

HITec ANNUAL REPORT 2021

HITec e.V. - an initiative of the Department of Computer Science
Faculty of Mathematics, Informatics and Natural Sciences
University of Hamburg

Hamburger Informatik Technologie-Center HITEC e.V.

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1. OVERVIEW

HITeC is the research and technology transfer center of the Department of Computer Science at the University of Hamburg. Due to its independent status, HITeC offers flexible and professional cooperation opportunities. HITeC solutions are based on the latest research results and provide advantages through innovative technologies.

HITeC is a registered, non-profit association supported by members of the Department of Computer Science at the University of Hamburg. The association is linked to the University of Hamburg by an agreement.

HITeC sees its main tasks in the:

-  Implementation of application-oriented research projects
-  Dissemination of application-oriented research results
-  Realization of seminars and workshops
-  Mediation of contacts between companies and students
-  Improvement of the practice-oriented education in the university
-  Support for business start-ups from the university
-  Education of students especially through including them in cooperation projects

In 2021 HITeC had five sponsoring members, these are companies and institutions that support HITeC. The number of active personal members of HITeC is more than 50.

HITeC's project volume in 2021 was approximately 2.1 Million Euro.

HITeC conducts application-oriented research in the general field of Computer Science and research in the field of technology transfer. In contrast to basic research, application-oriented research is scientific Computer Science research whose results can be used directly in practice. On the one hand, the results of basic research are incorporated into cooperative projects; on the other hand, new questions for basic research arise through research on applications, which decisively further stimulate this research. Also known as Action Research, in which scientists go into the concrete, real conditions in practice in order to gain knowledge for further basic research this method. In addition, this way back into basic research (which essentially takes place at the university) is a very important part of the application-oriented research at HITeC, in order to fertilize this basic research in a completely new way, so that it can later find better application-relevant results for practice.

Hence, application-oriented research at HITEc takes up the results of basic research at the Department of Computer Science and explores their possible applications in special application projects typically with partners.

Some selected projects and activities in 2021:



Several projects in the field of application of Artificial Intelligence methods:

- Develop an integrated process for 3D object determination using AI methods,
- Automatic transcription of spoken language data,
- AI systems for marketing content for the automobile industries.
- Analysis of images, videos and streams for the creation of situation and action descriptions (including sports, traffic, and landscape overflights), the retrieval of media content, and the extraction of components from technical drawings,
- New methods for explainable AI,
- Autonomous adaptive machines,
- Predicting processes in production machines,
- Continuation of the development of an Reinforcement Learning Framework,
- Co-development of a platform for the resilience of economic ecosystems,
- Co-development of a platform for the generation of synthetic data,
- Design of a platform for urban production and local value networks,
- RoboCup-AG - Hamburg Bit-Bots,
- Scientific consulting service collection of spoken language data,
- Continuation of the workshop series in cooperation with the Artificial Intelligence Center Hamburg e.V. (ARIC).



Several projects in the field of eHumanities aiming at the dissemination, collection, presentation, and long-term archiving of cultural objects, besides others: Portal for Philosophical and Hebrew Terminology, matriculation portal.



Projects in the area of software development and management, including distributed software development in heterogeneous groups and scientific support for the development of an online service.

-  Several projects in the area of Digital Transformation and Digital Literacy as well as support in the organization of the ITMC Conference at the Faculty of Computer Science with approx. 150 participants.
-  Many smaller projects, mainly with companies and research institutions from the Hamburg region, but also internationally.
-  Participation in a working group of the founding initiatives of all Hamburg Universities as well as cooperation with ahoi.digital, ARIC, and Hamburg Innovation.

Publications of HITEC are listed on the websites of the university of the respective professors and project collaborators. An overview of project activities provides <https://hitec-hamburg.de>.

2. PROJECTS OF HITEC

The following sections provide a brief overview of the projects implemented in 2021. A summary of the activities in the respective project area precedes these project overviews.

HITeC focuses with project areas on sub-areas of computer science, which stand out due to special activities at HITeC, e.g., in the form of cooperation projects.

In addition to the projects listed, there were a number of smaller activities that are not mentioned here.

2.1 IS - INTELLIGENT SYSTEMS

The project area "Intelligent Systems" (IS) emerged from the "Laboratory for Artificial Intelligence", in which innovative methods of Artificial Intelligence have been developed and applied in cooperation with companies since its foundation in 1988. Characteristic for the work of IS is a scientifically founded and at the same time practice-oriented approach. The rich wealth of experience ranges from expert systems, configuration and diagnosis, monitoring and event recognition as well as cognitive systems to machine learning (including deep learning and clustering), big data, knowledge discovery, image processing, and other current topics of Artificial Intelligence. IS offers the preparation of studies as well as prototype development in direct cooperation with companies. Furthermore, IS is often a partner in funded projects, especially in national and EU funding programs.

Head:



Lothar Hotz

2.1.1 Information Register - Portal for Implementation of the Transparency Law

The Hamburg Transparency Act came into force on October, 6th 2012. §1 states: "The purpose of this law is to protect the interests of the public through a comprehensive right to information. The information available to the authorities referred to in Article 2(3), while complying with the provisions of the protection of personal data, shall be made directly accessible to the public and to disseminate them in order to promote the formation of democratic opinion and wills and to monitor governance acts." Under §2 paragraph 3 almost all authorities are addressed. To implement this law, the financial authorities, HITEC, and partners designed and developed a web portal, the "Information Register" (Info-Reg). As essential functions thereby the collecting ("harvest"/"Harvesten") of existing documents and data from the authorities, the searchability from the Web portal and the machine access to the information objects are provided. This work belongs to the research areas "Open-Gov-Data" and semantic search.

In the project year 2021, HITEC supported cultural authorities, as current partner, in its further development of the portal. For this purpose, concepts for the cooperation of developer and operation teams (DevOps) at different, partly public institutions were further developed on an organizational (e.g., cooperation processes) and technical level (e.g., for the cloud infrastructure). As special research topics, new deployment and test strategies, as well as the evolution of the software architecture and the map-based geographic search module were continued.

Cooperation partners



Free and Hanseatic City of Hamburg, Department of Culture and Media,
State Archives Office



Dataport AöR

Staff



Christian Bähnisch, Lothar Hotz, Björn Kulas, Melvyn Linke, Anja Richter,
Dennis Rupnow, Yibo Wang

Link: <http://transparenz.hamburg.de/transparenzgesetz-hamburg/>

2.1.2 3S - Schul-Support-Service for Hamburg Schools





The School Support Service is a cooperation between HITEC e.V., the Department of Computer Science at the University of Hamburg and the Hamburg Authority for Schools and Vocational Training (BSB). The goals of the cooperation are: the development of low-maintenance IT structures in Hamburg schools, the training of students and the implementation of research activities. The common overarching goal of the cooperation partners is to develop solutions in line with the BSB's IT strategy.

Student employees relieve the teachers at the general education schools by eliminating malfunctions and performing necessary maintenance work on the computer systems and networks used for teaching purposes. Through their work, the students have the opportunity to gain practical experience and knowledge about professional IT support. For the schools, the project is a great support to be able to teach smoothly in the increasingly complex and larger networks.



3S celebrated its 20th anniversary: In December 2000, the cooperation agreement between the then Authority for Education and Sports (now Authority for Schools and Vocational Training, BSB) and HITEC e.V. was signed. At that time, five students supervised 27 schools in a six-month phase with the aim of gaining experience about costs, use of support and the nature of technical problems in schools. The response of the pilot schools to the work of 3S and the concept was so positive that the main phase could begin in the summer of 2001.

In the meantime, about 150 schools are successfully supported within the project by about 35 student and research assistants employed by HITEC, as well as new concepts for school infrastructure development are developed and researched.

Cooperation partners

-  Hamburg Ministry of Education (Behörde für Schule und Berufsbildung (BSB)).
-  University of Hamburg (Universität Hamburg (UHH))
-  Hamburg University of Applied Sciences (Hochschule für Angewandte Wissenschaften (HAW))
-  State Institute for Teacher Training and School Development (Landesinstitut für Lehrerbildung und Schulentwicklung (LI Hamburg))

Staff

-  Wiebke Frauen, Marc Heydorn, Ogeigha Koroyin, Kai von Luck, Anja Richter, Arne Springborn, and others
-  Approximately 35 students

Link: <https://www.3s-hamburg.de/>

2.1.3 IP Address Change in Hamburg Schools

In the fall of 2018, a special campaign began that was planned together with the Authority for Schools and Vocational Training and successively implemented in the schools supported by the School Support Service (3S). In this campaign, an IP address conversion is carried out in the school networks and the converted IP infrastructure is tested in regular operation in the schools. Each school receives its own IP range.

This changeover will provide the schools with a larger IP range for more devices in the future and prepare them for the expansion of the WLAN infrastructure that is currently underway. For 3S, the IP address changeover offers the advantage of enabling simultaneous visibility of all clients connected to the city network in the school networks. The goal is to be able to reach all school networks simultaneously from the central software distribution server. 3S will thus be able, for example, to distribute updates to all clients in the schools from the central lab, install software on a school's computers, or obtain an overview of both the inventory and the up-to-dateness of the clients. This special campaign was preceded by a test phase in the summer of 2018, during which the IP switchover was initially implemented in the 3S test lab. After about 20% of the schools served by 3S had been converted by the end of 2018, the promotion could be concluded in the summer of 2021 with the conversion of the last schools.

Cooperation partners

-  Hamburg Ministry of Education (Behörde für Schule und Berufsbildung (BSB)).



