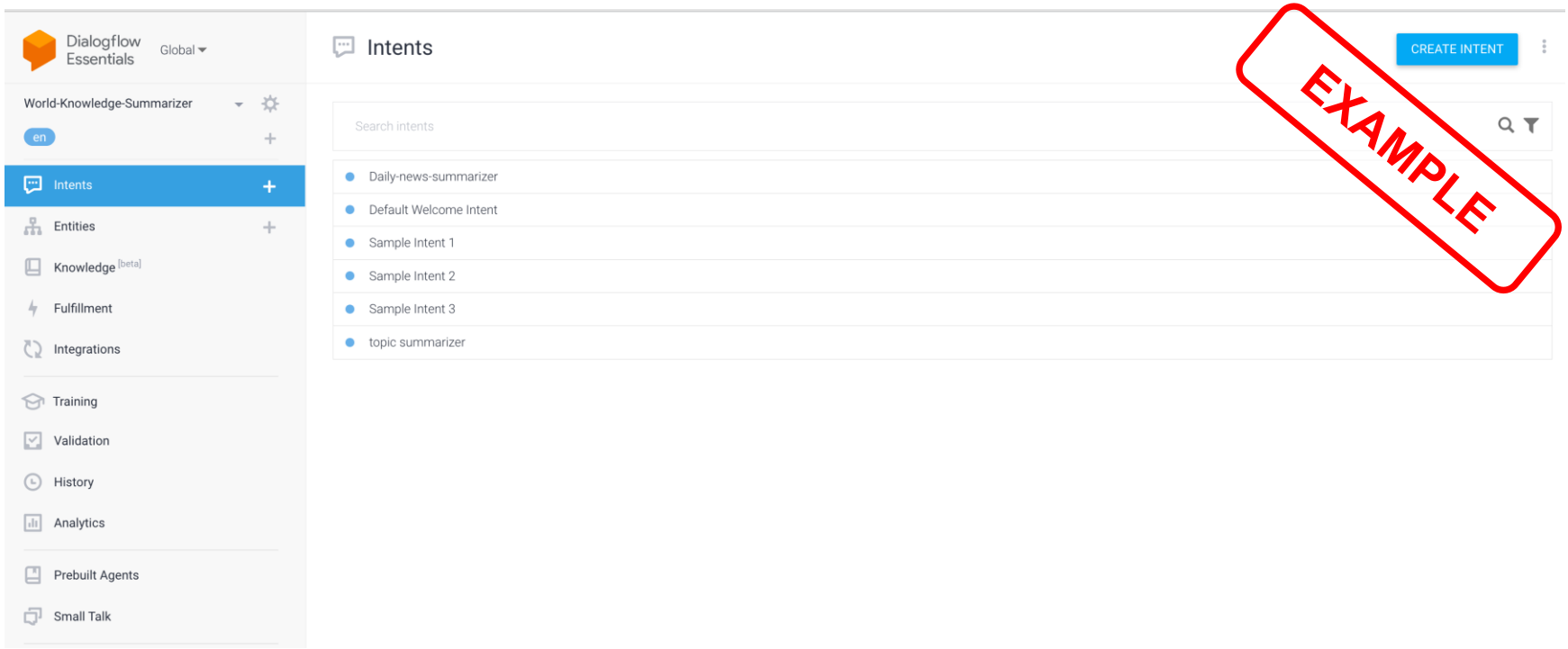
Contact

phillip.schneider@tum.de

WorKSumm – World Knowledge Summarization Skill for chatbot

Advisor / Product Owner: Anum Afzal

WorKSumm – World Knowledge Summarization Skill for chatbot



Outcome: A **chatbot** that supports:

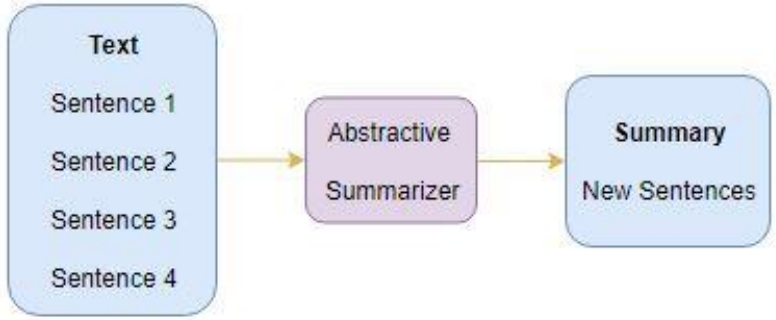
- ✓ Understanding of user utterance.
- ✓ Retrieval of relevant data for the user prompt.
- ✓ Summarization of the world knowledge into concise text for the chatbot

Technologies:

HUGGING FACE · TensorFlow · python · PyTorch · Dialogflow Essentials

```
summarize(
    "US-based private equity firm General Atlantic is in talks to invest about \
    $850 million to $950 million in Reliance Industries' digital unit Jio \
    Platforms, the Bloomberg reported. Saudi Arabia's $320 billion sovereign \
    wealth fund is reportedly also exploring a potential investment in the \
    Mukesh Ambani-led company. The 'Public Investment Fund' is looking to \
    acquire a minority stake in Jio Platforms."
)
```

```
'reliance group buys stake in net profit for 250 bn'
```



Project profile

Pitch: The goal of the project is to create a world knowledge skill for a chatbot. It involves using Natural Language Processing algorithms to summarize a topic-related world knowledge into a concise response to be used by the chatbot.

Basic functional requirements:

- Creation of a world knowledge skill for a chatbot.
- Analysis and Pre-processing of the dataset.
- Evaluation of state-of-the-art Abstractive Text Summarization models for large documents.
- Implementation of the best-performing Text Summarization model inside the world knowledge skill.

Basic non-functional requirements:

- The summarization skill is able to generate concise summarizes of a topic.
- Implementation of NLG evaluation metrics to access the quality of the summaries.
- Implementation of fallback mechanism for Intents

Expected prior knowledge

- Experience in Python Programming Language.
- Knowledge in Natural Language Processing (NLP) and Deep Learning (DL) Methodologies.
- Basic Knowledge in Hugging Face, PyTorch or TensorFlow
- Experience in Conversational AI and Rasa [optional]

Contact:

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Fact-Checking Tool

Advisor / Product Owner: Juraj Vladika

Fact-Checking Tool

EXAMPLE

Input a claim

Past Claims

Analytics

How It Works

Claim: Coffee helps increase lifespan

People who drink up to eight **cups of coffee** per day may slightly **lower their risk of early death** compared with non-drinkers, according to a large new study. And it doesn't appear to matter if the coffee is caffeinated or decaf, brewed or instant. The study analyzed data from about half a million Britons and found that the **more coffee** people drank, the **lower their risk of dying** during the 10-year study period. "People think of caffeine, but it's likely that some of the most beneficial compounds are not the caffeine." (...)

source: harvard.edu

supported

Claim: Koalas have gone extinct in 2019 after bushfires hit Australia.

Over the weekend, **erroneous declarations** that the animals have lost most of their habitat and are "functionally **extinct**" made the rounds in headlines and on social media. **Koalas** are considered vulnerable to extinction—just a step above endangered—and reports indicate that many of them have been found dead so far in fire-devastated zones. But, experts say, we are **not looking at the death of a species**—yet. "We're not going to see **koalas** go extinct this fast," says Chris Johnson, professor of wildlife conservation at the University of Tasmania. (...)

source: nationalgeographic.com

refuted

Claim: Coconut oil can cure Alzheimer's disease.

The damage caused by **Alzheimer's** disrupts the brain's ability to use its primary energy source, known as glucose. Ketones may provide an alternative energy source to the brain cells to moderate the damage caused by Alzheimer's disease. The body produces ketones when it metabolizes **coconut oil** and similar substances. Unfortunately, **there just isn't any creditable science to support this idea**. It is **impossible for us to know** how well **coconut oil** does or does not work in **Alzheimer's disease** because there have not been rigorous, large-scale research studies done. (...)

source: alz.org

uncertain

retrieve evidence

verdict

Outcome: App that supports:
- ✓ Document search
- ✓ Evidence retrieval
- ✓ Realtime claim verification

Technologies:

HTML, SQL, Google, python, PyTorch, Flask, django, Hugging Face

Project profile

Pitch: The goal of the project is to develop an automated fact-checking tool that for an input claim finds evidence in the corpus of documents or websites and produces a verdict on its veracity, using integrated machine learning models.

