

MUNICH AEROSPACE – NEW HORIZONS IN AVIATION AND SPACE

In 2010, through Munich Aerospace and its pooling of research, graduate programmes and teaching, an alliance has been formed between the **Technical University Munich (TUM)**, the **Bundeswehr University Munich (UniBwM)**, the **German Aerospace Center (DLR)**, as well as **Bauhaus Luftfahrt (BHL)**.

To promote excellent, scientific young academics, Munich Aerospace awards a PhD scholarship on

Coding for Uncoordinated Multiple Access

The research group **“Multiaccess and Security Coding for Massive IoT Satellite Systems”** is led by Prof. Gerhard Kramer from the Institute for Communications Engineering at the Technical University of Munich (TUM), and involves the COD group of Prof. Antonia Wachter-Zeh at TUM and the ITX group at the Institute of Communications and Navigation at the German Aerospace Center (DLR). The research aims at developing new key technologies for next generation satellite networks for the Internet-of-Things (IoT). Building on an existing research line within Munich Aerospace (where the group devised new advanced techniques for coding and modulation for short packet transmission), the group aims at addressing two fundamental elements of future satellite (and, more generally, wireless) communication systems: the design of uncoordinated multiple access schemes for massive satellite IoT networks, and the construction of lightweight quantum-resistant cryptographic primitives to ensure a long-term secure communication. Relying on a long-lasting and strong collaboration on several research topics, the groups at TUM and DLR will bring together their expertise and tightly collaborate within this activity.

Your tasks and qualifications

The rapid development of large-scale IoT networks has led to a strong demand of multiple-access schemes for massive populations of nodes, each aiming to transmit short data packets, in an uncoordinated manner, to a central collector (e.g., a satellite). The sporadic, unpredictable nature of the transmission points has led to the use of random access protocols (for example, the well-known Aloha protocol). Recent developments in this area point towards new families of uncoordinated multiple access schemes that leverage advanced signal processing algorithms and the theory of channel codes. Thanks to these synergies, a dramatic improvement in the information rates of uncoordinated transmissions was achieved over the past decade. Still, considerable gaps remain as compared to state-of-the-art approaches. The activity targets the exploration of coding techniques for random access protocols, and the analysis of such schemes with respect to emerging metrics (e.g., Age of Information). The candidate should possess a background in coding and information theory, and should be acquainted with the tools of queuing theory.

The Institute for Communications Engineering offers an excellent research environment with up to date laboratory equipment to realize your ideas. The group consists of a highly motivated and interdisciplinary team that will support you during your personal and scientific development.

The Scholarship

The Munich Aerospace scholarship amount is 1.575 € per month granted for a minimum of 12 months and limited to a maximum of 3 years. Munich Aerospace scholarship holders are entitled to attend the Munich Aerospace Graduate School, formed by the TUM Graduate School and the DLR_Graduate_Program, and have access to special events and trainings. An additional grant of up to € 6.100 per year will be available to cover expenses that are directly related to the PhD project (e.g. textbooks, laptop, conference travels, public transport, housing subsidy). The scholarship holder is part of a Munich Aerospace research group and receives additional technical support from the research group head. The candidates receive their PHD from TUM or UniBwM.

Interested?

Please send us your application including relevant documents (cover letter, CV, diplomas, transcript of records) in PDF format to gerhard.kramer@tum.de. The application deadline is April 14, 2021.

We are looking forward to your application!