University of Hamburg (Universität Hamburg (UHH))



Hamburg University of Applied Sciences (Hochschule für Angewandte Wissenschaften (HAW))



State Institute for Teacher Training and School Development (Landesinstitut für Lehrerbildung und Schulentwicklung (LI Hamburg))

Staff



Wiebke Frauen, Marc Heydorn, Ogeigha Koroyin, Kai von Luck, Anja Richter, Arne Springborn, and others



Aproximately 30 students

Link: <https://www.3s-hamburg.de/>

2.1.4 DigitalPakt

The object of the project "Administration structure for IT end devices from the DigitalPakt (DigitalPakt I, II and IV)" is the development and establishment of a comprehensive and central support structure to support schools in the digital transformation through effective, comprehensive conceptual design and realization of technical solutions for maintenance and administration of the end devices.





In doing so, the school support service will take on the development of new technical solutions for loan devices for students as well as teachers and employees in the classroom. It will a) develop and implement a central technical support system for the devices of the DigitalPakt and b) carry out the administration of the devices at participating schools in order to obtain further starting points for the further development of support systems for IT infrastructures in schools.

The tasks are in particular:



- Development of concepts and realization of organizational and technical support structures for the administration of a large number of school devices
- Investigation of transfer possibilities of the existing solutions
- Targeted training of students in practical projects
- Administration of IT end devices from the DigitalPakt
- Use of action design research as a scientific method for the design, development, implementation and evaluation of solutions for the establishment and operation of central support structures.

Work began as early as summer 2020 due to the urgency in the 2020 crisis situation (Covid-19 pandemic). Digitally supported teaching at Hamburg schools as well as distance learning was to be ensured by quickly providing ready-to-use devices for rental.

Cooperation partners

-  Hamburg Ministry of Education (Behörde für Schule und Berufsbildung (BSB)).
-  University of Hamburg (Universität Hamburg (UHH))
-  Hamburg University of Applied Sciences (Hochschule für Angewandte Wissenschaften (HAW))
-  State Institute for Teacher Training and School Development (Landesinstitut für Lehrerbildung und Schulentwicklung (LI Hamburg))

Staff

-  Wiebke Frauen, Marc Heydorn, Ogeigha Koroyin, Kai von Luck, Anja Richter, Arne Springborn, and others
-  Approximately 30 students

Link: <https://www.3s-hamburg.de/>

2.1.5 Design and Development of a Prognostic Simulation Tool

At the Hafen City University (HCU), a prototype was developed in the CoSI project – Cockpit for Urban Infrastructure (Cockpit städtische Infrastruktur) - that shows statistical data of a city (e.g., kindergarten) on a map for social planners.

The prototype was further developed and extended as part of a joint cooperative development project of the CSL (CityScienceLab) at the HCU and the LGV (State Office for Geographic Information and Surveying) as part of an agile development process based on SCRUM.

A development team, which was only intermittently active at the HCU and the LGV, carried out further developments. The data and requirements to be integrated were developed in a fortnightly workshop with a newly formed inter-district and inter-agency working group "AG CoSI Sprint". The working group was directly involved in the further development of the tool as part of the agile development process.

For the successful collaboration in a team of distributed developers and a group of heterogeneous stakeholders (represented by the members of the working group AG CoSI Sprint), a development process was defined and planned. This included, beside others,

communication channels, roles, repository use, stakeholder feedback, multi-institutional development, and planning.

During the development of the tool, particular attention was paid to the long-term usability, operability, and interoperability with the existing master portal established by the LGV.

In the development project Design and Development of a Prognostic Simulation Tool (CoSI II), HITEC has taken over development work in the "analysis frontend". Here, calculations for the prognosis, which are based on a large number of data, are not carried out in the backend, but in the user's frontend. This means that these calculations are independent of a central component.

Cooperation partners



Hafen City University

Staff



Christian Bähnisch, Dennis Rupnow

2.1.6 Yard Planning in Seaport Container Terminals

At a container terminal, equipment for handling and transporting containers during loading and unloading processes has to be synchronized. In a specific use case, quay cranes for executing vessel (un)loading processes, truck trailers for transporting containers horizontally from/to quay cranes to/from the container storage block, and rubber tyred gantry cranes (RTGs) for picking up and dropping down containers in the block are used. For smooth processes, different priorities of containers and therefore equipment have to be taken into account. Furthermore, planning with a rolling horizon reflects the current and upcoming complex situation at the terminal. Therefore, a recalculation is required frequently (e.g., each minute).

This project is aiming at developing a concept for process control. Plans should be recalculated frequently, so that algorithms as well as human planners and decision-makers are provided with real-time information. The plans have to incorporate all jobs to be executed in the next planning period and reflect all given restrictions. The result is an assignment of equipment to jobs/containers including decisions on the storage place (slot) for inbound containers within the yard. However, typically changes have to be made during operation (due to new unforeseen jobs to be served, machine failure etc.), and changes at one point can result in a chain-reaction of necessary changes at other points. It can be assumed, that the complex situation cannot be solved to a proven op-

timum quickly enough, therefore the approach will be a rule-based one. Solution candidates have to be identified and evaluated systematically (with respect to a target criteria, e.g., time) in a search tree, and finally a satisfactory or "best" solution should be found within the set of some or all-appropriate and valid solutions.

Cooperation partners



EUROGATE GmbH

Stuff



Dr. Kai Brüssau, Michael Kuls

2.1.7 Intelligent Decision Support for Truck Route Planning in Ports

Container transfers are indispensable for linking locations (e.g., container terminals, depots, repair) and logistics nodes in the port area and hinterland. In the port of Hamburg, about 90% of these transports between the terminals are carried out by truck and contribute significantly to high traffic volumes and long waiting times at the gates. The ever-increasing size of container ships, which leads to peak loads with regard to the provision and transport of containers, will exacerbate this effect. Often, transports are planned centrally by dispatchers and assigned to independent haulage contractors.

This cooperation project develops a software component to support route planning and scheduling using combinatorial optimization methods (e.g., heuristics, metaheuristics). The software component enables an automatic planning of truck tours to available truck drivers under consideration of various temporal, local, and organizational restrictions (e.g., dangerous goods transports, driver qualifications). The availability and the necessary change of chassis are also included in the planning. The dispatcher can configure the optimization procedure and pursue different optimization goals (e.g., reduction of distance and empty runs, fair distribution of transport orders). The software component is integrated with a map service in order to be able to optimize routes on the basis of real route and real-time data on the traffic situation. Rolling planning is also supported in order to integrate new orders into existing plans and to be able to react to deviations/disruptions in operations.

Compared to manual planning, the optimization results demonstrate that automatic planning leads to improved planning results. It could also be shown, even for days with high transport volumes, that the number of possible transports per day can be increased. Accordingly, the intelligent decision support enables higher productivity on the part of EUROGATE Intermodal on the one hand and an improved order volume for the participating haulage contractors on the other.

Cooperation partners



EUROGATE Intermodal GmbH

Staff



Dr. Kai Brüssau

2.1.8 Cooperation with ARIC

HITeC co-founded the Artificial Intelligence Center Hamburg e.V. (ARIC) in September 2019. ARIC's mission is to bring topics from the field of Artificial Intelligence (AI) into the economy and society. ARIC develops formats such as networking events, workshops, use case identification, and project initiation with HITeC. In the reporting period, HITeC conducted internal and publicly accessible AI workshops with the support of ARIC.

Cooperation partners



Artificial Intelligence Center Hamburg e.V.

Staff



Lothar Hotz, Sven Magg, Mohammad Zamani

2.1.9 UNEVIS - AI Systems for Marketing Content in the Automotive Industry

HITeC started the project "AI Systems for REACT and SOLID" with the UNEVIS GmbH in May 2020. In this project, development processes of large companies, especially in the automotive industry, are to be optimized. In order to obtain representations of products such as cars in glossy brochures for marketing purposes, these products are nowadays no longer photographed in the conventional way, but rendered from CAD descriptions and a suitable background image. However, this process, which is necessary for product presentation, today consists of a time-consuming and costly chain of error-prone conversion steps. HITeC supports Unevis in this project in the area of

- Quality assurance (checking for consistency and completeness of data): During the project period, various extensive data sources were reviewed, some of which were independent of each other. Interfaces were developed for connectivity, the best possible combination was achieved in order to be able to search efficiently for specific configurations, while possible errors were found through intelligent matching (constructability check). Finally, the control and output was integrated into the given processes of the project partner.
- Uniform presentation of surfaces (to ensure a uniform appearance, different render engines require different configuration parameters, which often differ

significantly in number and mode of action): During the project period, an evolutionary algorithm was used to find an optimal set of parameters for the rendering of initially monochrome surfaces. Even at this stage, the challenge was that the parameter set must also contain the appropriate reflection properties for different lighting situations in order to mimic a given original. Later, with an extended parameter set, also parameters for textures were determined, which should correspond to the given representation of, e.g., wood or brushed aluminum.

- Optically optimized fitting of background images to mimic the 3D structures of background objects and enabling parallax effects: During the project period, neural networks were initially trained with freely available datasets of real environments both inside and outside buildings. Due to often too low image resolutions as well as incompleteness and frequent errors in the given depth information, it was decided to train with artificially generated, realistic-looking landscape images instead, which in addition to the image information also contain perfect depth information. These were generated by the project partner in close consultation. This way, it was also possible to generate images with depth information in equirectangular projection, which were finally used to train a neural network in such a way that depth information could be determined and displayed in a 360° view.

The project is funded by the Innovations und Förderbank of Hamburg (IFB), the European Regional Development Fund (ERDF), and by the Freie und Hansestadt Hamburg.