Basic functional requirements:

- Creation of a graphical UI for input and navigation
- Visualization of found evidence and verdicts
- Preparation and processing of data
- Construction and configuration of machine learning models

Basic non-functional requirements:

- Realtime processing of predefined and new queries
- Efficient retrieval of documents from the database
- Modularity and reusability of components

Expected prior knowledge

- Knowledge of HTML, JavaScript, CSS
- Skills in Python, Flask / Django, Angular / React
- Integration with SQLite, Google Cloud / AWS

Desirable**:**

- Knowledge of ML models, PyTorch, Hugging Face
- Understanding of NLP methods & applications

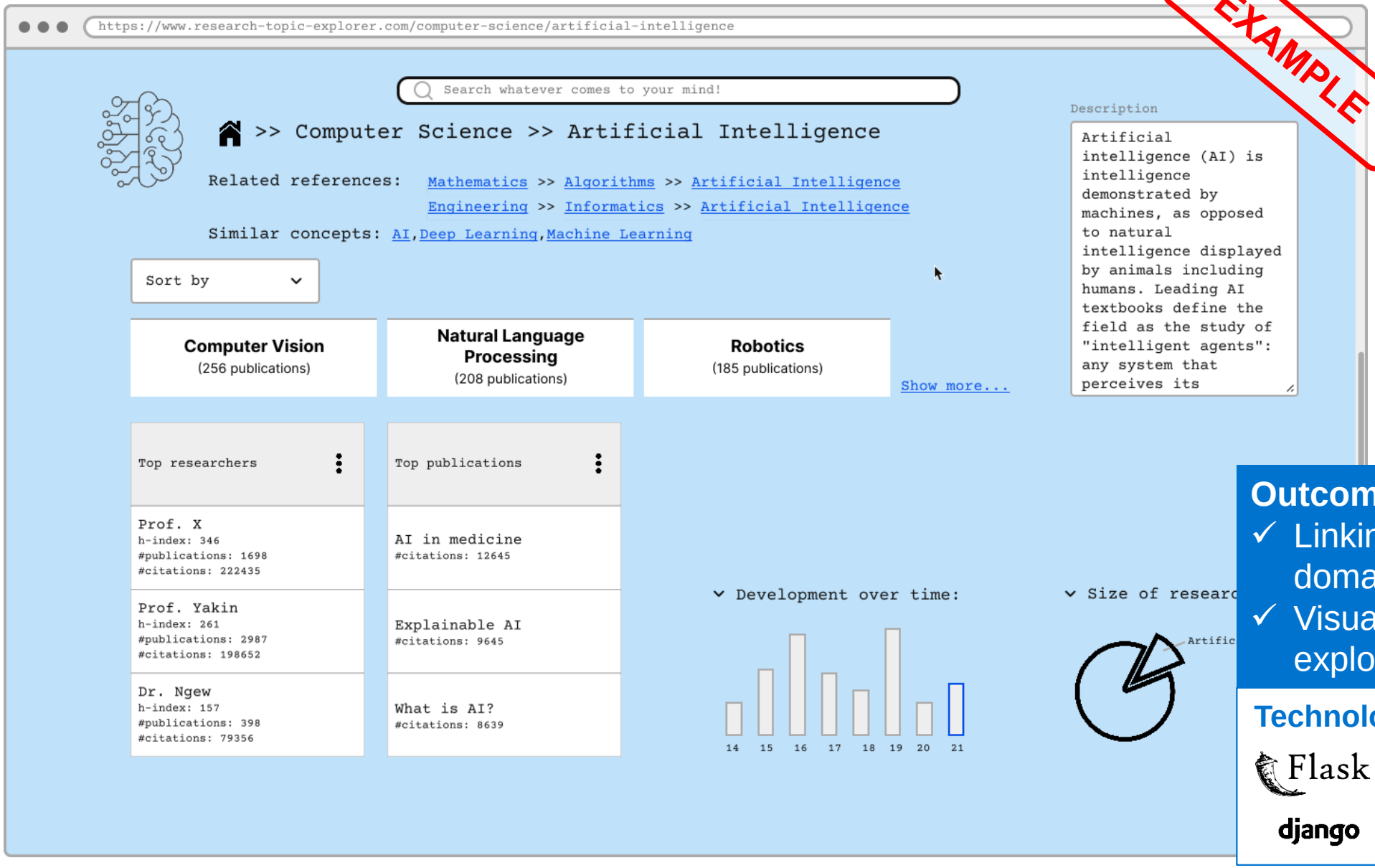
Contact:

juraj.vladika@tum.de

Research Institution Knowledge Graph

Advisor / Product Owner: Tim Schopf

Research Institution Knowledge Graph



Outcome: App that supports:

- ✓ Linking of related scientific domains
- ✓ Visual knowledge exploration

Technologies:

Flask, django, React, Python, neo4j

Project profile

Pitch: The goal of the project is to develop a web application which provides an explicit overview of the research fields within a research institution based on graph data.

Basic functional requirements:

- Support navigation of research concepts based on a provided ontology
- Support search of researchers and their topics

Expected prior knowledge

- Knowledge in React, Python and Flask
- Basic Knowledge in Neo4j beneficial

Basic non-functional requirements:

- Realtime processing of predefined queries
- Adaption of the result set in realtime
- Realtime client – server communication
- Design of modular components

Contact:

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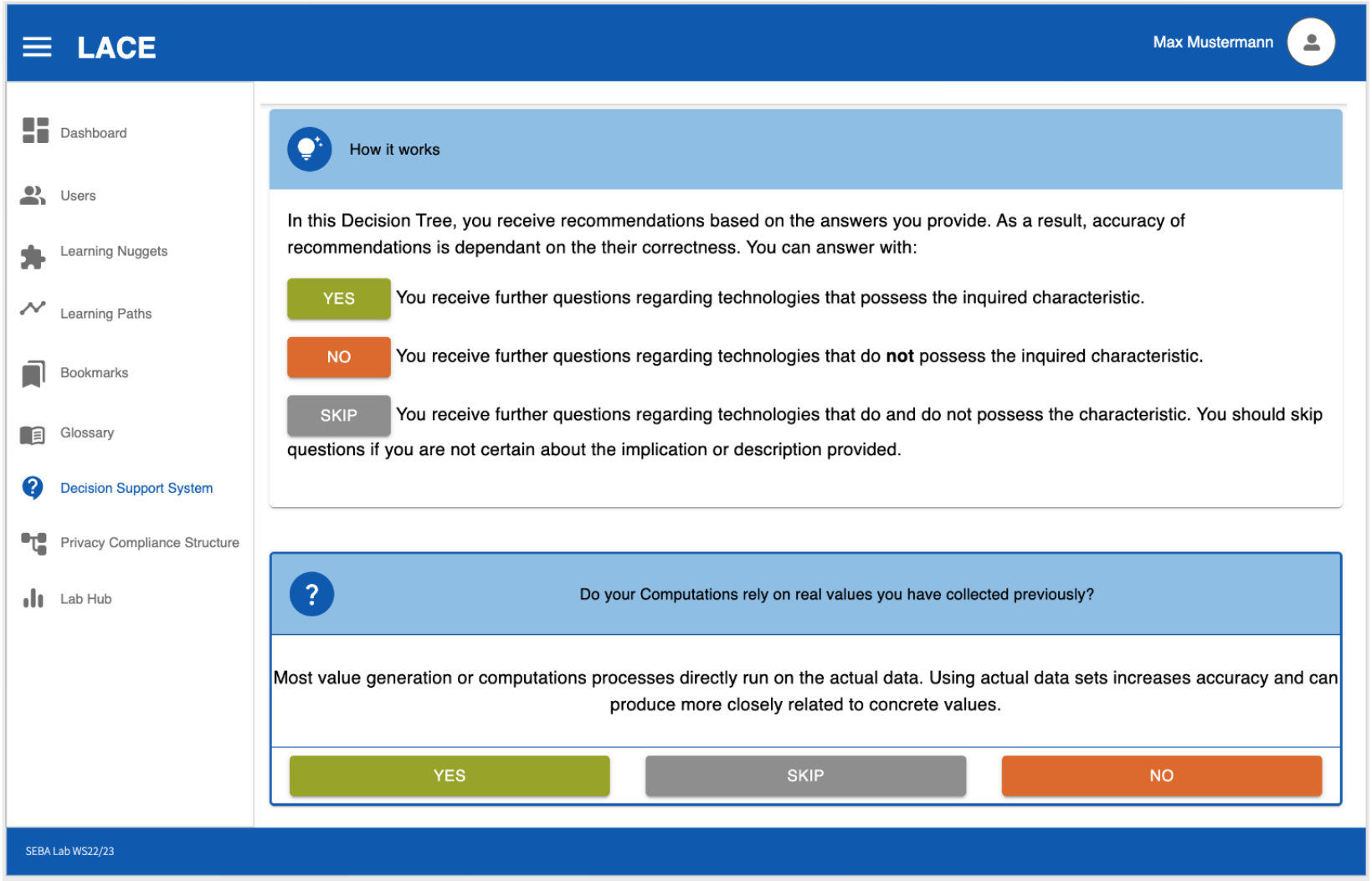
DP/PCE
Data Privacy – Privacy Compliance Ecosystem

