WELCOME @

Institute for Telecooperation
www.tk.jku.at

Univ.Prof. Dr.
GABRIELE KOTSIS

cis.jku.at

Department of
COOPERATIVE
INFORMATION SYSTEMS

PRÄSENTATION:

A.UNIV.-PROF. DR.
WERNER RETSCHITZEGGER

Scientific Team

ACM President 2020-2022
Head of Department

Senior Researcher@
SCCH Hagenberg 2001-2004

Guest Professor@
universität wien 2009
TU WIEN 2002

Univ.-Prof. Dr.
Gabriele
KOTSIS

Assoc.Prof. Dr.
Karin
HUMMEL

Assoc.Prof. Dr.
Wieland
SCHWINGER

a.Univ.-Prof. Dr.
Werner
RETSCHITZEGGER

Assoc.Prof. Dr.
ISMAIL KHALIL

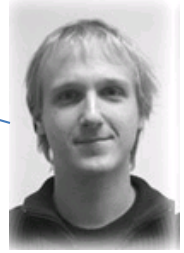
DI Manuela
POLLAK

Ass.Prof. Dr.
Elisabeth
KAPSAMMER

Institute for Telecooperation
www.tk.jku.at

cis.jku.at
Department of COOPERATIVE INFORMATION SYSTEMS

Dr. David **GRAF**



Dr. Andreas
MÜLLER

Mag. Markus
WEISSENBEK

Daniel
NEIDHART

Dr. Jürgen
ETZLSTORFER

Dr. Andrea
SALFINGER

Dr. Stefan
MITSCH

Dr. Johannes
SCHÖNBÖCK

"Promotio sub auspiciis"
& professor@FH Hagenberg
Project Collaborator

"Promotio sub auspiciis"
& professor@CMU
Project Collaborator

Teaching

Bachelor

Computer Science

Wirtschaftsgrundlagen der Informatik	VO	2 h	3 ECTS	SS	6. Sem.
Datenbanken & Informationssysteme 2 (IFS2)	VO/UE	3 h	4,5 ECTS	WS	3. Sem.
Projektorganisation	KV	2 h	3 ECTS	WS	5. Sem.
Multimediasysteme	VO/UE	3 h	4,5 ECTS	SS	2. Sem.

Business Informatics

Softwareentwicklung 1 und 2	UE	2 h	3 ECTS	SS	1. Sem.

Master

Computer Science: Major Subjects

Web Information Systems	KV	3 h	4,5 ECTS	SS	IIS

Computer Science: Electives

Advanced Model Engineering	KV	2 h	3 ECTS	WS	
Modelling Internet Applications	KV	2 h	3 ECTS	SS	
Big Data Engineering	KV	2 h	3 ECTS	SS	
Human Computer Interaction (HCI)	KV	2 h	3 ECTS	WS	
Mobile Computing	KV	2 h	3 ECTS	WS	
Mobile Web Development	KV	2 h	3 ECTS	SS	
Web Performance	KV	2 h	3 ECTS	WS	

Digital Society

Informatische Grundlagen der Digital Society	KV	1 h	2 ECTS	WS	

Data Science

Big Data Management and Processing	KV	2 h	3 ECTS	SS	


elisabeth.kapsammer@jku.at


wieland.schwinger@jku.at


werner.retschitzegger@jku.at

Research


Karin_anna.hummel@jku.at


ismail.khalil@jku.at


gabriele.kotsis@jku.at

① Model-Driven Engineering

② Semantic Systems Engineering

③ Web Engineering

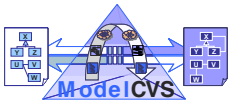
④ Distributed | Mobile Computing

⑤ Media | Interaction | Collaboration

Projects 1/8

① Model-Driven Engineering

ModelCVS – A semantic Infrastructure for Model-based Tool Integration



- FUNDING: FFG FIT-IT | Semantic Systems
- VOLUME: 428.000 EUR
- DURATION: JAN/2006 – DEC/2007