Cooperation partners



Unevis GmbH

Staff



Christian Bähnisch, Rainer Herzog, Lothar Hotz, Gabriele Libardi, Sven Magg, Mohammad Ali Zamani

2.1.10 AI-VideoScouter - Automatisiertes erfassen und bewerten eines vollständigen Fußballspiels anhand von Videomaterial

Since the 1950s, data has been collected in professional sports for analysis purposes. When collecting data from a soccer match, a distinction is made between tracking and scouting data. Nowadays, tracking data is usually already collected automatically, while scouting data, which can be events such as penalty kicks or "ball in sideline", is still mainly collected manually.

The aim of this project is not only to record the positions of players, but also to record scouting data in an automated way. For this purpose, an interpretation system with three levels is designed.

The lowest level will provide detections, these are mostly based on a single still image and are usually provided by neural networks.

The middle layer enriches detections to primitive events, for this purpose different information from different detections is combined.

At a high level, a knowledge representation in the form of ontologies and a constraint system combine the middle level information into complex actions. A complex action could be e.g. "A goal is scored after a corner kick". The constraint system can minimize error detection in case of ambiguous information, e.g. a constraint could be "All players of a team wear different jersey numbers".

The project is funded through the Innovations und Förderbank of Hamburg (IFB) by the Freie und Hansestadt Hamburg.

Kooperationspartner



WWE Media GmbH

Mitarbeiter/innen



Rainer Herzog, Lothar Hotz, Pascal Rost

2.1.11 Prediction of the Skin Sensitization Potential of Small Molecules

Exposure to small molecules such as preservatives and fragrances can trigger allergic contact dermatitis in humans. So far, the skin sensitization potential of substances has primarily been determined by animal experiments, which for ethical reasons should be replaced as far as possible by alternative test methods such as in vitro tests and computer-based predictions. Cosmetic companies are obliged to renounce animal testing due to new legislation.

Within the scope of this cooperation with Beiersdorf AG Hamburg, new in silico models for the prediction of the skin sensitization potential of small organic molecules are being developed as alternatives to animal models. Main research areas include the estimation of the confidence of predictions and the definition of the scope of the models. These aspects are of fundamental importance for the acceptance of computer-based predictive models by national and international regulatory authorities.

As a result of this cooperation, three generations of computer models for the prediction of the skin sensitization potential of small molecules have been published in leading

scientific journals in 2019, 2020 and 2021. The models are accessible online via the “Skin Doctor” module.

Cooperation partner



Beiersdorf AG

Staff



Johannes Kirchmair, Jochen Kühnl, Anke Wilm

Link: <https://nerdd.univie.ac.at/skinDoctorII/>

2.1.12 ADAM - Autonomous Adapting Machines

In mechanical and plant engineering, there is the general challenge of achieving flexibility in order to process changes in the requirements or operating conditions of a machine on site at the machine operator. Changes to the machine and its configuration require intensive interaction between the operator and the machine builder (or plant builder in the case of several machines) and, if necessary, with its suppliers. In this project, adaptation possibilities are to be developed during the machine runtime, which reduce these efforts by the machine independently recognizing and preparing meaningful changes and supporting and - as far as possible - implementing the changes.

The aim of the ADAM project is to deliver a machine as well as so-called autonomous agents with delivery. These have the task of monitoring the machine and adapting it to changes in requirements. The machine together with the autonomous agent forms the autonomous adapting machine.

In 2021, the architecture for autonomous adapting machines was implemented and a concept for the knowledge-based monitoring of such a machine was designed. Furthermore, business models were outlined with the partners.

The project is assigned to the research area Industry 4.0 and focuses in particular on the following research topics research topics ontologies, constraints, modeling and Asset Administration Shell (AAS).

The German Federal Ministry of Education and Research funds the project ADAM.

Cooperation partners



University of Hamburg



Encoway GmbH



Lenze SE



Remmert GmbH

Staff



Christian Bähnisch, Rainer Herzog, Lothar Hotz, Alexander Pokahr, Stephanie von Riegen

2.1.13 Intelligent traffic infrastructure - SmartWalk

The aim of the "SmartWalk" project is to develop an intelligent traffic infrastructure with "smart" crosswalks to protect vulnerable road users such as cyclists and pedestrians. The number of cyclist fatalities in road traffic, for example, has been on the rise for years, according to the German Federal Statistical Office. Another reason is seen in an increasing and ever more complex traffic volume. As a model, a road sign with extensive sensor technology for a crosswalk is to be coupled with a data-protection-safe and anonymizing camera system. Involved road users are detected by these sensors and this information is aggregated by semantic AI processes. If a potentially dangerous traffic situation is detected by the deployed scene interpretation system, this triggers a visual warning (by the road sign), to the involved road users on the road, such as pedestrians, bicyclists, car, and truck drivers.

After the launch in the last quarter of 2021, the first critical traffic situations to be detected have been described, and the architecture was modeled and interfaces defined. The project could be presented at the ITS World Congress in Hamburg.

SmartWalk is funded by the Federal Ministry of Digital Affairs and Transport within the framework of mFund.

Cooperation partners



NATIX GmbH Hamburg



Bercman SE Estland



Aric e.V. Hamburg (associated)

Staff



Lothar Hotz, Stephanie von Riegen

Link: <https://www.bmvi.de/SharedDocs/DE/Artikel/DG/mfund-projekte/smart-walk.html>

2.1.14 Intelligent inspection system - aiSpecTo




The aim of the aiSpecTo project is the development of an intelligent inspection system for the aerial inspection of production pipelines. Pipelines are considered critical infra-

structure and are therefore subject to special inspection requirements. The use of artificial intelligence (AI) and unmanned aerial vehicles (UAVs) in remote sensing can reduce costs, streamline inspections, and improve quality. Existing systems are capable of capturing and displaying material using a variety of sensors, but the complex evaluations, up to and including hazard assessment, have been performed only by trained personnel. The project aims to design a complex system to automate the inspection process by using different sensor systems, AI-based algorithms for multi-sensor fusion, object recognition and tracking, and knowledge-based scene interpretation.

After the project start in November 2021, the first use cases were analyzed according to their hazard potential and modeled in a knowledge-based way. Furthermore, first drafts for architecture and interfaces were made. Furthermore, mock data for scene interpretation was created.

The idea for the project originated within the framework of the innovation network MOWAI - mobility with artificial intelligence, which is funded by the Central Innovation Program for SMEs (ZIM).

Cooperation partners

-  AeroDCS GmbH
-  Speenlab GmbH
-  Digpro Technologies AB Schweden

Staff

-  Rainer Herzog, Jasper Gerwers, Lothar Hotz, Stephanie von Riegen

Link: <https://www.mowai.net/projekte/aispecto>

2.1.15 Digital, Urban Production - Digitization of Local Value Networks

Within the scope of the project, a new form of local production is to be established in the Hamburg metropolitan region, which is to be targeted at the local production of individualized, globally developed products. The product (focused on furniture) can be customized by the customer. A platform is to support from the product development phase to production and delivery through a continuous digital value creation process with innovative technologies. The products are manufactured locally by regional craftsmen and small or medium-sized production companies.

As a cooperation partner, HITeC carries out scientific implementation consulting. Joint working sessions are held in which results and work processes are reflected on, expert

feedback is given, and advice is given on further development. One focus was the support in the development of a methodology for requirements and technology analysis, as well as in the implementation of the technology potential analysis and evaluation.

The project is funded by the Center for Digitization and Technology Research of the German Armed Forces (DTEC.bw).

Cooperation partners



Helmut-Schmidt-Universität Hamburg



Unity AG

Staff



Lothar Hotz, Stephanie von Riegen

Link: <https://dtecbw.de/home/forschung/hsu/projekt-urbane-produktion>

2.1.16 PESHAT - Portal for Philosophical and Hebrew Terminology

Up until Spring 2016, HITeC helped transfer an existing web application for philosophical and scientific Hebrew terminology over to the content-repository application “My-CoRe”. By means of this transfer, a permanent application was created, aimed to last throughout the project term of “PESHAT in context” and beyond.

After a comprehensive review by the German Research Society (DFG) at the end of 2019, the project “PESHAT in context” has been extended for another 3 years. A number of improvements and enhancements are set to be realised in cooperation with HITeC by the end of 2022.

In 2021, various large projects located in the research area "Digital Humanities" were implemented. Specifically, in close cooperation with the staff of the Mispar project (<http://mispar.ethz.ch/>), we designed, tested, and implemented a shareable interface for automated data exchange. In addition, the PESHAT application was extended in such a way so that static texts from external sources can be included semi-automatically into the dataset. An example of this is the integration of a large part of the terminology and explanations from the book "A Concise Dictionary of Novel Medical and General Hebrew Terminology from the Middle Ages" by Gerrit Bos (ISBN 9789004398658). In each of the subprojects, the HITeC staff acted as interdisciplinary mediators in close cooperation with all participating scientists, provided assistance on questions of practical and theoretical computer science, and have contributed to advancing standardized data exchange using machine-processable formats between the portals and resources.

Also in 2021, with respect to the "dissemination" aspect of the Digital Humanities, work was done to open the PESHAT dataset to the general public. For this purpose various new search and overview functions were implemented, which enable interested scholars to find Hebrew lemmas, their linguistic roots, and the corresponding linguistic definitions even without an account on the website. In the process, the website was also adapted to be searchable by automated web crawlers (Google, Bing and others), with the aim of giving the content of the PESHAT portal a wider reach through the major internet search engines.