Advisor / Product Owner: Alexandra Klymenko
Stephen Meisenbacher

DP/PCE: Decision Support System

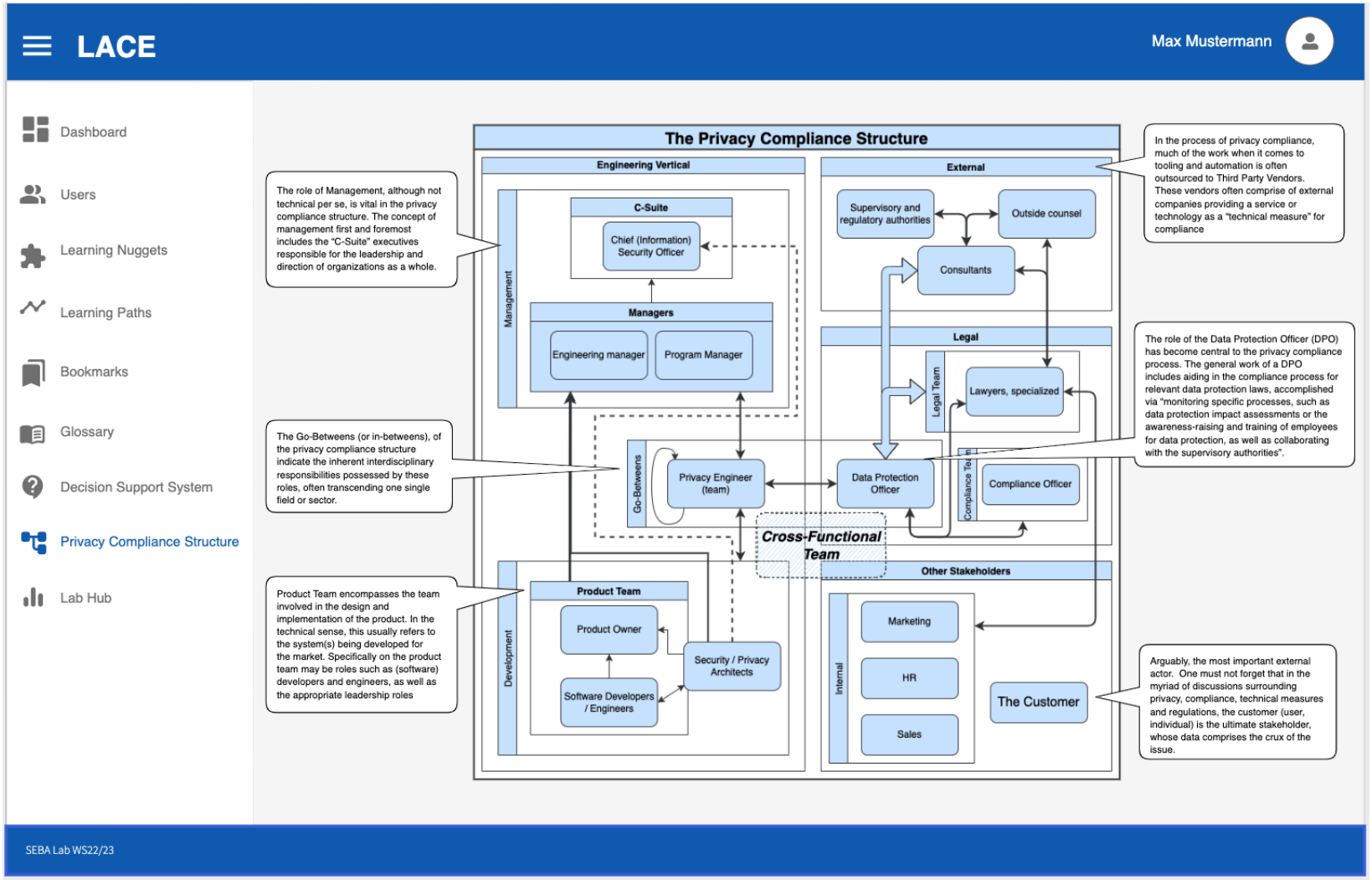


Technologies:

Outcome: App that supports:

- ✓ Educational UI
- ✓ Interaction with learning content
- ✓ Visual exploration
- ✓ Decision support system
- ✓ Discussion forum

DP/PCE: Privacy Compliance Structure



Technologies:

Outcome: App that supports:

- ✓ Educational UI
- ✓ Interaction with learning content
- ✓ Visual exploration
- ✓ Decision support system
- ✓ Discussion forum

Project Profile

Pitch: The goal of the project is to extend a learning platform for Privacy-Enhancing Technologies with a focus on interactively showcasing the data privacy compliance process.

Basic functional requirements:

- Integration of an existing decision support system
- Linking of the decision support system to existing learning material on PETs
- Creation of interactive privacy compliance structure exploration tool
- Addition of a discussion forum for registered users
- Further e-learning features (e.g., gamification)
- UI design improvements

Expected prior knowledge:

Required:

- Knowledge in HTML, CSS, JavaScript, Material UI, React, Python, Flask, MongoDB

Desirable:

- First experience or high interest in data privacy (compliance) and Privacy-Enhancing Technologies

Basic non-functional requirements:

- Intuitive user interface
- Code quality
- Modular and extendable design

Contact:

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DP²NLP
Data Privacy – Differential Privacy in Natural Language Processing

Advisor / Product Owner: Stephen Meisenbacher
Alexandra Klymenko

DP²NLP – Explore Word-Level Text Privatization

Private NLP Playground

Welcome, User!

Framework

Hyperparameters

Epsilon

Delta

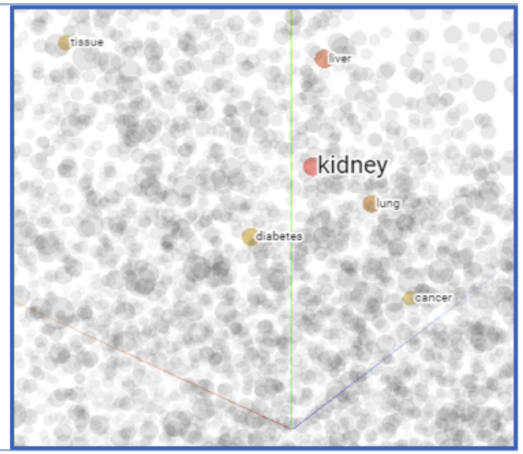
Run!

100%

TOTAL PERTURBED WORDS
1

TEXTUAL SIMILARITY
0.95

EMBEDDING SPACE VISUALIZATION



MECHANISM CALCULATIONS

D'	$\exp(\frac{\varepsilon q(D,r)}{2\Delta q})$	Pr[D']	*q(heart, D')*
liver	16.602	0.367	0.590
lung	9.647	0.213	0.476
tissue	6.560	0.145	0.395
diabetes	6.315	0.140	0.387
cancer	6.108	0.135	0.380

ORIGINAL TEXT

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. heart Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

PRIVATE TEXT

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. liver Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

SEBA Lab WS 22/23

Goal: to develop an educational user interface that allows users to explore the application of word-level Differential Privacy to textual data, in an interactive and real-time manner.

