CRC/Transregio TRR 169
Crossmodal Learning: Adaptivity, Prediction and Interaction

CML Summer School 2022
19st to 30th September 2022

- **Online Part: Zoom Link**

  https://uni-hamburg.zoom.us/j/61967360335?pwd=ZlI2WU1kMjZFbkdUMnJQNVJqTW5Hdz09

  Meeting ID: 619 6736 0335

  Passcode: has been mailed to all CML participants

- **Time**

  19. - 23. Sep. 2022, Five 1-hour slots per day (For invited Speakers)
  (10:00-16:00 Germany Time, 16:00-22:00 China Time)
  26. - 30. Sep. 2022, Five 1-hour slots per day (For internal Projects)
  (09:00-16:00 Germany Time, 15:00-22:00 China Time)

- **Overview**

	Online Meeting (Zoom)					
CET	**19. Sep.**	**20. Sep.**	**21. Sep.**	**22. Sep.**	**23. Sep.**	**CST 北京时间**
10:00-11:00	Project Meeting	Project Meeting	Project Meeting	Project Meeting	Marc Ernst (Uni Ulm)	16:00 - 17:00
11:00-12:00					Oya Celiktutan	17:00 - 18:00
12:00-13:00	*Pause*	*Pause*	*Pause*	*Pause*	*Pause*	18:00 - 20:00
13:00-14:00						
14:00-15:00	Yonatan Bisk	Hong Cheng	Bin Yang	Xuguang Lan	Jirong Wen	20:00 - 21:00
15:00-16:00	Aiguo Song	Jiahua Xu	Dezhen Song	Baihua Li	Shih/Chii Liu	21:00 - 22:00

CET	Online	Ikum B201 Konrad-Zuse Hörsaal + Online				
	26. Sep.	**27. Sep.**	**28. Sep.**	**29. Sep.**	**30. Sep.**	**CST 北京时间**
9:00 - 10:00	Project meeting (Online)	**B3**	**A1**	**A5**	**C1**	15:00 - 16.00
10:00 - 11:00	Project meeting (Online)	**B1**	**B5**	**B2**	**C9**	16:00 - 17:20
11:00 - 11:30	*Coffee Break*	*Coffee Break*	*Coffee Break*	*Coffee Break*	*Coffee Break*	17:00 - 17:30
11:30 - 12:30	Project meeting (Online)	**Z1**	**A6**	**B4**	**A2**	17:30 - 18:30
12:30 - 14:00	Lunch break	Lunch Break	Lunch Break	Lunch Break	Lunch Break	18:30 - 20:00
14:00 - 15:00	Theory Workshop (Online)	**Z2**	**C7**	**C8**	**C4**	20:00 - 21:00
15:00 - 16:00	Robot Integration Workshop (Online)	**Z3**	**A4**	**A3**	**General Assembly**	21:00 - 22:00
18:00-21:00		Working Dinner (Yu Garden)		Working Dinner (Augila)		

Monday, September 19, 2022

Hamburg	Beijing	**Project**	Title
10:00 - **11:00**	16:00 - 17:00		**Project Meeting**
11:00 - 12:00	17:00 - 18:00		**Project Meeting**
12:00 - 13:00	18:00 - 19:00		***Pause***
14:00 - 15:00	20:00 - 21:00		**Yonatan Bisk (CMU)** **Following Instructions and Asking Questions** **Abstract:** As we move towards the creation of embodied agents that understand natural language, several new challenges and complexities arise for grounding (e.g. complex state spaces), planning (e.g. long horizons), and social interaction (e.g. asking for help or clarifications). In this talk, I'll discuss several recent results both on improvements to embodied instruction following within ALFRED and initial steps towards building agents that ask questions or model theory-of-mind.
15:00 - 16:00	21:00 - 22:00		**Aiguo Song (South East University of China)** **Force sensing, feedback and control for teleoperation robot** **Abstract：** Teleoperation robot is currently the frontier and hot-point of the robotics research. The telerobot combines the human intelligence with robot viability in unknown environments, so that it is able to perform the complex tasks or pre-unknown tasks in unknown or dangerous environments. Force sensing, feedback and control are core techniques of the teleoperation robot. In this presentation, we review the history of the teleoperation robot, and illustrate the architecture of the teleoperation robot system. Teleoperation robot with force feedback allows humans to perform complex tasks in a remote or inaccessible environment, while providing force feedback to the human operator. The incorporation of real-time force feedback as well as visual information in the teleoperation control loop can lead to significant improvements in task performance, feeling of presence. Then