PARTNER: TU VIENNA, ca, ÖBB

www.modelcvs.org

TROPIC – Transformations on Petri-nets in Color

- FUNDING: FWF
- VOLUME: 200.000 EUR
- DURATION: MAR/2009 – FEB/2012

PARTNER: TU VIENNA

www.modeltransformation.net

AMOR – Adaptable Model Versioning

- FUNDING: FFG FIT-IT | Semantic Systems
- VOLUME: 558.841 EUR
- DURATION: FEB/2009 – AUG/2011

PARTNER: TU VIENNA, SYSTEMS

www.modelversioning.org

DARWIN – Model-driven Evolution of Semantic Infrastructures

- FUNDING: FFG BRIDGE
- VOLUME: 320.000 EUR
- DURATION: MAR/2012 – FEB/2014

PARTNER: TU VIENNA, FREQUENTIS team, joinVISION, LieberLieber software gmbh

www.model-evolution.net

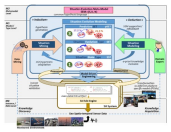
TETRABox – Generic White-Box Test Framework f. Model Transformations

- FUNDING: FWF
- VOLUME: 343.300 EUR
- DURATION: OCT/2016 – SEP/2019

PARTNER: TU VIENNA

www.modeltransformation/tetrabox

iSEM – Inductive Situation Evolution Modeling



- FUNDING: FWF Hertha Firnberg
- VOLUME: 230.000 EUR
- DURATION: NOV/2018 – OCT/2021

www.modeltransformation/isem

Projects 2/8

① Model-Driven Engineering

- **Aktuelles EU-Projekt**: »**B**ETTER **E**MPLOYABILITY FOR **E**VERYONE WITH ORACLE APEX«
- **Fokus:** Low-Code Development
- **Partner**:
  - Oracle Academy
  - 5 Unis: Zagreb, Marburg, Slovakia Žilinský, Thessaloniki, Warschau
- **Bakk-Themen**:
  - **Case study-driven comparison** of Low-Code-Development Platforms (LCDPs) in different application domains
    - **IoT** (Internet-of-Things)
    - **CPS** (Cyber-Physical Systems)
    - **Data Science / AI**
    - **SaaS Integration / Mashups**
    - **Mobile Applications**
    - **General Purpose** LCDPs
  - **Vorschläge** für **Bakk-Themen HIGHLY WELCOME**!

Technologies / LCDPs:
- MS PowerApp
- Google AppMaker / Sheet / DialogFlow
- Amazon Honeycode / AppFlow / Lex
- Oracle APEX
- OutSystems
- Mendix Zoho Creator
- Kissflow
- Salesforce App Cloud
- Appian
- Zapier / IFTTT / Trello
- Node-RED
- ....

Projects 3/8

② Semantic Systems Engineering

SW Engineering Methods for CPS

SPHINX – Co-Evolution for Model Refactoring & Proof Adaptation in CPS

- FUNDING: FP7-PEOPLE-2012-IOF
- VOLUME: 183.000 EUR
- DURATION: FEB/2014 – APR/2016

PARTNER: SEVENTH FRAMEWORK PROGRAMME, Carnegie Mellon University

Analysis of Computational Grids Efficiency via Colored Petri Nets

- FUNDING: WTZ 07/2013
- VOLUME: ~10.000 EUR
- DURATION: JAN/2014 – MAR/2016

PARTNER: OEAD, ODESSA EDUCATION, Rail Cargo Austria

ProofAwareECPS – Proof-Aware Engineering of Cyber-Physical Systems

- FUNDING: P 28187-N31
- VOLUME: 237.100 EUR
- DURATION: SEP/2015 – AUG2019

PARTNER: FWF, Carnegie Mellon University

FlexPod – Flexible Production Through Secure Auctions

- FUNDING: FFG Produktion der Zukunft im Rahmen von open4innovation
- VOLUME: 320.000 EUR
- DURATION: MAR/2019 – FEB/2021