Outcome: App that supports:

- ✓ Interactive NLP Dashboard
- ✓ Real-time calculations
- ✓ Complex Data Visualization
- ✓ Educational UI

Technologies:

Flask plotly | Dash

Project Profile

Pitch: The goal of the project is to develop an educational user interface that allows users to explore the application of word-level Differential Privacy to textual data, in an interactive and real-time manner.

Basic functional requirements:

- Creation of an interactive text privatization playground
- Displaying of perturbation results, both graphically and mathematically
- Exhibition of non-privatized vs. privatized text
- Providing relevant stats and user notifications

Basic non-functional requirements:

- Real-time execution of Differential Privacy
- Intuitive visualization of the perturbation process
- Adaptation of calculations to user-given parameters
- 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
- 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:

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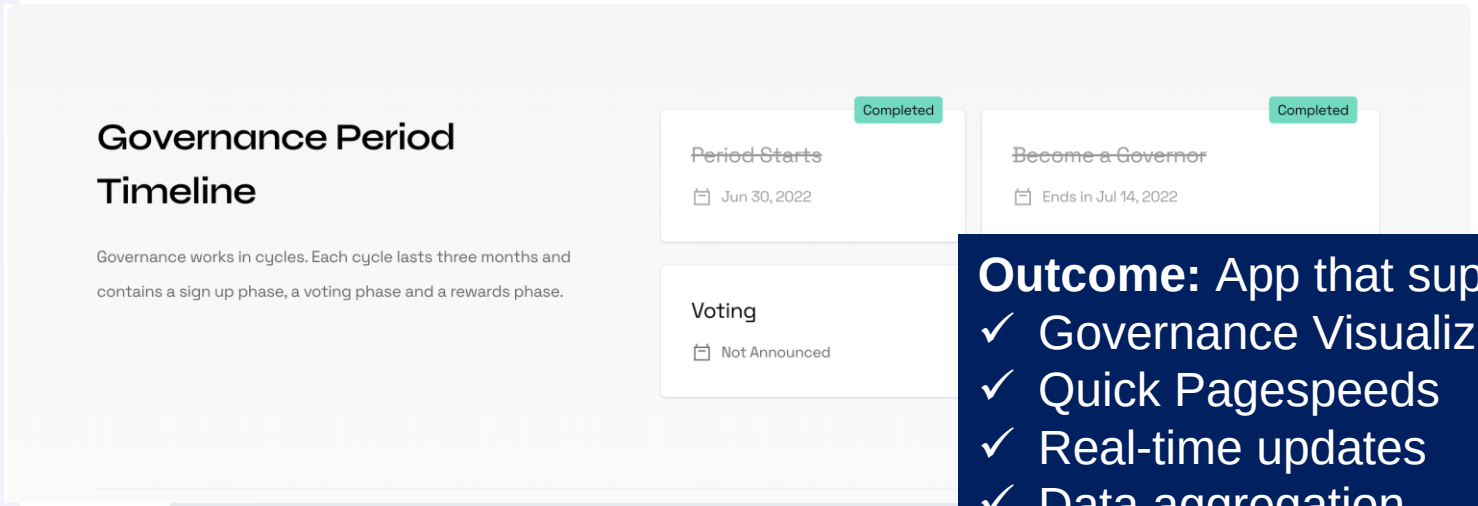
Governance Evaluation for Algorand

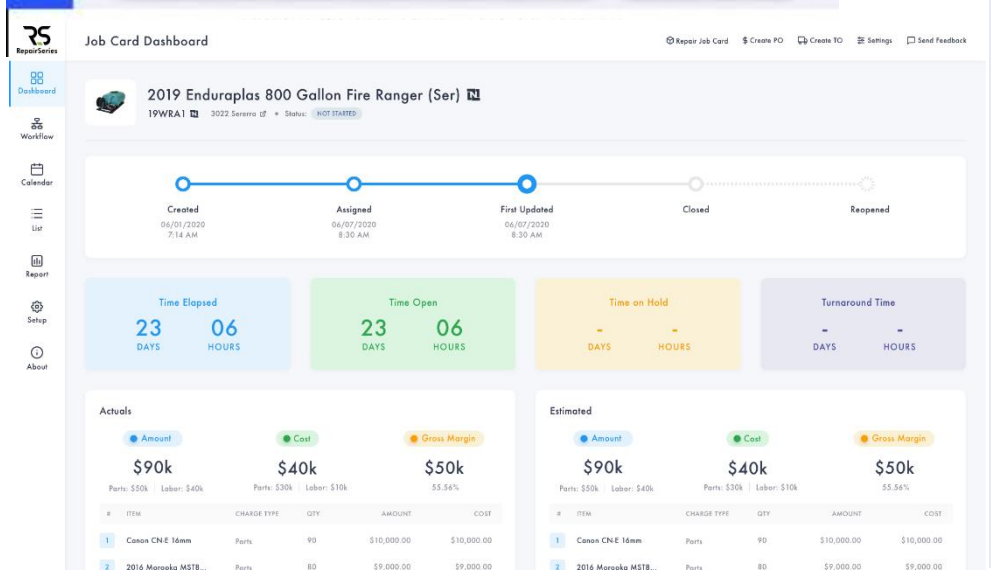
Advisor / Product Owner: Burak Öz
Christian Ziegler

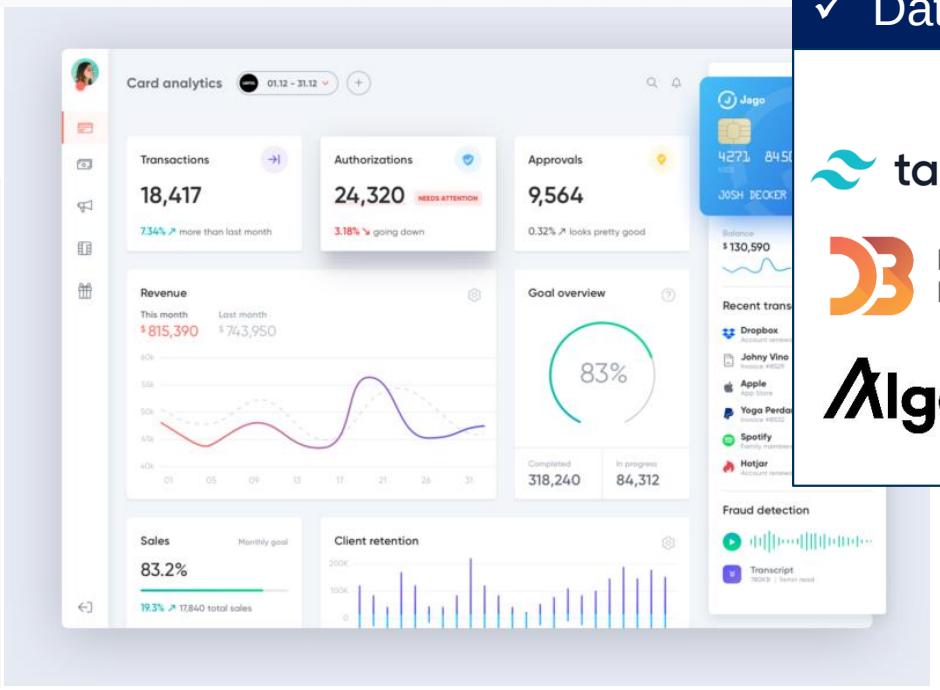
SUPPRA-Governance – Governance evaluation for Algorand



Outcome: App that supports:

- ✓ Governance Visualization
- ✓ Quick Pagespeeds
- ✓ Real-time updates
- ✓ Data aggregation





Project profile

Pitch: The goal of the project is to develop a governance evaluation platform and dashboard for the cryptocurrency Algorand with ongoing data-collection.