			we discuss its three key techniques, that is force sensing, force feedback, and force control strategy under time delay. At last, we briefly introduce the development of teleoperation robot system with force sensing and feedback, and its typical applications at Southeast University during the past decade. **CV:** Aiguo Song is the chief professor of Southeast University, winner of National Outstanding Youth Fund, National Outstanding Scientific and Technological Worker, and winner of China Youth Science and Technology Award. He has been selected into the National "Ten Thousand Talents Plan". He is the member of the Discipline Evaluation Group of Instrument Science and Technology of Academic Degree Committee of the State Council, chair of Jiangsu Instrumentation Society, chair of IEEE Nanjing Section Robotics and Automation Society Chapter, and IEEE senior member. Prof. Song has been engaged in the research of robot sensing and control technology, space robot, nuclear detection robot, power inspection robot and rehabilitation/medical robot since 1993. As the project leader, he has completed more than 50 important projects, including national key R & D projects, National 863 high-tech projects, national 973 projects, key projects of National Natural Science Foundation of China, and Space Exploration Research projects. He has won the second prize of National Technology Invention Award, two times of the first prize of Technology Invention Award of Ministry of Education, and five times of gold awards of Geneva International Invention. He has published more than 360 peer reviewed journal papers, and 260+ papers have been indexed by SCIE, and SCI cited time is 3500+. He has gotten more than 80 authorized patents and 5 national technique standards for special robots.

Tuesday, September 20, 2022

Hamburg	Beijing	Project	Title
10:00 - 11:00	16:00 - 17:00		**Project Meeting**
11:00 - 12:00	17:00 - 18:00		**Project Meeting**

12:00 - 13:00	18:00 - 19:00		***Pause***
13:00 - 14:00	19:00 - 20:00		***Pause***
14:00- 15:00	20:00- 21:00		**Hong Cheng (UESTC China)** **Human-Robot Cooperation for Rehabilitation Medicine**
15.00- 16:00	21:00- 22:00		**Jiahua Xu (Universität Tübingen)** **Noninvasive Brain Stimulation and Visual Field Decoding for Vision Recovery**

Wednesday, September 21, 2022

Hamburg	Beijing	Project	Title
10:00– 11:00	16:00– 17:00		**Project Meeting**
11:00– 12:00	17:00– 18:00		**Project Meeting**
12:00– 13:00	18:00– 19:00		***Pause***
13:00- 14:00	19:00- 20:00		***Pause***
14:00- 15:00	20:00- 21:00		**Bin Yang (Universität Stuttgart)** **Machine learning approaches in multimodal signal processing**
15.00- 16:00	21:00- 22:00		**Dezhen Song (Texas A&M, USA)** **Sensor Fusion and Its Applications in Autonomous Vehicles, Augmented Reality and Robotic Grasping** **Abstract**: Combining multiple sensor modalities to achieve more robust understanding of environment and robot status is an emerging research area in robot navigation and autonomous driving. To fuse sensors such as camera, lidar, inertial measurement unit, wheel encoder, etc., one must solve problems in synchronization, calibration, signal correspondence, and data fusion. In this talk, I will discuss the lessons that we have learned in sensor fusion to address many problems in autonomous driving and robot navigation using autonomous motorcycle and NASA Robonaut as examples. We will also discuss how augmented reality development on mobile devices benefited from the sensor fusion approach in robotics. Moreover, addressing perception challenges after sensory data are collected from individual

			modalities may limit perception potential; I will talk about sensor fusion at device level where we combine different sensory modalities into a single device to achieve new promising capabilities in robotic grasping applications. **CV**: Dezhen Song is a Professor and Associate Department Head for Academics with Department of Computer Science and Engineering, Texas A&M University, College Station, Texas, USA. Song received his Ph.D. in 2004 from University of California, Berkeley; MS and BS from Zhejiang University in 1995 and 1998, respectively. Song's primary research area is robot perception, networked robots, visual navigation, automation, and stochastic modeling. He received NSF Faculty Early Career Development (CAREER) Award in 2007. From 2008 to 2012, Song was an associate editor of IEEE Transactions on Robotics (T-RO). From 2010 to 2014, Song was an Associate Editor of IEEE Transactions on Automation Science and Engineering (T-ASE). Song was a Senior Editor for IEEE Robotics and Automation Letters (RA-L) from 2017 to 2021. He is also a multimedia Editor and chapter author for Springer Handbook of Robotics. Dezhen Song has been PI or Co-PI on more than $17 million in grants including more than $5.6 million from NSF. His research has resulted in one monograph and more than 130 refereed conference and journal publications.