PARTNER: EBNER Industrieofenbau GmbH, AIT Austrian Institute of Technology, X-NET

www.flexprod.at

Situation-Awareness in Critical Infrastructures

BeAware – Situation-Awareness in Road Traffic Control

- FUNDING: FFG FIT-IT Semantic Systems
- VOLUME: 400.000 EUR,
- DURATION: MAR/2009 – JUN/2011

PARTNER: FREQUENTIS, ASFINAG, HEUSCH BOESEFELDT, team

www.situation-awareness.net

CSI – Collaborative Situation Awareness

- FUNDING: FFG FIT-IT Semantic Systems
- VOLUME: 500.000 EUR
- DURATION: OCT/2011 – SEP/2014

PARTNER: POLIZEI, CNS, LINZ, FREQUENTIS, ASFINAG, LINZ AG LINIEN, team

csi.situation-awareness.net

ProFlow – Situation Aware Process Management

- FUNDING: FFG Basisprogramm
- VOLUME: 400.000 EUR
- DURATION: OCT/2012 – SEP/2013

PARTNER: PROLOGICS BUSINESS IN MOTION, FREQUENTIS team, Rail Cargo Austria, OeKB

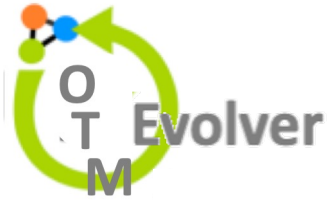
Evolution-Aware Semantic Framework For Operational Technology Monitoring in Critical Infrastructures

- FUNDING: FFG ÖSTERREICH-FONDS
- VOLUME: 100.000 EUR
- DURATION: APR/2019 – MAR/2022

PARTNER: FREQUENTIS team

Projects 4/8

② Semantic Systems Engineering



- **Aktuelles FFG-Projekt**:
  »Evolution-Aware Semantic Framework for **O**perational **T**echnology **M**onitoring in Critical Infrastructures«
- **Fokus:**
  - IoT-based Large Scale Control Systems (LSCS) / Road Traffic Control / Data Mining auf Real-Daten, Visual Data Exploration
- **Partner**:
  - Team GmbH (Frequentis), ASFINAG
- **Bakk-Themen**:
  - **Event Pattern/Process Mining** in IoT-based LSCS
  - **Evolution/Change Detection** in IoT-based LSCS
  - **Provenance** for Data Mining in IoT-based LSCS
  - **Predictive Maintenance** for IoT-based LSCS
  - **Smart Alarm Management** in IoT-based LSCS
  - **Visual Data Exploration** in IoT-based LSCS
  - **Vorschläge** für **Bakk-Themen HIGHLY WELCOME**!

Technologien:
- Python, R
- Docker
- Jupyter Notebook / Lab
- NumPy, bokeh, hvPlot,
- Pandas
- Parquet
- MS PowerBI
- Amazon Quicksight
- KNIME
- RapidMiner
- Tableau
- Protegé – Ontologies
- ....

Projects 5/8

③ Web Engineering

theHiddenU – A Social Nexus for Privacy-Ensured Personalisation Brokerage

- FUNDING: FFG FIT-IT Semantic Systems
- VOLUME: 385.000 EUR
- DURATION: SEP/2010 – AUG/2013

PARTNER: TU VIENNA, Netural, IVENTA, Thalia.at

www.social-nexus.net

crowdSA – Crowdsourced Situation Awareness for Crisis Mangement

- FUNDING: FFG BRIDGE
- VOLUME: 360.000 EUR
- DURATION: SEP/2013 – JUN/2015

PARTNER: FREQUENTIS team, FAW, Netural, Österreichisches Rotes Kreuz

csi.situation-awareness.net

WTZ3 – Reference Architecture for Crowd-Based SA in Crisis Management

- FUNDING: AR 2015
- VOLUME: ~10.000 EUR
- DURATION: JUN/2015 – MAY/2017

PARTNER: oead, FAW

CrAc – Cooperative Activities in Volunteering

- FUNDING: FFG COIN
- VOLUME: 772.000 EUR
- DURATION: OCT/2014 – SEP/2017

PARTNER: NET, JKU, FH, GTN, Österreichisches Rotes Kreuz, FAW, kunstuniversität linz, Institut für Organisation, Geo Services, Caritas, deenweberei, GEMEINWOHL ÖKONOMIE

www.crac.at

iVolunteer – Ein digitales Eco-System zur Unterstützung lebensbegleitender Freiwilligenarbeit