Basic functional requirements:

- Fetch Governance data from the Algorand Blockchain
- Aggregate Governance Data and do basic analysis
- Visualize the aggregated Governance Data
- Design an ongoing data-collection

Basic non-functional requirements:

- Quick loading times and very good Pagespeed scores
- Realtime client – server communication
- Design of modular components
- Caching of results in the server

Expected prior knowledge

- Knowledge in tailwindcss, Next.js, NodeJS
- Basic Knowledge working with REST APIs, GraphQL, RPCs.
- Experience in JavaScript visualization libraries d3
- Basic Knowledge of Socket.io or similar realtime client – server communication frameworks

Contact:

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christian.ziegler@tum.de

Group Ordering

Advisor: Felix Hoops

Product Owner: Isa Usmanov

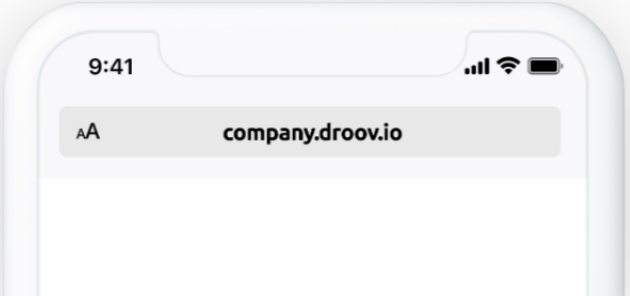
droov

E-commerce and delivery solution for SMEs

Step 1

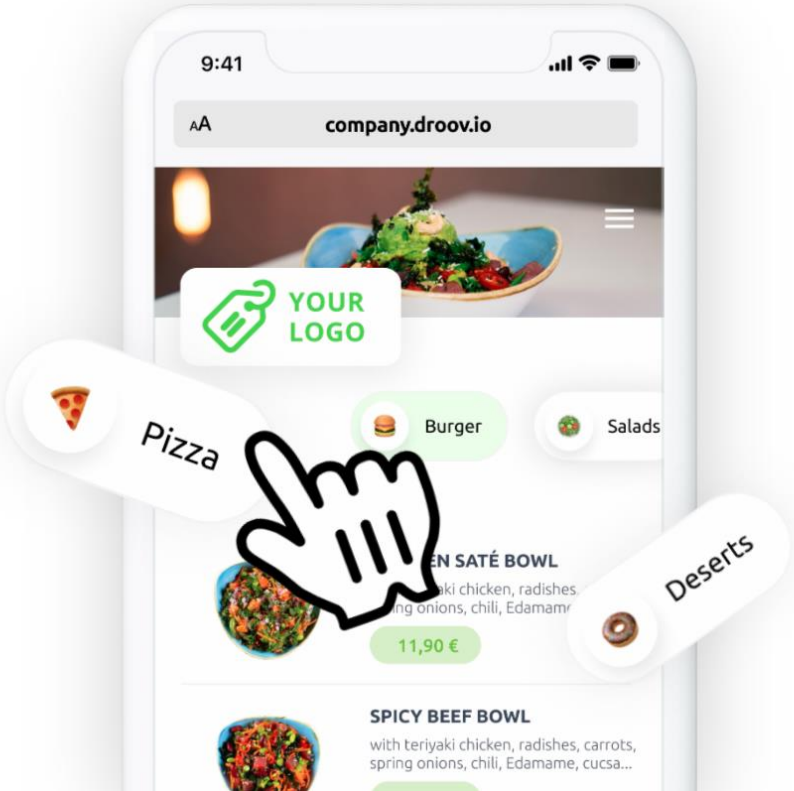
Choose a unique link for your shop

https:// **company**.droov.io



Step 2

Drag-and-drop assemble and design your store (no code)