Thursday, September 22, 2022

Hamburg	Beijing	Project	Title
10:00–11:00	16:00–17:00		**Project Meeting**
11:00–12:00	17:00–18:00		**Project Meeting**
12:00–13:00	18:00–19:00		***Pause***
13:00-14:00	19:00-20:00		***Pause***
14:00-15:00	20:00-21:00		**Shih-Chii Liu (ETH/ University of Zurich)** **Edge AI with Neuromorphic Spiking Sensors**
15.00-16:00	21:00-22:00		**Baihua Li (Loughborough Unversity, UK)** **Foot action/event detection using vision and sound**

Friday, September 23, 2022

Hamburg	Beijing	Project	Title
10:00– 11:00	16:00– 17:00		**Marc Ernst (Uni Ulm)**
11:00– 12:00	17:00– 18:00		**Oya Celiktutan (KCL)** **Multimodal Human Behaviour Understanding and Generation for Interactive Robots** **Abstract**: The success of robots that can interact and work alongside people in human environments depends significantly on their ability to recognise human expressive gestures and activities and respond to them accordingly. In this talk, I will give an overview of our work on the understanding and generation of human behaviour using different data modalities such as images, speech, or text. Particularly, I will present examples from our research on how machines can recognise human personality, engagement status, and other mental states to provide personalised interaction experiences, and how robots can learn to adapt their nonverbal behaviours to their interaction partners. I will conclude by highlighting the challenges and open problems. **CV**: Oya Celiktutan is a Senior Lecturer (Associate Professor) in Robotics at the Department of Engineering, King's College London and she is the Director of Social AI & Robotics Lab. Her research interests are computer vision and machine learning applied to human behaviour understanding and generation, and human-robot interaction. Particularly, she is interested in developing smart algorithms to learn (multimodal) representations of human behaviour from data and integrating such models into the perception, learning, and control of real-world systems such as robots. Oya was awarded an EPSRC New Investigator Award in 2020, and her research has been supported by EPSRC, the Royal Society, and the industry (Toyota and SoftBank Robotics) so far. Her team has been the recipient of several awards, including IEEE RO-MAN'22 Best Paper Award, IEEE FG'21 Best Student Paper Runner Up Award, ICCV'21 UDIVA Challenge 1st Place Award (personality recognition track), and ICCV'21 UDIVA Challenge Honourable Mention Award (behaviour forecasting track).
12:00– 13:00	18:00– 19:00		***Pause***

13:00-14:00	19:00-20:00		**Title / Name**
14:00-15:00	20:00-21:00		**Jirong Wen/Renmin University of China** **Wenlan: a multi-modal foundation model** **Abstract**: This talk will indroduce our resent work on a large-scale multi-modal foundation model nemed Wenlan. Wenlan was trained in a self-supervised way on huge datasets containing billions of image-text pairs collected from the internet and millions of short videos. We have applied Wenlan to a number of downstream tasks and demonstrated its superiority and versatility. Moreever, I will share some insights by further exploring and exploiting the Wenlan model, which verify that multi-modal pre-training is a promising way to get better representation, structure and knowledge like human beings. **CV**: Ji-Rong Wen is a professor, the dean of School of Information and the executive dean of Gaoling School of Artificial Intelligence at Renmin University of China. His main research interests include information retrieval, data mining and machine learning. He once was a senior researcher and group manager of the Web Search and Mining Group at Microsoft Research Asia (MSRA). He is the PC Chair of SIGIR 2020 and the Associate Editor of ACM TOIS and IEEE TKDE. He is also a Chief Scientist of Beijing Academy of Artificial Intelligence.
15:00-16:00	21:00-22:00		**Xuguang Lan/ Xi'an Jiaotong University** **The Chanllenges of Robot Autonomous Manipulation: Visual Reasoning and Learning** **Abstract**: This talk briefly introduces the progress and challenges of robots in terms of intelligence, especially the difficulty of robots understanding, learning and manipulation in collaboration scenarios. Aiming at the difficult problems, a manipulation method based on visually physical reasoning is proposed for partially observable scenes. The interaction between learning and planning (POMDP) enables the robot to perform visual reasoning on dynamic unstructured scenes and autonomously complete tasks for specific objects. We will also introduce the robot learning using hindsight trust region policy optimization on spares reward scenarios, and the multi-robot

			autonomous cooperation method and related applications. **CV**: Xuguang Lan received Ph.D. degree in Pattern Recognition and Intelligent System from Xi'an Jiaotong University in 2005. Currently, he is a professor at Institute of Artificial Intelligence and Robotics, and vice dean of the college of Artificial Intelligence of in Xi'an Jiaotong University. His main research areas include computer vision, robot learning, and human-robot collaboration. He is the director of the "Coexisting-Cooperative-Cognitive Robot, Tri-Co Robot" Committee of the Automation Society, etc. He has published more than 100 papers in journals and conferences such as IEEE Transactions and ICML/CVPR/RSS, and has obtained more than 10 national invention patents. He is a senior member of IEEE.