Cooperation partners



Institute for Jewish Philosophy and Religion at the University of Hamburg

Staff



Lothar Hotz, Pascal Rost

Link: <https://www.peshat.org/>

2.1.17 Matrikelportal Hamburg - Digitalization of Matriculation Registers from the Early History of the University of Hamburg

For this project, in the context of the anniversary "100 years University of Hamburg" in early 2019, the matriculation registers that were passed down from the center for the History of the University where digitalized, presented on a website and made searchable. The matriculation registers span from the beginnings of the University of Hamburg in the year 1919 to the year 1935. The technical implementation of the corresponding website and repository of the digital copies were implemented with the content-repository system "MyCoRe". The project was extended at the end of 2019 with the aim of also digitizing the students' matriculation cards over the aforementioned period and integrating them into the matriculation portal. The role of HITeC in both parts of the project was not only the technical implementation, but above all the cooperative, interdisciplinary development of suitable structures for storing the metadata with regard to publication, long-term archiving and subsequent use in the sense of the "FAIR data" principles of the research area of research data management.

The web-portal "Matrikelportal Hamburg" was successfully completed in time for Hamburg's university anniversary in 2019. Even before the project was completed, the staff of the University Archives approached us to plan an extension of the matriculation portal under the heading "Matriculation Cards". In addition to the matriculation books, the

so-called "matriculation cards" are now to be digitized and displayed on the matriculation portal. The digitized matriculation books are to be linked with the matriculation cards in a meaningful way. In doing so, the students of the matriculation records from the books are to be linked with the students recorded on the matriculation cards, while duplicates needed to be avoided. The technical fundamentals and the practical and theoretical assistance of HITEc for the extension of the matriculation portal with matriculation cards was completed at the end of 2020. However, due to the time-consuming work, specifically the creation of high-quality digital copies of the matriculation cards and the acquisition of their metadata, the publication of the enhancements has been delayed. The new publication date is planned for the second quarter of 2022.

Cooperation partners



Archive of the University of Hamburg

Staff



Rainer Herzog, Lothar Hotz, Pascal Rost, Arne Springborn

Link: <https://www.matrikelportal.uni-hamburg.de/>

2.1.18 Hamburg Professors Catalogue (HPK) - Integration of Geodata into the HPK and Extension of the Editor Workflow

Commissioned by the Arbeitsstelle für Universitätsgeschichte (department for the history of the University of Hamburg), this project produced a comprehensive catalog of former professors at the University of Hamburg (HPK) and made accessible to the general public via a website. The HPK covers a period from 1919 to the present day and, in addition to a multifaceted search function, also provides an efficient content management system for editors of the catalog. The application was implemented using the content repository system "MyCoRe" and was based on the professors catalog of the University of Rostock.

After the website was published in January 2017, the application was taken over by the Archive of the University of Hamburg for further editorial support and continuation. In the middle of 2020, the responsible persons of the HPK approached us to discuss a number of enhancements for the catalog. In joint work, we developed concepts for integrating the desired improvements and new functions into the existing application in a technically and graphically meaningful way. As a result, this new cooperative project emerged.

The focus of the extension of the HPK in the course of this project is the integration of standardized geodata (concretely: geo-coordinates or geo-identification numbers) into

the existing data stock as well as the presentation of the same on the website. For this purpose, the workflows of the editors of the portal are to be adapted and the corresponding editor functionalities are to be extended so that the geodata relating to different stations in the life of the professors can be found and entered easily and precisely. In order to relieve the editors, standardized geodata from external sources will be automatically collected and added to the existing data stock on the basis of the already existing location information. This data will then be used to display the stations in life of the professors in an interactive and dynamic world map specially developed for this application.

The project was started in the spring of 2021 and, in addition to the extensive maintenance work in the course of a major version update, the basic functionalities for the automatic enrichment of the existing data with standardized geo-identification numbers were implemented during the course of the year. Originally, it was planned to use the geo-identification numbers of the portal "GOV" (Place Database of the Association for Computerized Genealogy). However, in the third quarter of 2021 it was decided to work with the data of the portal "Wikidata" instead. Likewise, at the end of the year 2021, a prototype for an interactive world map was implemented, in which the professors of the HPK can be displayed with the help of the geodata. All enhancements have been in a testing and adaptation phase since the end of 2021. The release of the new functions in HPK are planned for the second quarter of 2022.

Cooperation partners



Archive of the University of Hamburg

Staff



Lothar Hotz, Pascal Rost

Link: <https://www.hpk.uni-hamburg.de/>

2.1.19 NICO – 3D Printing for the Humanoid NICO Platform

The use of the NICO (Neuro-Inspired COmpanion) robot in research projects requires a constant adaptation of the robot to the requirements of the respective experiment. The modular design of the NICO robot and its derivatives enable this adaptation to the specific requirements through design and 3D printing of plastic components. These have to be developed iteratively together with the respective experimenters to a) meet

the specific requirements of the experiment, b) fulfill structural, constructional specifications (e.g., breaking strength with minimum weight), and c) take material properties into consideration to be able to fulfill the respective specifications.

To develop optimal components, iterative rapid prototyping using 3D printing is used to quickly test the desired properties of the components developed as a CAD model.

In this project, HITEC has provided the expertise in CAD design for component development, which is not available in the Knowledge Technology research group, the partner of the project, to be able to develop optimal components as quickly as possible. To enable close collaboration, HITEC staff worked on-site on the respective robot, in close cooperation with the respective experimenters. Furthermore, on-site 3D printing capabilities were available to support rapid prototyping. Components were developed by the HITEC staff, fitted, installed, and functionally tested to ensure that they met the required properties. Subsequently, all components were approved by the person responsible for the experiment.

Among other things, a microphone adapter was fitted into the NICO head during the project, and the complete leg apparatus was redesigned, printed, assembled, and tested. The design was adapted to the lighter structure already used in the arms.

Cooperation partners



Knowledge Technology, Department of Informatics, University of Hamburg

Staff



Sven Magg, Christian Wermter

2.1.20 VeriKAS - Verification of learning AI applications in the aviation sector




The overall goal of VeriKAS is to develop proposals for certification processes of neural AI methods and to demonstrate the feasibility and usefulness of these proposals. One way to ensure quality is to examine and test the learned system to obtain a basis for certification, that is, to consider the system as a black box and test it from the outside. However, especially for complex AI systems, this kind of verification is often insufficient, since it is rarely possible to test the entire feature space to identify the behaviour of the system in all possible conditions (e.g., incorrect classifications). Therefore, VeriKAS also evaluates methods that have access to the neural model (i.e., learned weights) or have complete insight into the training and can influence it. The latter will be investigated in the project using Reinforcement Learning approaches. All methods will be

demonstrated using two use cases: emergency landing site selection of a drone and anomaly detection in aircraft fuselages.

HITeC is particularly focused on black box testing and is collaborating with the University of Hamburg on methods to explain Reinforcement Learning. In 2021, in addition to an in-depth literature review to identify potentially useful state-of-the-art methods from academia, a master's thesis was conducted to already test and evaluate "Reward Decomposition" as a possible method. In addition, HITeC organized one of three workshops to explain basic machine learning methods to partners.

The project is funded through the Bundesministerium für Wirtschaft und Klimaschutz (BMWK) in the „Luftfahrtforschungsprogramm“.

Cooperation partners

-  Center for Applied Aeronautics Research, Hamburg
-  Hs2 Engineering, Ulm
-  Knowledge Technology, Department of Computer Science, University of Hamburg

Staff

-  Sven Magg, Mohammad Ali Zamani

2.1.21 Green-Curri - Green-Potential-Screening for Curing Presses in the Tire Industry

Harburg-Freudenberger Maschinenbau GmbH (HF Group), in cooperation with HITeC, is conducting a project to set up an intelligently networked monitoring and diagnostic module for condition-based real-time monitoring of highly productive manufacturing plants in the tire industry to identify and exploit ecological and economic saving potential.

The focus of the research activities is on data-driven methods of condition monitoring for stress and damage detection of components in mechanical engineering parts. In this context, integrated sensor technology approaches are also considered, which are included in the monitoring concept. Thus, for the first time, curing presses will be able to provide information on the "state of health" of their components independently at any time and thus provide information on media and energy consumption and optimisation potential. The foundations thus created offer new possibilities for process optimisation in production engineering structures.

In the feasibility study which is part of the "Green Potential Screening" funding initiative, the focus is on identifying and concretising innovation potentials that meet both

economic and ecological targets. The project promises to uncover and evaluate optimisation measures for the operation as well as for the maintenance and servicing of tire curing presses (machine effectiveness and efficiency) as well as significant environmental relief potential (resource efficiency, energy efficiency, product life cycle) with the aim of creating a basis for a subsequent realisation of these saving potentials within the framework of an R&D follow-up project.

HITeC provides the necessary know-how from the field of machine learning and data science and scientifically accompanies the feasibility study to identify and evaluate technical possibilities.

The project is funded by the Hamburg Investment and Development Bank (IFB Hamburg) as part of the "Program[s] for Innovation" (PROFI).

Cooperation partners



Harburg-Freudenberger Maschinenbau GmbH (HF Group), Harburg

Staff



Lothar Hotz, Sven Magg

2.1.22 Deep RL Framework

This project aims to transform an existing Reinforcement Learning software framework from an early phase of a DLR research project into a more elaborate science-oriented state, so that research into new biologically oriented algorithms is accelerated. As far as possible, existing frameworks are to be used and integrated and, in particular, the implementation and documentation of series of experiments is to be simplified. In a first step, the existing framework was subjected to a software engineering review in 2021 in order to develop possible suggestions for improvement and to identify and correct existing problems. The goal until May 2022 is to optimise the experimentation pipeline and the documentation processes.