Step 3

Configure logistics to meet your business needs

Define delivery area

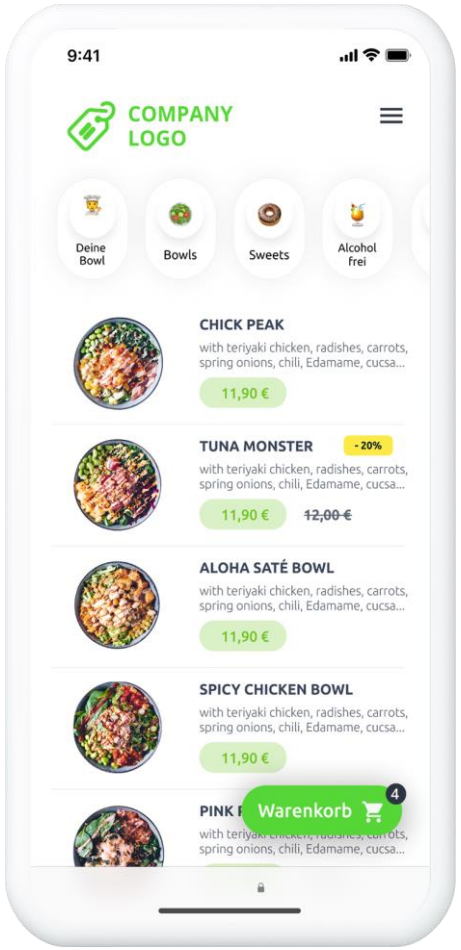
Set operating days and time

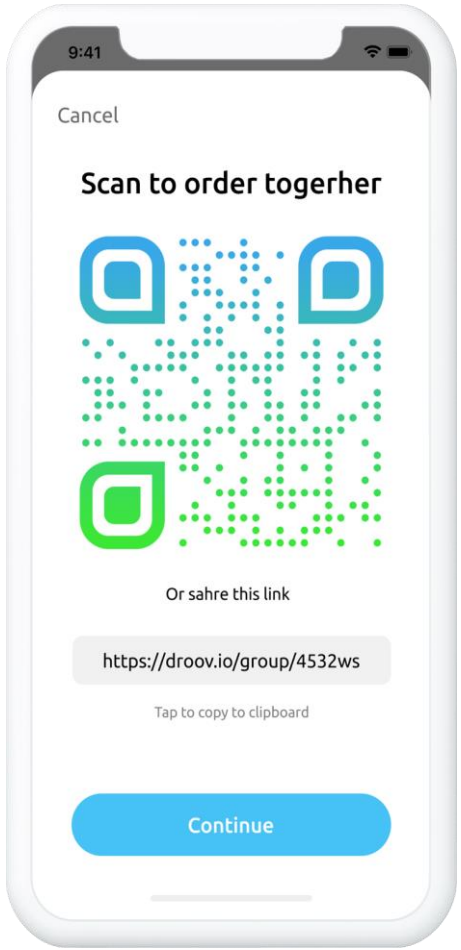
Monday 08:00 - 16:00

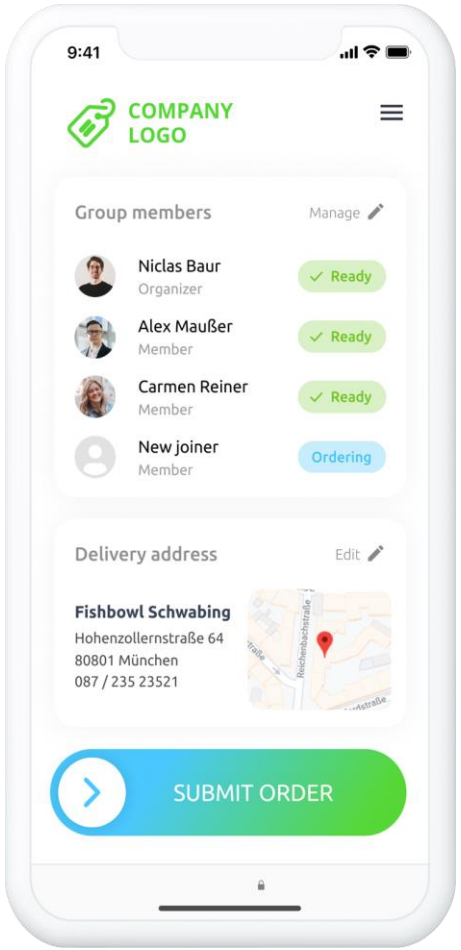
Connect payment methods

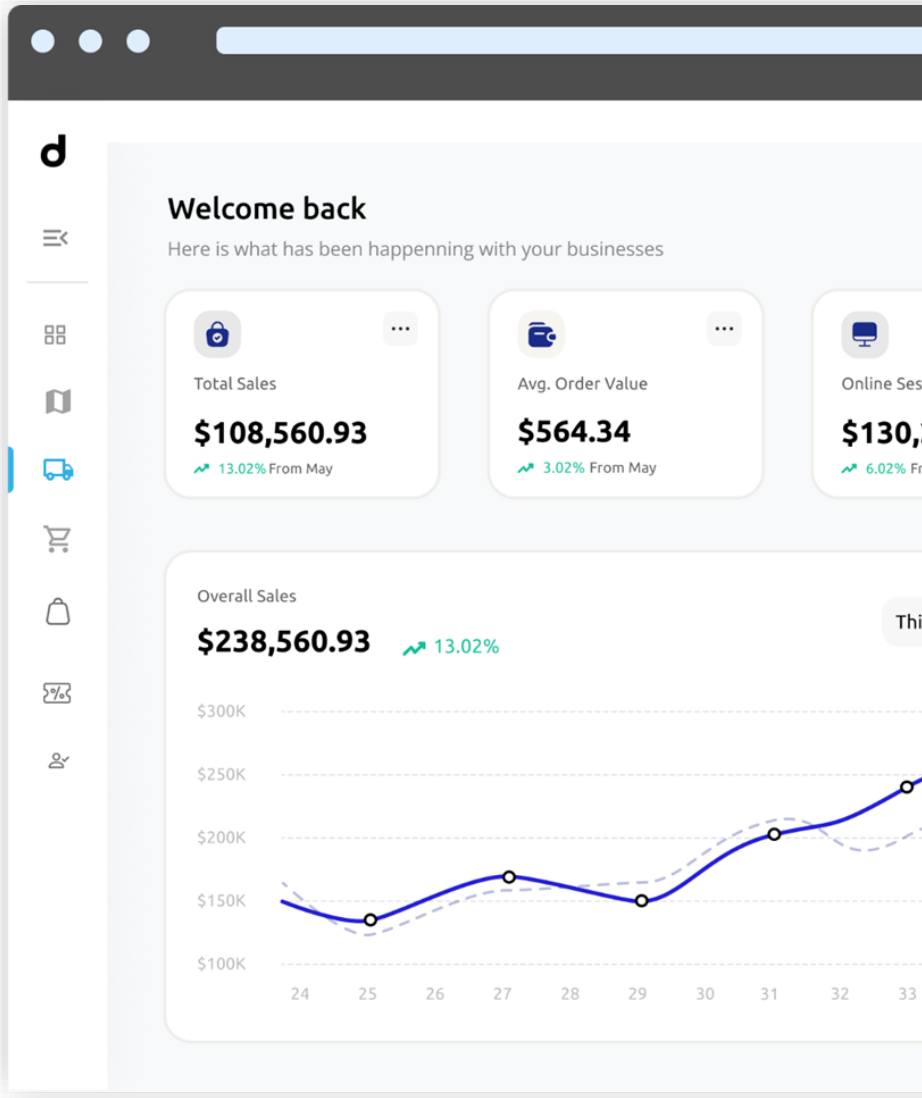
Organise & manage couriers

Goals – Group ordering & business analytics dashboard









React Firebase Tailwind CSS

Project profile

Pitch: droov allows small businesses to effortlessly create their online store and operate a delivery business. The two main goals of this project are **1)** Extending current solution with a possibility to offer a group ordering functionality. For example, if co-workers in the office or a group of friends in Englischer Garten want to order together from a single restaurant. Group orders are economically and ecologically beneficial for all of the parties involved. **2)** Developing a business analytics dashboard to display business performance metrics, among others, number of daily/weekly orders, revenues etc.

Basic functional requirements:

- As group organizer, initiate a group order, generate invite link & QR-code. Joining group via link; checkout
- Paying and submitting batched order and creating a group order status tracking view.
- Configuring group ordering details in the admin view
- Analytics dashboard with business performance metrics

Basic non-functional requirements:

- Intuitive and responsive user interface (Always eliminate extra clicks where possible - be creative)
- Follow droov's styling pattern
- Collaborate and engage with founder team

Expected prior knowledge

- Prior knowledge in web application & front-end development **React.js / JavaScript**
- Basic experience with styling **CSS libraries**
- Prior knowledge in backend development (**Node.js or Firebase + MongoDB or Firestore DB**)
- Basic knowledge in version controlling tools: **Git / Gitlab**
- Extra points for experience with **Payment processing** solutions (not mandatory)

Contact:

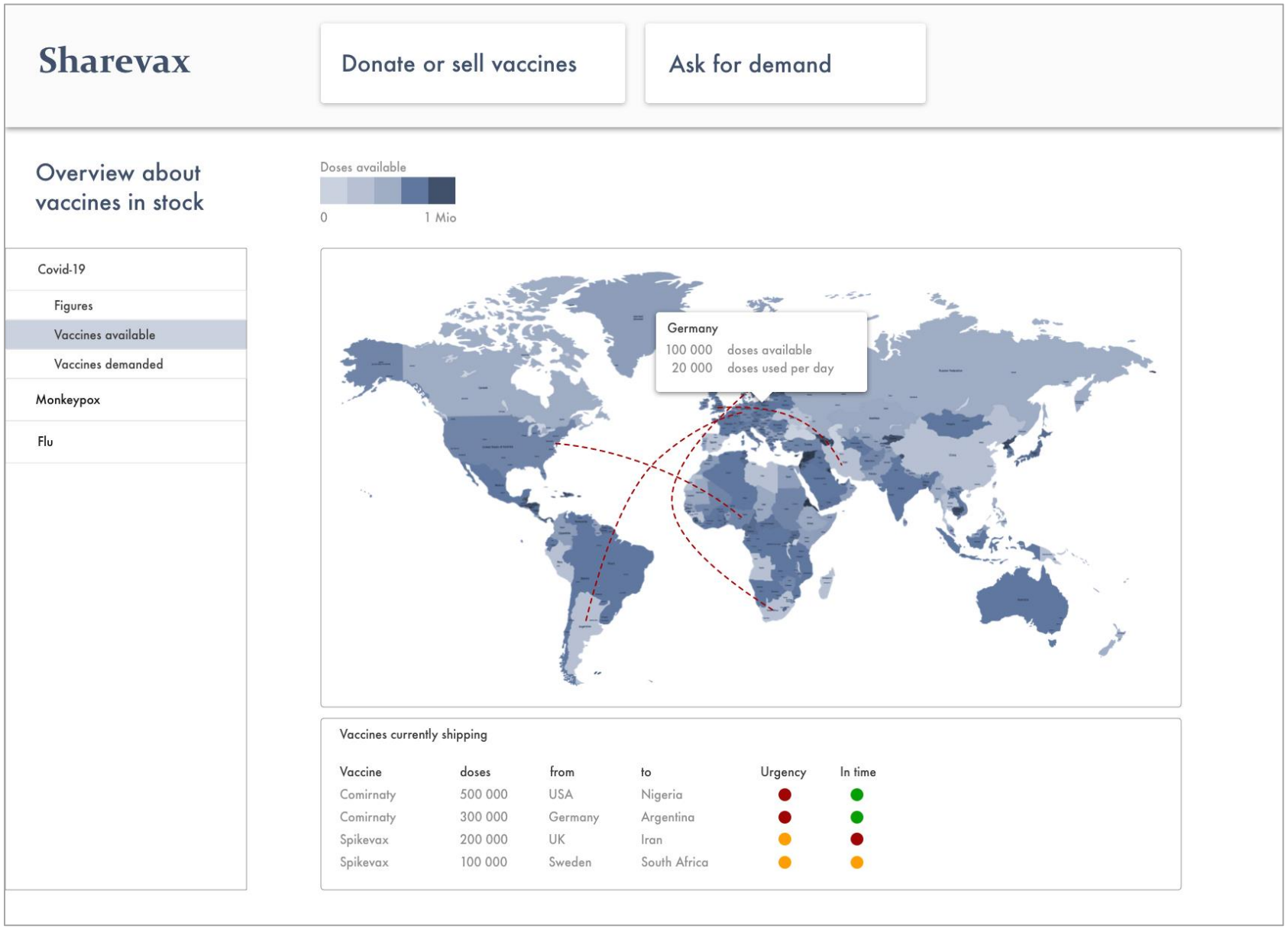
Isa Usmanov - isa@droov.io

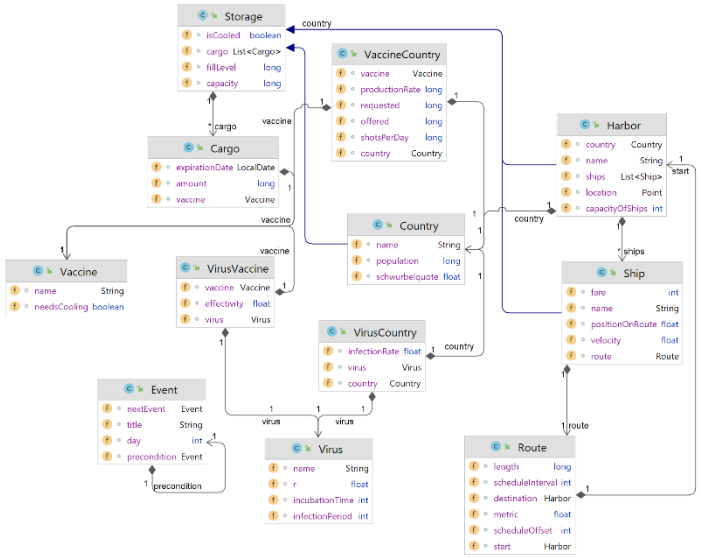
SHAREVAX – Get and share the vaccines people need