- FUNDING: FFG COIN
- VOLUME: 786.050 EUR
- DURATION: JAN/2018 – DEZ/2021

PARTNER: NET, JKU, FH, GTN, Österreichisches Rotes Kreuz, SOLARYS, Geo Services, FAW, kunstuniversität linz, Institut für Organisation, deenweberei, European Forum Alpbach, FREI WILL IG, Landes Feuerwehr Verband

CIvolunteer – Critical Infrastructures Powered by Volunteers

- FUNDING: KIRAS
- VOLUME: 420.000 EUR
- DURATION: JAN/2023 – DEZ/2024

PARTNER: Bundesministerium Soziales, Gesundheit, Pflege und Konsumentenschutz, NET, doloops, JKU, FH Oberösterreich, kunstuniversität linz, WU Vienna

Projects 6/8

③ Web Engineering

- **Aktuelles FFG-KIRAS-Projekt**:
  - »CIVOLUNTEER – CRITICAL INFRASTRUCTURES POWERED BY VOLUNTEERS«
- **Fokus:**
  - Digitaler Freiwilligenpass, Gamification, Personal Goal Setting/Tracking, Recommender/Community Platforms, Competency Mgmt., Mobile Apps
- **Partner**:
  - BMSGPK, KunstUni, WU Wien, FH Hagenberg, xNet / doloops GmbH
- **Bakk-Themen**:
  - **Mobile App** for
    - personal / collaborative goal definition / progress tracking
    - goal recommendations and task matching
    - gamification mechanisms for goal pursuing
    - visual mechanisms for personal goal reflection
  - **AI techniques** for deriving competencies from tasks
  - Evaluation of **community / socializing platforms**
  - **Vorschläge** für **Bakk-Themen HIGHLY WELCOME**!

Technologien:
- AngularJ
- MongoDB
- Gamification
- Deep Learning
- TensorFlow
- TorchRec
- amCharts, plotly, D3
- ....

Projects 7/8
Scientific Publications & Student Thesis

Model-driven Evolution of Semantic Infrastructures

- FUNDING: FFG BRIDGE
- VOLUME: 320.000 EUR
- DURATION: MAR/2012 – FEB/2014

PARTNER: joinVISION, TU VIENNA, FREQUENTIS team, LieberLieber software gmbh

www.model-evolution.net

Scientific Publications	Student Theses
15	6 + 1 PhD

A Social Nexus for Privacy-Ensured Personalisation Brokerage

- FUNDING: FFG FIT-IT Semantic Systems
- VOLUME: 385.000 EUR
- DURATION: SEP/2010 – AUG/2013

PARTNER: Thalia.at, TU VIENNA, Netural, IVENTA

www.social-nexus.net

11	16 + 1 PhD

Collaborative Situation Awareness

- FUNDING: FFG FIT-IT Semantic Systems
- VOLUME: 500.000 EUR
- DURATION: OCT/2011 – SEP/2014