The task of HITeC is to bring in expertise from the field of applied research and professional software development and to transform the framework into a more professional state in this respect. The staff of HITeC work in close coordination with the scientists who originally developed the framework to pursue the original goal as well as to train the collaboration partners regarding modern industrial software standards.

Cooperation partners



Manfred Eppe, Universität Hamburg

Staff



Elif Alkaç, Sven Magg

2.1.23 IMPA - Intelligent Media Production Assistant

An Intelligent Media Production Assistant (IMPA) is intended to provide media companies with an intuitive search and material research tool for audio-visual media. Using reference material, IMPA will generate a collection of material in the form of a video timeline as a search result. One of the main aspects of the project is the content-based search in videos and scripts, which enables editors to find relevant video material in a few steps and represents a huge improvement over purely keyword-based search in video descriptions.

The work in IMPA started in 2021 and is scheduled over 2 years, with the research-related work packages dealing with the data sets, the description form, the analysis procedures and the intelligent media asset management system having the largest scope. In the end, the intelligent assistant is to become an integrated component of the "medialoopster" software of the partner Nachtblau GmbH.

From HITeC's point of view, great progress has already been made in 2021 and two work packages have been completed. Through the transfer of the latest research for combined text and video search, a functioning prototype was implemented that can fulfil the specifications, and which will now be tested in a user test. Accompanied by HITeC, other learning search systems were also implemented and tested at the partner Nachtblau in parallel, which can serve as a comparison.

The project is funded by the Hamburg Investment and Development Bank (IFB Hamburg) as part of the "Program[s] for Innovation" (PROFI).

Cooperation partners



Nachtblau GmbH, Hamburg

Staff



Tayfun Alpay, Jessica Kick, Jona Kuntzer, Sven Magg, Mohammad Ali Zamani

2.1.24 3D-KIOB – Development of an Integrated Process for 3D Object Determination using AI Methods

In September 2021, HITeC started the project "3D-KIOB" together with LUVIS AI GmbH and LUIS Technology GmbH. The goal of the project is the development of an integrated

prototype for the visual recognition of known objects, as well as their exact position and orientation in 3D space. To this end, research is being conducted into how CAD models can be used to generate artificial photorealistic data, which will serve as the basis for AI algorithms from the current research fields of image processing and so-called "pose estimation". In order to enable real-time outdoor recognition with depth cameras using vehicle systems, we are also investigating how traditional algorithms can be accelerated so that they can be accommodated on a specially developed integrated system. The resulting prototype should be able to quickly detect objects, separate them from the background (segmentation), and calculate the orientation of the object (distance and rotation to the camera).

As a result of the work in 2021, the procedure for data collection is already prepared, a first pipeline for processing is developed, and methods are designed to generate artificial 3D training data.

The project is funded by the Hamburg Investment and Development Bank (IFB Hamburg) as part of the "Program[s] for Innovation" (PROFI).

Cooperation partners

-  LUVIS AI GmbH, Hamburg
-  LUIS Technology GmbH, Hamburg

Staff

-  Elif Alkaç, Tayfun Alpay, Robert Geislinger, Rainer Herzog, Gabriele Libardi, Benjamin Milde, Alexander Pokahr

2.1.25 Feasibility Study Semantic Analysis of Circuit Diagrams

In the semantic analysis of circuit diagrams project, digital circuit diagrams are available on images. From these, components are to be recognized and marked.

In preparation for a complete analysis, a component is used to test the extent to which a semantic model can be created by analyzing ASCII CAD data (DXF). Special properties of the graphical representation of the components such as different representations (old and new graphic symbols) or dashed representation of inactive components are taken into account.

Cooperation partners

-  Stromnetz Hamburg

Staff

-  Christian Bähnisch, Lothar Hotz

2.1.26 AI Workshops

Following requests by projects partner and companies, HITEC has started to offer a series of AI Workshops to teach the basics of AI and especially neural network implementation. The workshops cover a wide area, starting with basic concepts of Machine Learning, all the way to Hyperparameter Optimization with Bayesian Optimization. After a successful start with a 3-session workshop on Image Processing with Convolutional Neural Networks (CNNs) and Hyper parameter Optimization with BOHB, a series of 5 workshops was offered on a regular basis. The first, “AI for Deciders”, introducing the basic concepts of AI to people without computer science background, was successfully held three times, and led to new contacts and even further HITEC projects. The workshops will be further improved and offered as tailored workshops for companies for specific topics.

Staff



Sven Magg, Mohammad Ali Zamani

2.2 DSL – DISTRIBUTED SYSTEMS LAB

The project area "Distributed Systems Lab" (DSL) cooperates closely with research in the area of "Distributed Systems" (Verteilte Systeme, VSYS) of the Department of Computer Science at Hamburg University. It cooperates mainly with industrial partners that are active in the area of distributed information and communication systems and their applications. Current activities focus on concepts and prototype implementation of innovative system software for, e.g., the field of "Service-Oriented Computing" (SOC), operational procedures and processes (Business Workflows) as well as the coordination of autonomous and mobile services and processes (including social media) as well as cloud and sensor-based distributed services. Technologies used include (multi) agent technology, as well as related software development techniques as well as techniques of self-organization (autonomous computing) or sensor-based applications – such as in the area of the "Internet of Things" (IoT) or "Smart Cities".

Head:



Winfried Lamersdorf

Link: <https://vsys-www.informatik.uni-hamburg.de/vsys/main/index>

2.2.1 Blockchain Projects

Prior project partners for the DSL project "HITEC blockchain" were the Hamburg-based companies Ponton and ppi AG. Corresponding projects have been carried out also with students from the Department of Computer Science at the University of Hamburg aiming at analyzing and evaluating existing blockchain technologies, finding respective advantages and disadvantages of such a technology, and evaluating it practically. Respective prototypes of blockchain applications in the insurance industry have been designed, built, and evaluated jointly with ppi AG. In another former project together with the Hamburg-based company Ponton, Blockchain Technologies have been developed and applied in the area of energy management in the framework of the projects "Energy-" and "Gridchain".

In 2020 and 2021, HITEC DSL was engaged in another Blockchain project together with „Lufthansa Industrie Solutions“ (LHIND), Hamburg sponsored by "Hamburgische Investitions- und Förderbank" (IFB Hamburg) in its „Program for Innovation (PROFI) – Modul PROFi Environment Transfer“. Here, innovative Blockchain technologies have been applied to logistics applications in form of a realization study which included concepts and a prototypical realization (and evaluation) of an open freight market „Future Transport Hamburg“ (FTH).

In this feasibility study, LHIND and HITEC evaluated jointly, how a Blockchain-based open marketplace for freight can be realized both technically as well as economically. Main thematic focus was to minimize trips of trucks with empty cargo beds in Germany by optimizing the coordination of freight-supply and freight-demand. The corresponding pilot study laid the foundation for a subsequent establishment of an open provider-neutral freight exchange based on blockchain technology. Through an open plug-in architecture, service providers are also enabled to offer and provide additional services on the freight exchange. So, in addition to prototypical development and usage simulation, this feasibility study also focused on ecological (i.e. carbon reduction) and legal aspects.

In this study, HITEC DSL provided support in the areas of system architecture and topics related to decentralized marketplaces, blockchains, and distributed ledger technologies.

Cooperation partner



Lufthansa Industrie Solutions (LHIND), Hamburg

Staff



Heiko Bornholdt, Philipp Kisters, Winfried Lamersdorf, Wolf Posdorfer

2.2.2 Smart City Projects

Other ongoing HITEC DSL projects in the area of distributed system software concentrate on support for "Smart Cities", i.e. sensor-based system components which are designed, developed and used for networked applications in the area of intelligent and "smart" cities. This is also the focus of the project "Smart Networks for Urban Citizens' Participation" (SANE) which is carried out as part of the "ahoi.digital" digitalization initiative funded by the city of Hamburg together with partners from Hamburg University and Hamburg University of Applied Sciences. Main goal is to open up new opportunities for citizen participation (citizen science/ education) by, among other things, providing, disseminating, analyzing and sharing diverse (e.g. environmental) data for citizens and institutions. Technical challenges include the integration of large amounts of data from heterogeneous sensors and devices, the network-based, distributed analysis and processing of information and also guarantees for security, resilience, privacy and trust. At all levels, these are particularly important for acceptance and use of such an information space and, thus, represent a unique selling point of the results achieved using this approach.

Cooperation partners



Working group „IT-Sicherheit und Sicherheitsmanagement“ (ISS), FB Informatik, Hamburg University (Matthias Fischer et al.)



Working group „Internet Technologies“ (inet), HAW Hamburg (Thomas Schmidt et al.)

Staff



Heiko Bornholdt, Philipp, Kisters, Winfried Lamersdorf

Link: <https://sane.city>

2.3 ITMC - IT-MANAGEMENT AND CONSULTING

The project area ITMC works in close cooperation with the corresponding work area at the university. ITMC pursues with its research the vision: "Driving Innovation with Service". The aim of design oriented research is to contribute to better methods and tools for the development and management of complex, socio-technical service systems. We call this focus Service Systems Engineering. We apply this approach both to innovative, IT-enabled services in specific application domains and to the management of IT as a service.

Head:



Tilo Böhmann

Project Manager:



Paul Drews

Links:



<https://www.inf.uni-hamburg.de/inst/ab/itmc/home.html>



<https://www.inf.uni-hamburg.de/inst/ab/itmc/research/themes.html>

2.3.1 ITMC-Conference – Conference of the Informatics Course ITMC

Students of the Master's program IT Management and Consulting (ITMC) organized an exchange forum between IT business and science in June 2021.