Monday, September 26, 2022

Hamburg	Beijing		Title
9:00– **10:00**	15:00– 16:00		**Internal Project meeting (Online)**
10:00– 11:00	16:00– 17:00		**Internal Project meeting (Online)**
11:00– 11:30	17:00– 17:30		**Coffee Break**
11:30- 12:30	17:30- 18:30		**Internal Project meeting (Online)**
12:30- 14:00	18:30- 20:00		***Lunch***
14:00- 15:00	20:00- 21:00		**Internal Project meeting (Online)**
15:00- 16:00	21:00- 22.00		**Internal Project meeting (Online)**

Tuesday, September 27, 2022

Hamburg	Beijing	Project	Title
9:00– 10:00	15:00– 16.00	**B3**	**Neurocognitive mechanisms for transfer and generalization in implicit crossmodal learning** Qiufang Fu, Michael Rose
10::00– 11:00	16:00– 17:00	**B1**	**Modulation of neural mechanisms underlying crossmodal predictions**

			Andreas Karl Engel, Dan Zhang
11:00– 11:30	17:00– 17:30		***Coffee Break***
11:30– 12:30	17:30– 18:30	**Z1**	**Management and coordination** Norman Hendrich
12:30- 14:00	18:30- 20:00		**Lunch**
14:00- 15:00	20:00- 21:00	**Z2**	**Integrated research training group** Alex Maye
15:00- 16:00	21:00- 22.00	**Z3**	**Integration initiatives for model software and robotic demonstrators**

Wednesday, September 28, 2022

Hamburg	Beijing	Project	Title
9:00– 10:00	15:00– 16.00	**A1**	**Adaptation of multisensory processing to changing priors and sensory evidence** Patrick Bruns, Brigitte Röder, Xiaolan Fu Patrick Bruns: Overview Cora Kubetschek: Studies in adults Sina Storm: Studies in children Alexander Kramer: Modeling results
10:00– 11:00	16:00– 17:00	**B5**	**Crossmodal transfer of dexterous manipulation skills** Jianwei Zhang, Fuchun Sun
11:00– 11:30	17:00– 17:30		**Break**
11:30– 12:30	17:30– 18:30	**A6**	**Deep learning for robust audio-visual processing** Xiaolin Hu, Simone Frintrop, Timo Gerkmann
12:30- 14:00	18:30- 20:00		***Lunch***
14:00- 15:00	20:00- 21:00	**C7**	**Crossmodal learning for improving human reading** Xingshan Li, Qingqing Qu, Chris Biemann
15:00- 16:00	21:00- 22.00	**A4**	**Crossmodal representation facilitating robust robot behaviour** Changshui Zhang, Yizhou Wang, Jianwei Zhang

Thursday, September 29, 2022

Hamburg	Beijing	Project	Title
9:00–	15:00–	**A5**	**Neurorobotic models for crossmodal joint attention and**

10:00	16.00		**social interaction** Stefan Wermter, Xun Liu
10:00– 11:00	16:00– 17:00	**B2**	**Crossmodal inference by conjoining probabilistic and symbolic models** Jun Zhu, Jan Philipp Gläscher
11:00– 11:30	17:00– 17:30		***Coffee Break***
11:30– 12:30	17:30– 18:30	**B4**	**Brain dynamics of top-down control on crossmodal congruency** Xun Liu, Guido Nolte, Andreas Karl Engel
12:30- 14:00	18:30- 20:00		***Lunch***
14:00- 15:00	20:00- 21:00	**C8**	**Crossmodal bindings and plasticity during visual-haptic interaction for novel forms of therapy** Lihan Chen, Simone Kühn, Frank Steinicke, Kunlin Wei
15:00- 16:00	21:00- 22.00	**A3**	**Crossmodal learning in health and neurological disease: neurocomputational representation and therapeutic application** Christian Gerloff, Gui Xue

