Studienseminar für Nachrichtentechnik SoSe 25

Prof. Jorswieck, Prof. Kürner, Prof. Fingscheidt

Abteilung Informationstheorie und Kommunikationssysteme:

Betreuer: Bile Peng, b.peng@tu-braunschweig.de, 0531 391-2417

Thema: Semantische Kommunikation mit der maschinellen Intelligenz
Beschreibung: Die traditionelle Telekommunikation überträgt Bits, ohne deren Inhalt zu beachten. Im Gegensatz dazu zielt die semantische Kommunikation darauf ab, den Inhalt der übertragenen Informationen zu berücksichtigen, anstatt sich ausschließlich auf die Bits zu konzentrieren. Aufgrund der hohen Komplexität solcher Systeme wird häufig das maschinelle Lernen eingesetzt. Dieser Vortrag gibt eine Einführung in das Thema.
Zielstudiengang: Für alle Studiengänge geeignet (Vorwissen in Telekommunikation empfohlen)

Betreuer: Yaning Zhao, yaning.zhao@tu-braunschweig.de, 0531 391-2481

Thema: Concepts and Applications of Molecular Communication
Beschreibung: Conventional communication systems primarily rely on electromagnetic (EM) waves for information transmission. While these systems are highly effective in many applications, they face significant limitations in certain environments or at specific scales. For instance, they are unsuitable for communication in liquid media, at the nano- or micro-scale, or for integration with biological systems. These limitations render traditional EM wave-based communication systems inadequate for some advanced and specialized applications. In contrast, natural communication systems often utilize molecules as the primary medium for information transfer. This study will explore the concepts and applications of molecular communication, emphasizing its potential to overcome the constraints of conventional communication systems.
Zielstudiengang: ET, IST (BA, MA)

Betreuer: Jonas Hawellek, jonas.hawellek@tu-braunschweig.de, 0531 391-2472

Thema: Quantum Communication Networks
Beschreibung: Advancing quantum technologies will be integrated into communication networks to transmit quantum information or to enhance and secure classical communication. However, due to the nature of quantum mechanics, several challenges must be address, like there are no signal amplifiers available. In its presentation, the student provides an overview of the challenges faced in comparison to classical networks and discusses current solutions.
Zielstudiengang: Für alle Studiengänge geeignet (Vorwissen in Quantentechnologien empfohlen)

Betreuer: Hadi Aghaee, hadi.aghaee@tu-braunschweig.de, 0531 391-2448

Thema: Entanglement assisted communication
Beschreibung: A general overview of entanglement, superposition coding, and their advantages in classical and quantum communication is sufficient. Recently, it has been shown how entanglement can help us reach better rates in multi-user classical channels. We extend the current knowledge from multiple access channels to interference channels. We avoid technical details and focus on concepts.
Zielstudiengang: ET, IST (BA, MA)

Abteilung Mobilfunksysteme:

Betreuer: Carla Reinhart, carla.reinhardt@tu-braunschweig.de, 0531 391-2445

Thema: LiDAR, Radar und ISAC – Drei Technologien für die gleiche Anwendung?
Beschreibung: Alle drei Technologien werden im Bereich der Ortung, Abstandsmessung und Umgebungserkennung verwendet. Wie unterscheiden sich die Technologien in ihrer Funktionsweise, Anwendung sowie ihren Vor- und Nachteilen.
Zielstudiengang: Für alle Studiengänge geeignet.

Betreuer: Varvara Elesina, varvara.elesina@tu-braunschweig.de, 0531 391-2409

Thema: RFID Technology
Beschreibung: RFID (radio frequency identification) is a widespread technology widely used in various industries and found in everyday life. The research objective involves understanding and clarifying the fundamental principles underlying its functionality. Then, it is of interest to explore the diverse and complex applications of RFID technology, delving into current research aimed at solving emerging problems and pushing the boundaries of its capabilities.
Zielstudiengang: Für alle Studiengänge geeignet.

Betreuer: Georg Jensen, georg.jensen@tu-braunschweig.de, 0531 391-2436

Thema: Ursprung, Funktionsweise und Einsatzgebiete von SSTV
Beschreibung: Slow Scan Television (SSTV) ist eine Funkübertragungstechnik, die es ermöglicht, Bilder über Funkfrequenzen zu senden. SSTV verwendet hierbei eine schmale an den Sprachkanal angepasste Bandbreite von etwa 3 kHz. In diesem Vortrag soll der Ursprung, die Funktionsweise sowie das Einsatzgebiet dieser Technik näher beleuchtet werden.
Zielstudiengang: ET, IST (BA, MA)

Betreuer: Lorenz Löser, lorenz.loeser@tu-braunschweig.de, 0531 391-2408

Thema: From Nature to Technology - How Bats Inspired Radar Systems
Beschreibung: Bats use echolocation by emitting high-frequency sound waves and analyzing the reflected echoes to perceive their surroundings with precision—a concept that has inspired engineers in the development of radar systems. The presentation aims to highlight the parallels and differences between biological and technical approaches to wave propagation and signal processing.
Zielstudiengang: ET, IST (BA, MA)

Abteilung Signalverarbeitung und Machine Learning:

Betreuer: Thomas Graave, thomas.graave@tu-braunschweig.de, 0531 391-2427

Thema: Prompted Audio Generation
Beschreibung: In the age of generative neural networks with multimodal inputs, we specifically take a look at multimodal neural networks with audio output. Such a model typically has multitask capabilities, i.e. it can add vocals to an instrument track, generate audio from a text description, remove background noise, and more. How well does such a model perform compared to a specialized monotask model? What does the model architecture look like? How is the model trained?
Zielstudiengang: Für alle Master Studiengänge geeignet.

Betreuer: Miguel Kabus, julian.kabus@tu-braunschweig.de, 0531 391-2423

Thema: Recent Methods for Acoustic Source Separation Using Neural Networks
Beschreibung: In the audio domain it is often desirable to eliminate or to isolate sound events belonging to a specific class. This is called source separation and may be used, for example, to suppress the noise from a construction site next door while still being able to hear the birds chirping outside. In this work, the student will present a brief overview of the latest advancements in the field of source separation.
Zielstudiengang: Für alle Master Studiengänge geeignet.

Betreuer: Patrick Blumenberg, patrick.blumenberg@tu-braunschweig.de, 0531 391-2478

Thema: Retrieval Augmented Generation for Large Language Models
Beschreibung: Large Language Models (LLMs) excel in knowledge-intensive language tasks, but their training data may lack the specific knowledge required for certain applications. This can result in unanswered queries or hallucinatory responses. Retrieval-Augmented Generation (RAG) techniques access relevant information from an external knowledge base during model inference. In this work, the student will present an overview of common techniques and applications for RAG.
Zielstudiengang: Für alle Studiengänge geeignet.

Betreuer: Timo Bartels, timo.bartels1@tu-braunschweig.de, 0531 391- 2442

Thema: Can AI make Love? – AI Algorithms in Dating Apps
Beschreibung: This work explores how AI is utilized in dating apps and the common methods employed to determine compatibility between individuals. It also raises questions about the potential and limitations of technology in shaping relationships.
Zielstudiengang: Für alle Studiengänge geeignet.