This year, the conference was held virtually under the motto "NewWork x IT Megatrends - How New Work and IT Megatrends will shape post pandemic life" . The pandemic has driven changes within a few months that would have previously taken years. Among other things, ways of working were adapted to new conditions in a very short time and digitalization was accelerated in the same process. However, digital transformation was already crucial to the company's success before the Corona period and will remain so even more so afterwards. This makes it all the more exciting to ask how companies will adapt to the circumstances and what challenges they will have to face. Will companies perhaps even benefit from the changes brought about by the pandemic? Along with new ways of working and digital transformation, the second theme of the conference comes into play: IT Megatrends. Whether human-to-human interaction with the help of various collaboration tools, human-to-machine interaction with all kinds of chatbots or machine-to-machine interaction without any human involvement: Advancing digitalization is not only driving IT megatrends, but also forming their basis.

In specialist lectures and workshops, the participants were given the opportunity to get to know the course of study, to deepen their knowledge, and to share it with other interested parties. They were also given the opportunity to network or to meet old friends from their studies in the "Alumni Space".

Staff



Many students of the ITMC course

Link: <https://www.inf.uni-hamburg.de/de/inst/ab/itmc/studies/prospects/conference.html>

2.3.2 CUDIT - Competence Centre Customer and User-Driven IT

Businesses face challenges of increasing requirements regarding the IT support provided for their services, as staff and clients project their expectation regarding the usage of digital services across all business areas.

Clients expect digitally available offers and services. Staff expect the utmost support for personal information management at the workplace. Due to the digital transformation, IT competence in departments is increasing. These challenges lead to the conclusion that IT in many businesses is set to evolve into a "Customer and User Driven IT" (CUDIT) which can better react to the increasing requirements and expectations of stakeholders inside and outside a business.

The competence center CUDIT takes on these challenges, and organizes and undertakes applicable research in this field. Participating businesses (partners), the University of Hamburg and HITEC aim to take on these challenges together and investigate possible courses of action for CUDIT.

Cooperation partners



Beiersdorf Shared Services GmbH



Hamburg Port Authority AÖR

Staff



Tilo Böhmann, Paul Drews, Corvin Meyer-Blankart, Ingrid Schirmer, Jöran Tesse

2.3.3 Management of Digital Ecosystems

The starting point for this collaboration is the increasing dissemination and networking of digital services, especially in the healthcare sector. On the one hand, players in the healthcare sector are faced with the challenge of opening up to a large number of

new partnerships in order to enable competitive user experiences and promote digital innovations. On the other hand, networking poses significant risks. Networking partners in turn use other digital services. As a result, data flows in such highly networked and dynamically evolving digital ecosystems are difficult to keep track of. Individual examples show that critical personal data can diffuse in such ecosystems, presumably without any particular intention. This may be the - presumably unintended - consequence of using cloud-based tools to support the development and operation of smartphone apps in the context of application performance management or user activity tracking. Even very granular functionality, such as two-factor authentication or street name completion in address fields, can be easily implemented today using external services. The decision about the integration of such services can be in the hands of a single software developer. This level of networking complexity and dynamics is insufficiently addressed by existing methods and tools for analyzing and assessing partnership relationships.

Research area and question: Platform economy: How can the governance of actors in meshed platforms be realized? Privacy and data protection: How can user data be used reliably and privacy-preserving in meshed ecosystems? Service systems: How can services be designed, integrated and controlled that operate with the dynamic help of other actors?

Cooperation partner



German Health Insurer







Stuff:



Tilo Böhmann, Martin Semmann, Christian Kurtz

2.4 BUSINESS INFORMATION SYSTEMS

The project area Business Information Systems at HITEC deals with topics at the interface between computer science and business administration. The focus is on topics that can be researched in an application- and practice-oriented way in the sense of a design-oriented business informatics. A special concern of the department, however, is not only the execution of application and practice-oriented research projects, but also the transfer into practice up to the spin-off of companies, which transform current research results into marketable products and services. The transfer takes place via the heads involved. Topics and activities in the field of transfer are among others:

-  Business process management and IT support for business processes
-  Productivity of services through IT
-  Hybrid value creation through product service systems
-  Usability of business management systems
-  IT support for auditing tasks (auditing, internal audit)
-  Standardization projects at the German Institute for Standardization (Deutsches Institut für Normung)

Head:

-  Markus Nüttgens

2.4.1 ITE - IT-Entrepreneurship

Together with the Hamburg Research Center for Information Systems (HARCIS) at the University of Hamburg, the IT-Entrepreneurship program for undergraduate students is offered every summer semester. Topics from the field of IT-based start-up management are dealt with in multiple perspectives. The course run in the summer semester 2020 was dedicated to innovative solutions for overcoming the Corona crisis.

Contents of the course are:










- Economic significance of start-ups for the economy and society
- basic concepts of start-up management (founding ABC)
- methodical approaches to the development and implementation of ideas and innovations in IT-based products and services (including Design Thinking)
- critical success factors for technology-oriented and knowledge-intensive start-ups (opportunities and risks)
- Forms of financing and participation for company founders and risk / capital providers (investors, business angels, promotional banks, etc.)

- Process models and best practices for IT-based business start-up and consolidation (case studies and guest lectures)
- Creation and evaluation of business plans (business plan competition)
- Presentation of a business idea to an expert jury

Hereby the following aims are pursued:

- Knowledge of the theoretical foundations of IT-oriented start-ups
- Knowledge of founding from a regional, national, and international perspective
- Learn the basics of digital business models and innovations and how to translate them into IT-based products and services
- Applying a systematic and scientifically sound approach for establishing and consolidating young IT-oriented companies
- Case study-based preparation of a business plan
- Presentation of a business idea in a compact pitch

Contributors to the 2021 ITE round included representatives from:

-  Office for Knowledge and Technology Transfer (AWITT) of the University of Hamburg with the field office Hamburg Innovation (HI)
-  TUTECH
-  HITeC
-  Neuhaus Partners
-  IFB Hamburg
-  Taxdoo
-  Shortcut Ventures
-  eBlocker Open Source
-  Entrepreneurs from the metropolitan region

Staff

-  Marc Frerichs, Markus Nüttgens

Link: <https://www.bwl.uni-hamburg.de/harcis/03-lehre/bachelor/it-entrepreneurship.html>

2.4.2 Exploring New Development Techniques for of Mobile Applications - an Example for the LPG Engine Technology "GasTronic ®"

With the hydraulic gas system, Direct GasTec GmbH is setting new standards in the field of LPG systems, so that even vehicles with state-of-the-art direct-injection petrol engines can be expanded by the lower-emission LPG mode. In order to provide the end user and car workshops with a modern and user-friendly operation and maintenance

of the LPG system, a mobile application is being developed in cooperation with HITEC, which connects via Bluetooth to the LPG system installed in a vehicle. The app is primarily used by the end user to control and monitor their gas system. The service workshops are supported in the initial set-up and maintenance of the gas system. Furthermore, the app can be used to find cheap gas stations in the area. In addition to the app, a web-based administration environment is being developed, which can be used to maintain the configurations and software of the gas systems as well as user and technician master data.

The project explores new ways of software development, especially the development of mobile applications. The methodology is agile Scrum and prototyping is used to develop mock-ups and prototypes. There was also a strong focus on usability and open-source technologies. The project evaluates methods and technologies as well as a framework concept for "additive software production."

Cooperation partners



Direct GasTec GmbH

Staff



Marc Frerichs, Markus Nüttgens, Frank Rump

Link: <https://www.bwl.uni-hamburg.de/harcis/03-lehre/bachelor/it-entrepreneurship.html>

2.5 INDIVIDUAL PROJECTS

2.5.1 Lecture2Go/Subtitle2Go

Subtitle2Go is an open source solution for the generation of automatic subtitles for videos. For German speech recognition, the basis is the open source solution for training German speech recognition models (<https://github.com/uhh-lt/kaldi-tuda-de>) developed at the Language Technology department, which was also significantly improved in this project. The models are trained with the speech recognition toolkit Kaldi and now achieve a low word error rate, since large amounts of data of up to 1700 hours of speech are used for training. In addition to speech recognition, we created models for punctuation reconstruction and developed algorithms to segment the subtitles at appropriate points. An English version of the subtitle pipeline is also the subject of current development, as well as an improvement of punctuation reconstruction through new models.

A particular challenge of this project is the correct recognition of lecture-relevant keywords and technical terms, which are rare in normal speech but have a higher probability in lecture videos. For the subtitling of English videos, there is the additional challenge that the speakers may have a German accent and are not native speakers, which usually worsens recognition results. Accordingly, the subject of research is also how this can be improved.

Subtitle2Go is available as open source at <https://github.com/uhh-lt/subtitle2go>, including all necessary models.

Cooperation partner



Universität Hamburg

Staff



Robert Geislinger, Benjamin Milde

2.5.2 Meeting Minute Bot and AI-Support

The Language Technology (LT) group of the Department of Computer Science maintains a close cooperation with Telekom AG in order to establish methods and applications in the field of Artificial Intelligence and machine learning for various internal processes of Telekom AG and, thus, to increase the productivity of the company. LT acts as a consultant and evaluator and develops prototype components in the areas of speech recognition, information extraction, and processing as well as in the area of business intelligence.

In the last year, the focus was on the documentation and further use of the prototypical solution for recording and summarizing meetings.

The components and scientific results developed within the framework of this project were also used in teaching in 2021 and continued to be incorporated into the Lecture2Go project.

Cooperation partners



Telekom AG

Staff



Saba Anwar, Chris Biemann, Tim Fischer, Benjamin Milde, Soniya Vijayakumar

2.5.3 OPENREQ – Requirements Engineering, Big Data, Recommendation Technologies

Funded with 4.6 million Euro by the European Commission, our Horizon 2020 research project, involving nine research and industry partners - including multinational companies and leading open source communities - from five European countries in order to develop novel context-aware Requirements Engineering approaches and tools as well as intelligent recommendation and decision technologies for community-driven Requirements Engineering, was successfully completed by February 2020.