Advisor: Peter Kuhn

Product Owner: Monja Puggel
Martin Gail

SHAREVAX – Get and share the vaccines people need





Outcome: App that supports:

- ✓ Calculation Algorithms
- ✓ Real-time Result Change
- ✓ Complex Event Processing
- ✓ Multi-level Data visualization

Technologies:

TS, React, Angular, HTML5, CSS3, node.js, spring boot, mongoDB

Project profile

Pitch: The goal of the project is to develop a web application for simulating the distribution of vaccines based on an algorithm that calculates optimal shipping routes and delivery.

Basic functional requirements:

- Simulating the usage of shipment routes
- Find optimal distribution of vaccines
- Visualization of vaccine amount and shipment routes
- Visualization of dashboards

Expected prior knowledge

- Knowledge in frontend technologies like Angular or React, HTML, CSS
- Knowledge in backend technologies like mongoDB, Spring Boot, NodeJS
- Basic knowledge in developing calculation algorithms

Basic non-functional requirements:

- Processing of user input and adaption of the result in real-time
- Real-time client – server communication
- Design of modular components

Contact:

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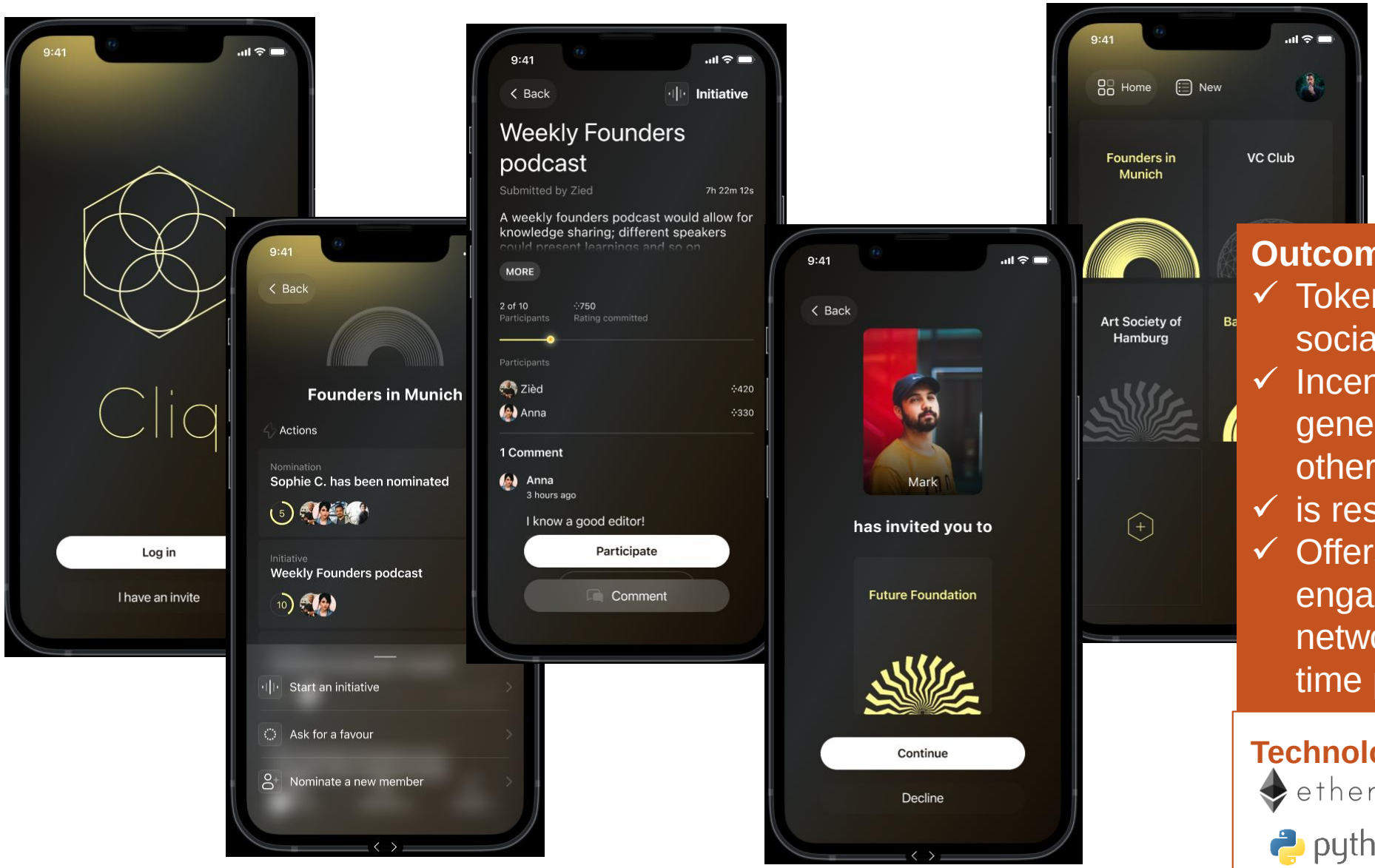
CLIQ – A Web3 protocol to tokenize reciprocity in a social network

Advisor: Sascha Nägele

Product Owner: Zied Bahrouni
Ehsan Olyaee

CLIQ – A Web3 protocol to tokenize reciprocity in a social network



Outcome: A protocol that:

- ✓ Tokenizes reciprocity in the social network app Cliq
- ✓ Incentivizes users to generate value for each other
- ✓ is resilient against fraud
- ✓ Offers a different engagement metric in social networks (as opposed to time per user)

Technologies:

ethereum · web3 foundation · python · React · django

Project profile

Pitch: Cliq (in beta) is a social network that enables users to create small closed cliques to exchange favors and organize collective action. The goal of this project is to create a Web3-based protocol that tokenizes reciprocity. The protocol would incentivize users to help others and with that create reciprocity within the group.

Basic functional requirements:

- Tokens should be earned by fulfilling favor requests, taking part in collective actions or nominating new members.
- The sum of tokens a user has therefore corresponds to their helpfulness within a group.
- Moreover, the tokens should be linked to privileges or financial incentives to further incentivize users to create value for each other.

Basic non-functional requirements:

- Create different concepts of the reciprocity token and test them with the Dev team and the social science team.
- Run experiments with Dev team and social science team in controlled groups of pilot users.