PARTNER: POLIZEI, LINZ AG LINIEN, FREQUENTIS team, LINZ, CNS, ASFINAG

csi.situation-awareness.net

12	11 + 2 PhDs

Crowdsourced Situation Awareness for Crisis Mangement

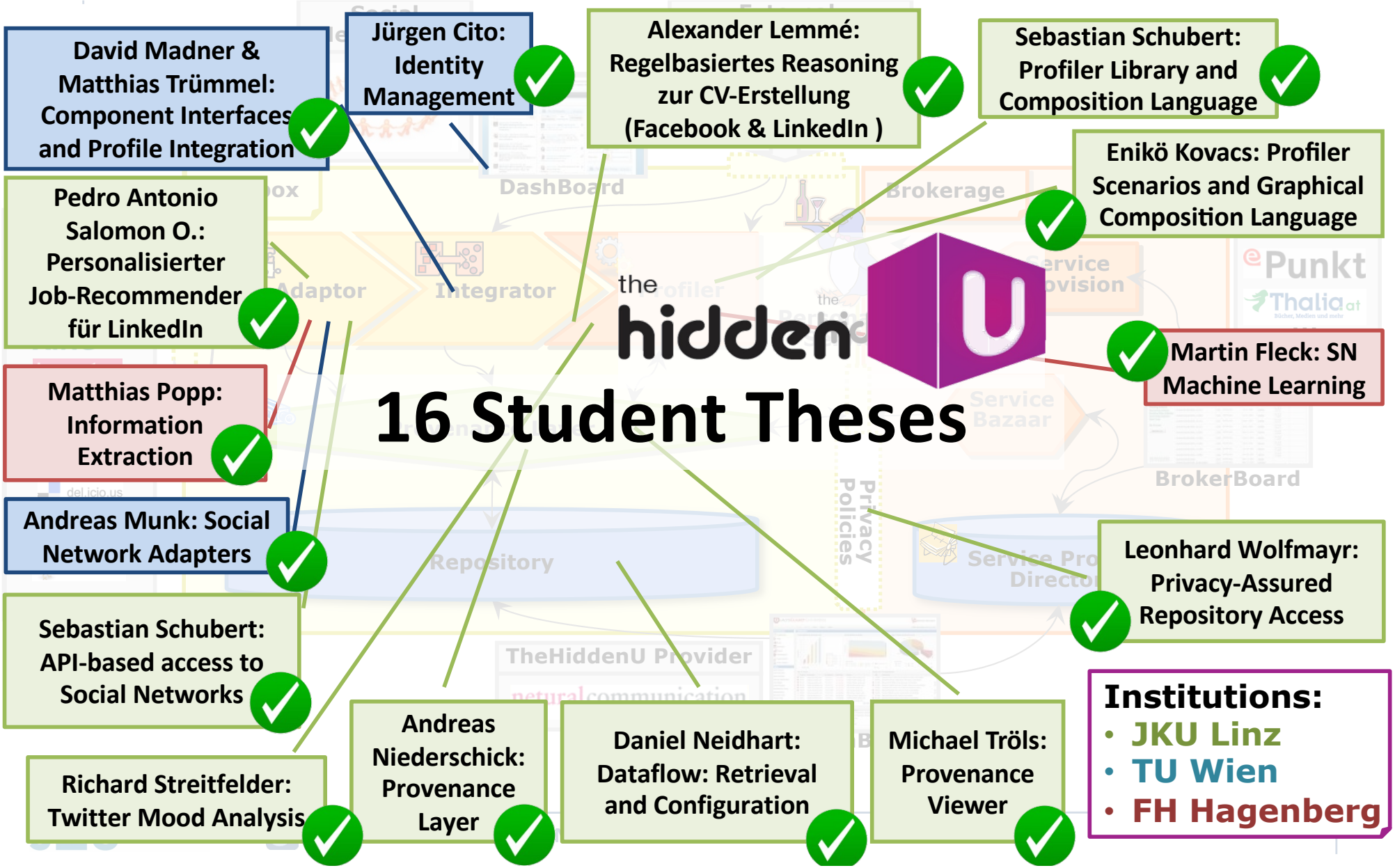
- FUNDING: FFG BRIDGE
- VOLUME: 360.000 EUR
- DURATION: SEP/2013 – JUN/2015