Following the official close of project, there was an OpenReq open source initiative. The primary task was to maintain the files, datasets, and running instances of the OpenReq outcomes. For this, we kept an eye on the OpenReq GitHub organisation and continue to “own” it currently and also created a replica deployment environment to the one we built during OpenReq. Currently several services are still running and available on this deployment environment. Multiple research groups continue to use these services for their own research and contact us when the services go down. But the interest and work in the open source domain does not stop at just the results of the OpenReq project, we also have furthered efforts into gathering and analysing other open source solutions such as Jira for project and requirements management. As a part of our work we have extracted 16 datasets of Jira repositories containing three million issues and 30 million issue evolutions. This dataset is publicly available via Zenodo and a recently submitted data track paper.

During the reporting period, the further dissemination and exploitation of the project results was investigated.

Staff



Walid Maalej, Lloyd Montgomery, Carina Volkmer

Link: <https://openreq.eu/>

2.5.4 Sensory Analysis of the Influence of the Terroir on Luxembourg Auxerrois and Chenin Blanc Wines

This project examines the influence of geological, agrolological, topographical, and climatical factors, as well as cultural, viticultural, and oenological methods, on the chemical and sensory properties of Auxerrois and Chenin blanc wines from selected Luxembourg vineyards. The question is, whether different vineyard-areas (terroirs) at the Mosel in Luxembourg can be distinguished and characterized in regard to the properties of grapes and wines.

The following aspects were looked into in different work groups:

- Geography, topography, and microclimate of different terroirs and their influence on the type of wine
- Chemical properties in must and wine that are influenced by terroir
- Sensory properties in wine that are influenced by terroir
- Influence of cultivation parameters onto the terroir development
- Influence of the terroir onto decay of the grapes
- Influence of the harvest's ripeness state onto terroir development

Cooperation partners



Luxembourg Institute of Science and Technology (LIST), Belveaux, Luxembourg



Institute Viti-Vinicole, Remich, Luxembourg



University of applied sciences (Hochschule für angewandte Wissenschaften), Hamburg

Staff



Andrea Bauer

2.5.5 Data Protection Compliant Collection of Patient Data for Medical Research

The project IDOMENEO, carried out by the department for vascular medicine of the University Medical Center Eppendorf (UKE), evaluates the success of treatments for peripheral arterial disease (PAD) patients. The required data is gathered in a centralized platform, which is implemented in collaboration with HITeC. The platform utilizes

innovative techniques from the fields of cryptography and privacy by design to safeguard sensitive medical data while providing this data for medical research.

Cooperation partners



University Medical Center Eppendorf (UKE)



Barmer GEK

Staff



Hannes Federrath, Tobias Müller, Tom Petersen

2.5.6 Latency-based Forwarding in Metropolitan Area Networks

Latency-based forwarding (LBF) is a distributed approach to implement deadline-oriented packet forwarding in layer-2 networks.

In this project, we extended our implementations of a network simulator by component features and added various topologies to deepen our study of QoS effects and load balancing in large metropolitan area networks. Furthermore, we raised the research question whether IEEE time sensitive networking (TSN) can likewise be used to effectively meet deadlines in underlay networks. We started to compare the approaches of LBF and TSN, after larger implementation work of TSN, which extend our simulation framework.

Cooperation partners



Futurewei

Staff



Mehmet Cakir, Philipp Meyer, Thomas C. Schmidt

2.5.7 Orientation in Digital Transformation - Understand Digitisation and Shape it Sustainably

The project wants to bring together different disciplines in order to understand digitisation and shape it sustainably. We want to strengthen the judgement and orientation of students, for whom there is hardly any time left today in the shortness of every day university life. The expectation is to strengthen judgment and orientation for students of (business) computer science, for which there is hardly any time left in today's short-winded university routine. That's why we press the technologies with their registered values (Digitisation in context), the challenges, opportunities, consequences, and sustainable realisation by value- and interest-oriented design. We call this Digital Literacy.

During the reporting period, this platform was further developed and new concepts for the further dissemination of the topic to the business community were elaborated.

Stuff



Lothar Hotz, Mathias Kerkhoff, Arno Rolf, Tim Runge

Link: <https://mikropolis.org>

2.5.8 Technologies for Chemical Informatics

The Algorithmic Molecular Design group at the ZBH of the UHH and BioSolveIT GmbH are researching new methods in chemical informatics. The resulting software is widely used in biotechnological and especially pharmaceutical research - academic and industrial. In the project, an exchange takes place in particular for the further development of basic technologies such as the correct handling of organic molecules molecules incl. stereochemistry, protonation and data formats, pattern recognition, the creation and processing of three-dimensional molecule models up to practical issues such as the provision of software solutions in the form of web servers. During the project year, intensive work was done on the calculation of molecular conformations, on the processing of SMARTS expressions incl. their matching for pattern recognition, on the handling of chemical reactions and chemical fragment spaces to the comparison of such spaces. A further focus was the methodological basis for a runtime efficient growth of fragments in growth of fragments in protein binding pockets.

The project is related to chemical informatics and molecular design and focuses on basic research in the field of method development.

Cooperation partners



BioSolveIT GmbH, Sankt Augustin

Staff



Louis Bellmann, Gerd Embruch, Florian Flachsenberg, Patrick Penner, Matthias Rarey, Robert Schmidt

2.5.9 Data-driven and Networked Non-linear Predictive Control

The aim of the project is to develop and test nonlinear predictive control strategies for networked applications as well as for applications with data-driven models. In recent years, new methods for fast nonlinear predictive control have been developed at the Institute for Control Technology (IRT) of the TUHH, which are based on a quasi-LPV

model of the nonlinear controlled system. These methods are to be further developed for use in the above-mentioned applications.

Cooperation partners



IAV GmbH, Berlin

Staff



Herbert Werner

2.5.10 Modelling and Automation of Enterprise Processes

Our project partner is an industrial service provider that operates a large chemical park. From time to time, incidents occur that require the knowledge of selected employees. In order to operationalize this knowledge for a larger group of employees, the corresponding processes are modeled on the basis of a previously conducted feasibility study and stored in an open source process engine so that they can be executed using the existing sensors, among other things. The number of these processes will be extended step by step in order to establish the Process Engine as a general tool for the automation of business processes in the company. From a research perspective, the results of this project form an important basis on which further activities in the field of process analysis can be implemented.

The project is assigned to the research area of digital transformation in companies and focuses on the automation and analysis of business processes.

Cooperation partners



Yncoris GmbH & Co. KG

Staff



Ulrike Steffens

2.5.11 DaFne – Platform Data Fusion Generator

The generation of synthetic data, usually in addition to existing data, is of great importance in the research and development of AI methods where data is not available in sufficient quantity or does not contain certain features, such as rarely occurring anomalies. Although some approaches to data generation already exist in science, the practical usability of these methods is often severely limited, as they are optimized for a specific context (e.g. use case, AI model) to ensure the corresponding data quality. The application of the obtained results then remains limited to the chosen context and thus low in its impact.

The goal of the DaFne project outlined here is to significantly and systematically improve the usability of data generation methods for AI researchers and developers in the context of developing an innovative flexible platform for data generation through three closely coordinated contributions:






- Developing flexible methods for improved data generation that lead to robust models and can be used in additional application areas.
- Development of assured and verifiable quality criteria for the generated data, which allow a reliable use in AI applications.
- Systematic parameterization of data generation methods to extend their applicability.

Both the developed methods and the platform will be evaluated in the project based on concrete use cases in the application domain of smart cities.

The project can be assigned to the research area of artificial intelligence and focuses in particular on the topic of data synthesis and the consideration of suitable platform architectures.

The German Federal Ministry of Education and Research funds the project DaFne.

Cooperation partners

-  HafenCity Universität Hamburg
-  Forschungszentrum L3S (Leibniz Universität Hannover)
-  Technische Universität Dresden, Center for Interdisciplinary Digital Sciences (CIDS)
-  Sopra Steria SE
-  Ströer SE & Co. KGaA

Staff

-  Ulrike Steffens

Link: <https://dafne.haw-hamburg.de/>

2.5.12 RoboCup-AG - Hamburg Bit-Bots

The student working group "Hamburg Bit-Bots" has been participating in the international science competition RoboCup since 2012. The competition aims at advancing research in Robotics. The rules of the RoboCup football leagues are continuously increased to meet the proposed goal to beat the human world champion team by the middle of this century. The competitions are a place to share knowledge and compare approaches while providing an incentive for further development.

The Hamburg Bit-Bots compete in the Humanoid Kid-Size League. Since 2012, they have qualified every year for the World Championship. Additionally, the team participated in multiple GermanOpen and IranOpen tournaments. Due to the pandemic, the world championship was held via simulation. The team achieved the third place in this competition and the first place in the simulated BrazilOpen tournament.

Besides their participation in the competitions, the team has become the university's flagship student project. Therefore they are typically participating in different public events. Unfortunately, this was not possible this year due to the pandemic.

Since 2015, the members of the team have made twelve scientific publications. In 2021, three theses that resulted from work in the RoboCup AG were completed successfully. Furthermore, eight former members of the team are now working at universities, five of them at the Universität Hamburg. The group's research focus lies in the integration of many complex systems in the field of humanoid robotics.