Friday, September 30, 2022

Hamburg	Beijing	Project	Title
9:00– 10:00	15:00– 16.00	**C1**	**Crossmodal active perception of human speech and its implication in social learning** Dan Zhang, Bo Hong, Guido Nolte
10:00– 11:00	16:00– 17:00	**C9**	**The role of mental models and sense of agency in learning crossmodal communicative acts** Jan Philipp Gläscher, Xiaolan Fu
11:00– 11:30	17:00– 17:30		***Coffee Break***
11:30– 12:30	17:30– 18:30	**A2**	**Neural circuits for crossmodal memory** Ji-Song Guan, Claus C. Hilgetag
12:30- 14:00	18:30- 20:00		***Lunch***
14:00- 15:00	20:00- 21:00	**C4**	**Neurocognitive models of crossmodal language learning** Cornelius Weber, Stefan Wermter, Zhiyuan Liu
15:00- 16:00	21:00- 22.00		**General Assembly**

TRR 169 Main Participants

Abawi, Fares (A5, Speaker)
Alaçam, Özge (C7, Speaker)
Bauer, Carina (B3, Speaker)
Biemann, Chris (C7, PI)
Bruns, Patrick (A1, PI)
Buidze, Tatia (C9, PI)
Burke, Rebecca (B1, Speaker)
Cai, Yiyang (C8, Speaker)
Chen, Lihan (C8, PI)
Duczek, Nicolas (A5, Speaker)
Engel, Andreas (B1, PI)
Frintrop, Simone (A6, PI)
Fu, Di (A5, Speaker)
Fu, Qiufang (B3, PI)
Fu, Xiaolan (C9, PI)
Gerkmann, Timo (A6, PI)
Gerloff, Christian (A3)
Gläscher, Jan (C9, PI)
Gong Wenxiao (C8, Speaker)
Görner, Michael (B5)
Göschl, Florian (B4, Speaker)
Guan, Ji-Song (A2, PI)
Guo, Ning (C1, Speaker)
Hafez, Burhan (Z3, Speaker)
Hartfill Judith (C8, Speaker)
Hendrich, Norman (Z2, Speaker)
Hugo Cesar de Castro Carneiro (A5, Speaker)
Hilgetag, Claus (A2, PI)
Hong, Bo (C1, PI)
Hu, Xiaolin (A6, PI)
Jablonowsi, Julia (B3, Speaker)
Jing, Mingxuan (B5, Speaker)
Jonetzko, Yannick (Z3, Speaker)
Kerzel, Matthias (Z3, Speaker)
Kramer, Alexander (A1, Speaker)
Kubetschek, Cora (A1, Speaker)
Kühn, Simone (C8, PI)
Lee, Jae Hee (C4, Speaker)
Lei Xiao (C8, Speaker)
Li, Dong (A2, Speaker)
Li, Mengdi (C4, Speaker)
Li, Xingshan (C7, PI)
Li, Zhenghan (B4, Speaker)
Liang, Hongzhuo (B5, Speaker)
Liu, Jiayu (C7, Speaker)
Liu, Xun (B4, PI)
Liu, Zhiyuan (C4, PI)
Lou Chunmiao (C8, Speaker)
Maye, Alexander (Z2, Speaker)
Nolte, Guido (B4, PI)
Taesler, Philipp (B3, PI)
Qu, Qingqing (C7, PI)
Richter, Julius (A6, Speaker)
Rose, Michael (B3, PI)
Röder, Brigitte (A1, PI)
Ruppel, Philipp (A4, Speaker)
Steinicke, Frank (C8, PI)
Storm, Sina (A1, Speaker)
Sun, Fuchun (Coordinator)
Sun, Ke (B2, Speaker)
Sun, Xunwei (A5, Speaker)
Weber, Cornelius (C4, PI)
Wei, Kunlin (C8, PI)
Wang, Guangyu (A2, Speaker)
Wang, Peng (B1, Speaker)
Wang, Xintong (C7, Speaker)
Wang, Yikai (B5, Speaker)
Wang, Yizhou (A4, PI)
Wermter, Stefan (A5, PI)
Xiao, Changming (A4, Speaker)
Xue, Gui (A3, PI)
Yan, Yuxiang (C1, Speaker)
Yang , Chao (B5, Speaker)
Zeng, Zheni (C4, Speaker)
Zhang, Ao (C4, Speaker)
Zhang, Changshui (A4, PI)
Zhang, Dan (C1, PI)
Zhang, Jianwei (Coordinator)
Zhao, Ke (C9, Speaker)
Zhao, Shuning (A6, Speaker)
Zhong, Fangwei (A4, Speaker)
Zhu, Jun (B2, PI)

Li, Shuang (Z3, Speaker)