PARTNER: FREQUENTIS team, FAW, Netural, ÖSTERREICHISCHES ROTES KREUZ

crowdsa.situation-awareness.net

11	28 + 1 PhD

Projects 8/8
Scientific Publications & Student Thesis



Students

- **Study abroad** ...
  - ... **FIN** (Jyväskylä), **SWE** (Skövde), **ESP** (Malaga), **ITA** (Mailand), **USA** (Pittsburgh – CMU), **AUS** (Adelaide)
- **Practicas**, **seminars**, **bachelor/master thesis** ...
  - ... within interesting, research-driven industry-related **projects**
- **Dissertations** ...
  - ... **funded** positions within research projects
- **Supervision** ...
  - ... intensive, personal, **cooperative**
- **Teamwork** ...
  - ... with collegues!
- **Start** ...
  - ... possible **anytime!**

you are most welcome @

Institute for Telecooperation

cis.jku.at

Department of COOPERATIVE INFORMATION SYSTEMS

Bakk-Themen

① **Low-Code Platforms in Different Domains**

BEE WITH APEX

② **Data Mining in Road Traffic IoT**

OTM Evolver

③ **Mobile Apps, Gamification, Recommender for Volunteers**

iVOLUNTEER

elisabeth.kapsammer@jku.at

wieland.schwinger@jku.at

werner.retschitzegger@jku.at

Weitere Bakk-Themen siehe next Slides

gabriele.kotsis@jku.at

Karin_anna.hummel@jku.at

ismail.khalil@jku.at

Ass.Prof. Dr. Elisabeth KAPSAMMER

Dr. Andreas MÜLLER

Dr. Johannes SCHÖNBÖCK

Dr. Stefan MITSCH

DOWNLOAD Slides:
https://tkcloud.tk.jku.at/s/eSYCFiResD6fiT3

Weitere Bakk-Themen 1/9
Prediction – Anticipatory Computing

Karin_anna.hummel@jku.at

Idea

- What if the future of a system can be predicted based on recent data?
- Develop systems that can adapt pro-actively based on forecasts!

Student Project "Forecasting Library"

- Develop a **library for mobile apps that includes predictions**
- Apply prediction to a use case, e.g., wireless network performance or activity recognition
  [Library for a PC solution is available]

Student Project "Prediction Algorithms"

- Develop **prediction algorithms for mobile systems (mobile apps or drones)**

Weitere Bakk-Themen 2/9
Drones – Drone Radar

Karin_anna.hummel@jku.at

Idea

- Small consumer drones “pollute” the air space leading to restrictions.
- Develop a radar-like system that can locate drones / avoid collisions!

Student Project “Drone Radar”

- Develop a **radar-like avionic system for civilian consumer drone monitoring**
- Consider uncertainties (positioning, delays in communication) and solutions

Student Project “6th Sense”

- Develop a model for future **6G “Joint Communication And Sensing (JCAS)”** approaches applied for the drone use case; evaluate the accuracy and timeliness of JCAS approaches

Weitere Bakk-Themen 3/9
Drones – Human-Drone Teaming

Karin_anna.hummel@jku.at

Idea

- What if, humans and drones can form hybrid cooperating teams?
- Create a drone system that understands human needs in a team!

Student Project "Keep Your Distance"

- The distance between a human and a drone is key for feeling safe - or threatened.
- **Develop a drone algorithm that learns and keeps the distance to a human**
  (based on reinforcement learning;
  the human gestures and emotions are used as feedback)
  – this project involves working with a real drone

Weitere Bakk-Themen 4/9
Wireless Communication – Space

Karin_anna.hummel@jku.at

Idea

- SF movies show "easy" communication in space – what is feasible?
- Develop protocols for space communication!

Student Project "Space Communication"

- Develop a **simulation model for space communication** consisting of earth stations, space relay stations, space interferences, etc.
- Implement a delay-tolerant networking approach for space communication

Student Project "Forecasting in Space"

- Develop **predictive approaches to cope with space dynamics** such as interferences, bad link quality, etc. (machine learning and simulation)

Weitere Bakk-Themen 5/9
Responsible Networking – Energy-Efficiency

Karin_anna.hummel@jku.at

Idea

- The future Internet needs to be sustainable and responsible.
- Create a supporting framework for energy-efficient networking!