Cooperation partners



RoboCup AG „Hamburg Bit-Bots“

Staff



Marc Bestmann, many students

Link: <https://bit-bots.de/>

2.5.13 M-Lab 2020/2021 - Teaching and Innovation Project

Within the learning and innovation project “M-Lab”, Bachelor and Master students have the opportunity to develop smartphone apps and services using the newest technologies, working in small teams (4-6 members) for real clients from the industry with real deadlines.

The students can experience software engineering technology and methods, such as for example object-oriented analysis or design and implementation of mobile applications. Furthermore, they gain experience in teamwork, project management and communication with clients.

Due to the COVID-19 pandemic, we launched the first virtual version of M-Lab; physical meetings and presentations are taking place via Zoom.

Within the Client-Acceptance-Test concluding the project, the students present their applications for mobile devices such as smartphones and tablets. All the developed

apps come with a poster, a product video, a website and a live presentation by the responsible students.

The students received the project with great enthusiasm. This year's focus was also mainly on creative processes and solutions. The students had the possibility to attend an additional workshop in order to improve their skills and optimize their strategies and workflows.

Practice partners and results:

1) ARIC: The app built for aric is a social-media unifier and group management app that gives control of the community back to companies like aric. The app has a unified feed of all social media posts where the user can read, like, and save posts for future use. The app also has a community management portal that lets admins create events, generate check-in QR codes, track member activity, and additional community-building feature like quizzes.

2) HMC: The app built for HMC is a complete conference/fair event solution to deliver information to attendees about the ongoing event. The app conceptualises schedules, vendors, contacts, and additional fair information. This solution allows an event attendee to get all information about the event in one place. Important features include offline mode, contact tracing, and immediate search results.

3) HaspaNext: The app build for HaspaNext is a diary app designed to encourage employees to write down their daily or weekly thoughts about prescribed topics. These topics/diaries are created by the change managers within companies, with the explicit purpose of learning about their employees. Notable features of the app includes full anonymity of the data, custom diaries, pre-built diaries, and statistics.

4) UKE: The app built for UKE is the combination of these three devices. The physical hardware is out of scope, but otherwise the app functions as if it is a ventilator, heart monitor, and defibrillator. The work done to combine these three devices was largely an interface design task, combined with some complicated alarm-management features.

Cooperation partners (practice partners)



Artificial Intelligence Center Hamburg (ARIC) e.V.



Hamburg Messe und Congress (HMC)



Hamburger Sparkasse AG



Universitätsklinikum Hamburg-Eppendorf (UKE)

Staff



Volodymyr Biryuk, Abir Bouraffa, Walid Maalej, Daniel Martens, Lloyd Montgomery

Link: <https://mast.informatik.uni-hamburg.de/mlab/>

2.5.14 Representation Expenses of the Department

In close cooperation with the Department of Computer Science, HITEC regularly supports scientific research and teaching events of the department, such as colloquia or closed conferences.

Cooperation partners



Department of Computer Science at the University of Hamburg

Staff



Professorships of the Department of Computer Science

2.5.15 Computer Science Orientation Unit

In close cooperation with the Department of Computer Science and in particular through the committed cooperation of many students of computer science, HITEC regularly organizes the Orientation Unit Computer Science.

Cooperation partners



Department of Computer Science at the University of Hamburg



Student Council of Computer Science at the University of Hamburg

Staff



Many students in the field of computer science

2.5.16 Business Information Technology Studies Orientation Unit

In close cooperation with many students of the bachelor and master degree courses Information Systems and the master course IT Management & -Consulting HITEC regularly organizes the orientation for the Information Systems and ITMC courses.

Cooperation partners



Department of Informatics at the University of Hamburg



The University of Hamburg's student association of Information Systems and ITMC

Staff



Many students in the field of Information Systems and ITMC

2.5.17 Hamburg Informatics Computer Museum

Since his retirement, Prof. Dr. Horst Oberquelle has set up a computer museum in the university's Department of Computer Science, where you can see an interesting selection of groundbreaking inventions from the beginnings of mechanical computing, desktop and pocket calculators, hardware from Konrad Zuse to mainframes, the development of workstation systems and home computers to large and smallest portable computers. Data transmission from the Morse key, to teleprinters and telephones, to smartphones, writing and printing from mechanical typewriters to laser printers, and the development of storage media are also featured. Many devices will be demonstrated live. A special aspect is the importance of innovation and design in Apple computers and the development of interaction techniques in mice, joysticks, trackballs and other input devices.

The Computer Museum reaches out to alumni clubs, schools, and the general public in addition to faculty members. Prof. Oberquelle offers tours on a regular basis. In 2021, however, many scheduled tours had to be cancelled due to Corona. Through aid of a technophile guest, various old computers could be revived.

The museum is financed almost exclusively by donations and gifts and would like to thank HITeC for its support in acquiring interesting exhibits.

Staff



Horst Oberquelle

Link: <https://www.inf.uni-hamburg.de/home/about/museum.html>

2.5.18 PoC Augmented Reality – Conditioning of a Pressure Regulating Station

This project investigated the possibilities offered by augmented reality (AR) to support technicians in the inspection of gas network facilities. In a user-centered design process, the suitability of different kinds of data for visualization and interaction in AR glasses was investigated. In several iterations, several prototypes were developed and tested on site. The application contains various functions, e.g., the presentation of 2D and 3D information, the creation of annotations, and the multimodal input (like speech and gestures) of information.

A major focus was on documentation, as an existing inspection form was replicated in AR. Thus, technicians can fill out the form using hand gestures and voice input, take photos and add comments. The presentation of 3D models of technical components as interactive holograms was also of particular interest. In contrast to conventional 2D representations, users can intuitively view the models from all angles and gain new insights into the internal structure of the components.

The project is assigned to the research area of human-computer interaction and gains knowledge into the user-centered development of AR applications in industrial contexts.

Cooperation partners



Gasnetz Hamburg

Staff



Jenny Gabel, Julia Hertel, Lucie Kruse, Frank Steinicke

2.5.19 CoyPu – Cognitive Economy Intelligence - Platform for Resilience of Economic Ecosystems











In an increasingly interconnected corporate world, the company-specific parameters that are relevant from the perspective of crisis management are in very complex relationships and dynamic interactions with a wide range of external factors (e.g., location, customers, competition, suppliers, personnel market, legal and social context). The CoyPu project addresses these complex economic challenges in crisis situations with an intelligent platform for integrating, structuring, networking, analyzing and evaluating heterogeneous data from economic value networks as well as from the industry environment and social context.

HITeC's mission is to explore and develop synergies between knowledge graphs and machine learning methods (hybrid AI). The focus is on geospatial and temporal data or data streams as well as time-dependent, graph-based AI methods and their application to event detection problems.


In 2021, after a comprehensive analysis of the technology field, HITeC started to create algorithms for event data extraction based on the Transformer technology. In addition, several surveys and data sets for question answering were created, which are currently in the peer review process.

The project is funded through the Bundesministerium für Wirtschaft und Klimaschutz (BMWK) in the framework "Innovation Competition Artificial Intelligence".

Cooperation partners

-  Institut für Angewandte Informatik e.V. (INFAI)
-  Forschungszentrum L3S, Leibniz Universität Hannover (L3S)
-  Leibniz Informationszentrum Technik und Naturwissenschaften (TIB)
-  Deutsches Institut für Wirtschaftsforschung (DIW)
-  eccenca GmbH
-  DATEV eG
-  Implisense GmbH
-  Siemens AG
-  Infineon Technologies AG
-  Selbstregulierung Informationswirtschaft e.V. (SRIW)

Staff

-  Rudy Garrido, Junbo Huang, Longquan Jiang, Angelie Kraft, Jan Reineke, Julius Schulz, Ricardo Usbeck, Xi Yan

Link: <https://www.coypu.org/>

2.5.20 WiBUmo - Scientific Monitoring of the Implementation of the "Re-Registration Online" Service

The Free and Hanseatic City of Hamburg (FHH) - Senate Chancellery is currently carrying out a project to implement the OZG project for electronic place of residence registration. The online service electronic registration of place of residence (German: elektronische Wohnsitzanmeldung, eWA) is intended to enable citizens to register their place of residence digitally and to update their address on electronic identification (eID) documents.

The process allows for the user to clearly authenticate themselves via eID, register their new place of residence and then update the eID document using the NFC interface of their mobile phone via the AusweisApp2, and the dedicated writing service (eID server with write access) in the background.

The introduction of this online service thus represents an important building block in the implementation and dissemination of the use of the German eID for a large number of other online administrative services.

This project is in new territory concerning the rewriting of eID documents via a dedicated writing service and the implementation as a central nationwide online service (following the one-for-all (German: Einer für Alle, EFA) principle), which requires the connection of several state-specific applications.

HITEC accompanies and evaluates the project scientifically with regard to security aspects, digital transformation aspects, and software development strategic aspects within the bounds of a large-scale project with heterogeneous stakeholders in the public administration domain.

Cooperation partners



Office for IT and Digitization (ITD)



Free and Hanseatic City of Hamburg (FHH) - Senate Chancellery

Staff



Fabian Burmeister, Mathias Fischer, Lothar Hotz, Ogeigha Koroyin, Ingrid Schirmer, August See

3. OUTLOOK

As a guiding theme, HITEC is involved in research and technology transfer projects in the field of digitization of urban tasks, digital transformation in economy and society, secure distributed systems as well as the application of Artificial Intelligence in enterprises. This is intended to bundle current and future projects in this field and to increase the visibility of HITEC.

In 2022, projects with research institutions, authorities, and industry will continue to be carried out and advanced. In particular, further projects are planned in the area of Artificial Intelligence, also in cooperation with ARIC, as well as in the area of secure, data protection-friendly system developments.