Expected prior knowledge

- General knowledge about web3 protocols and blockchain (bonus: in social networks)
- Ethereum protocol
- (Optional) Python, Django, JavaScript, React
- Basic knowledge in DevOps

Contact:

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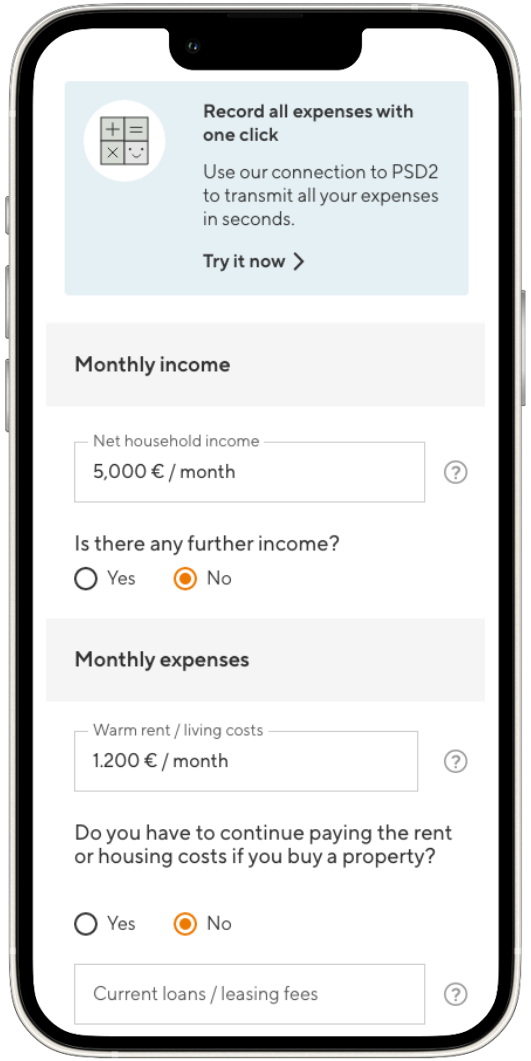
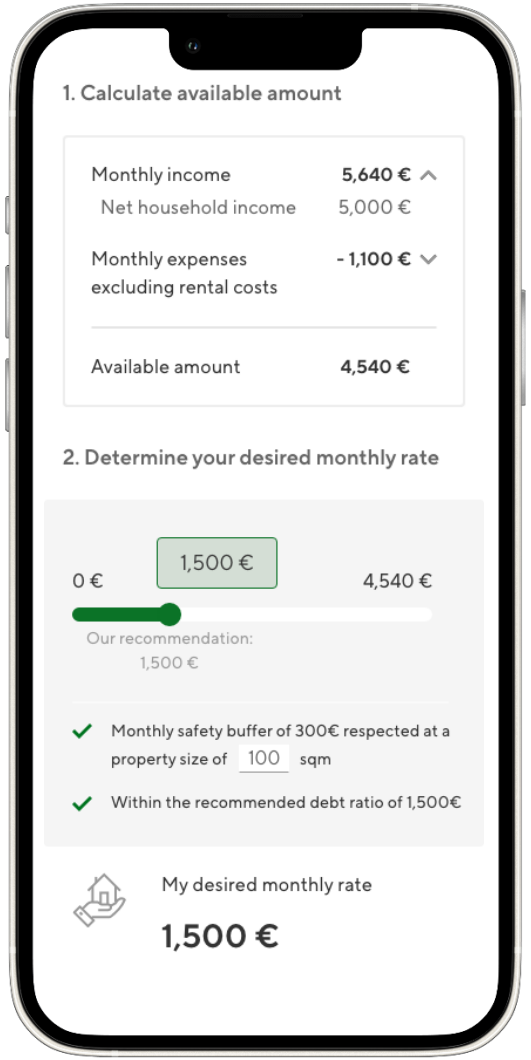
Know your Money! – Budget Calculator with PSD2

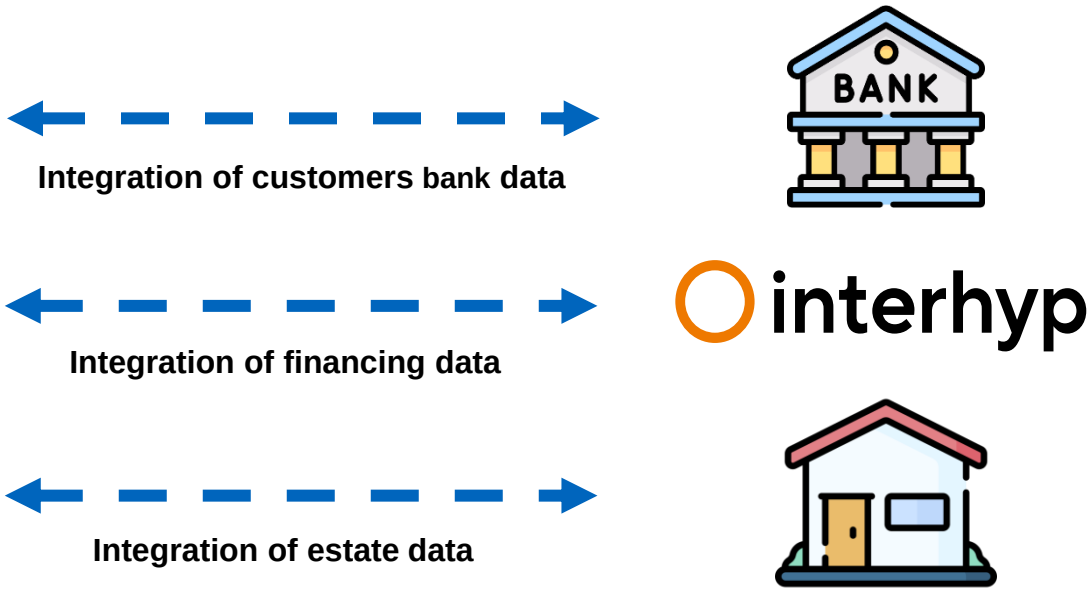
Advisor: Pascal Philipp

Product Owner: Francisco De las Casas Young
Krassimir Ovcharov
Felipe Wieman

Know your Money! – Budget and Estate Platform with PSD2







Outcome – Web-App that supports:

- ✓ Integration of Estate, Financing and Bank APIs
- ✓ Calculations of the customers financial possibilities
- ✓ Categorization and optimization of income and expenses
- ✓ Multi-level data visualization of complex financial data
- ✓ Personalized mortgage calculations
- ✓ Personalized estate recommendations

Technologies:

Project profile

Pitch: The goal of the project is to develop a budget and estate web platform using different APIs to compute the financing possibilities of our customers to provide recommendations for estates and mortgages.

Basic functional requirements:

- Implementation of several forms and views
- Visualization of data and calculations
- Integration of a PSD2 (Payment Service Directive 2), Interhyp and Estate APIs
- Categorization and Optimization of income/expenses
- Personalized recommendations for estates and mortgages

Basic non-functional requirements:

- Intuitive, performant and responsive user interface (mobile first)
- Design of modular and reusable components
- Security (2FA, Captcha, Access Token)

Expected prior knowledge

- Knowledge in Frontend Technologies
  - HTML, CSS, JavaScript, TypeScript, React
- Knowledge in Backend Technologies
  - Java, Node, Kotlin, Spring Boot
- Bonus: Knowledge of PSD2 conform Bank APIs

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

Contact:

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pascal.philipp@tum.de

Managing cloud developer workspaces

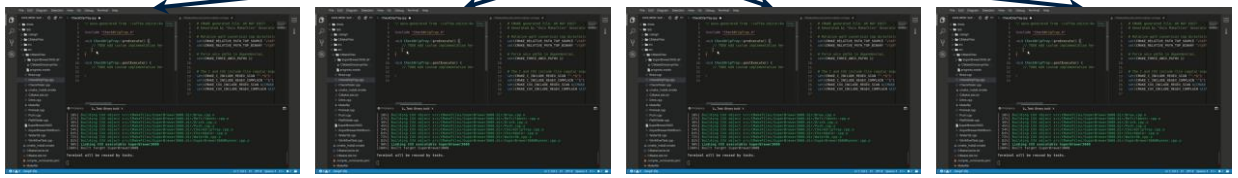
Advisor: Tri Huynh

Product Owner: Jonas Helming

Managing cloud developer workspaces

Application for managing a cluster of developer workspaces

Cluster of developer workspaces (Kubernetes)



Browser-based IDE

Outcome: App that supports:

- ✓ Managing Dev Workspaces
- ✓ Monitoring Deployments
- ✓ Resource/Cost Analysis
- ✓ Optimizing the cluster

Technologies:

Project profile

Pitch: The goal of the project is to develop a web application for managing a cluster hosting developer workspaces.

Basic functional requirements:

- Configure parameters, such as allowed resource consumption per user
- Managing user workspaces
- Monitoring deployed service
- Statistics about usage, performance and cost
- Mange cluster optimizations, e.g. “prewarming”

Basic non-functional requirements:

- All code will be contributed under an Open Source license (EPL)
- Reproducible build and set-up

Expected prior knowledge

- Knowledge in HTML, CSS, TypeScript and React
- Basic Knowledge in Docker and Kubernetes
- Standard “toolbox” including Git and VS Code

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