RESPONSIBLE INTERNET

Student Project "Responsible Internet"

- Develop a **contract-based networked system to formalize environmental societal needs as policies** (e.g., in terms of energy consumption, etc.)
- Develop **adaptive network protocols** that change their behavior based on the policies and current conditions (e.g., availability of solar power).

Weitere Bakk-Themen 6/9
Human-Machine Collaboration

ismail.khalil@jku.at

(1) Gesture Recognition for Human-Robot Collaboration
Develop a system that allows humans to communicate with robots using gestures. Train a machine learning model to recognize and interpret different hand gestures, enabling seamless collaboration between humans and robots.

(2) Human-AI Collaboration in Image Editing
Develop an image editing tool that combines human creativity with AI assistance. Train a model to understand and implement user instructions in the image editing process, making the collaboration more intuitive.

(3) Human-Machine Cooperation in Autonomous Vehicles
Develop a system for autonomous vehicles that integrates human input for decision-making. Explore scenarios where humans and AI collaborate to enhance safety and efficiency in navigation.

(4) Predicting Traffic Flow with Machine Learning
Build a machine learning model that predicts traffic flow patterns based on historical data, weather conditions, and events. This system can assist in optimizing traffic management and providing real-time navigation recommendations.

(5) AI-assisted Language Translation
Create a language translation system that combines human input with machine translation capabilities. Train the model to understand context and user preferences, improving the accuracy and naturalness of translations.

Weitere Bakk-Themen 7/9
AI-Enabled Human-Human Collaboration

ismail.khalil@jku.at

(1) Collaborative Decision Support System

Develop a decision support system that integrates input from multiple users and utilizes machine learning algorithms to provide informed suggestions or recommendations. This could be applied in group decision-making scenarios.

(2) Emotion-aware Communication Platform

Develop a communication platform that utilizes facial recognition and natural language processing to detect and respond to users' emotions. This can enhance online collaboration by adapting communication strategies based on emotional cues.

(3) Group-based Learning Analytics

Implement a learning analytics system that tracks the progress of individuals within a group learning environment. Use machine learning to identify patterns and provide personalized feedback to each group member.

(4) AI-assisted Group Fitness App

Create a fitness app that encourages group workouts by leveraging AI to tailor exercise routines based on the fitness levels and preferences of each participant. The system could adapt workouts dynamically based on real-time feedback.

(5) Collaborative Music Playlist Generation

Design a music playlist generation system that takes input from multiple users and employs collaborative filtering to create playlists that suit the preferences of the entire group.

Weitere Bakk-Themen 8/9
Machine-Machine Collaboration

ismail.khalil@jku.at

(1) Multi-Agent Reinforcement Learning for Traffic Control
Design a traffic control system using multi-agent reinforcement learning, where intelligent agents control traffic signals to optimize traffic flow, reduce congestion, and improve overall transportation efficiency.

(2) Distributed Image Recognition Network
Develop a distributed image recognition system where multiple machines collaborate to process and analyze large sets of images. Each machine can specialize in recognizing specific objects or patterns.

(3) Energy Optimization in Smart Grids
Build a machine learning-based system for optimizing energy consumption in a smart grid. Machines within the grid can collaborate to predict demand, manage renewable energy sources, and balance the load efficiently.

(4) Multi-Robot Exploration in Unknown Environments
Develop a multi-robot system where robots collaborate to explore and map unknown environments. Utilize machine learning algorithms for path planning, obstacle avoidance, and information sharing.

(5) Dynamic Resource Allocation in Cloud Computing
Create a system for dynamic resource allocation in a cloud computing environment. Machines can collaborate to optimize resource allocation based on workload, improving overall system performance.

Weitere Bakk-Themen 9/9
Mobile Computing

gabriele.kotsis@jku.at

(1) Feasibility studies
on mobile technologies in application domains including Arts, Medicine, or Education

(2) Performance evaluation studies
of distributed and mobile systems, Web-Architectures, ad-hoc networks,

(3) Prototypical development and evaluation
of humans and robots (drones) teaming scenarios