



## **mmWave Beam Trajectory Prediction**

### Master/Diploma Thesis Studienarbeit/Diplomarbeit

#### **Problem Statement**

- Due to its exhaustive nature, the mmwave beam management procedure suffers from high reference signal overhead, latency, and power consumption
- Machine learning methods have gained significant attention to ameliorate the above-mentioned limitations [1]
- 3GPP has defined spatial and temporal domain prediction as use cases of ML based beam prediction [2]
- Aim of this work is to design and investigate an ML model (LSTM and/or AI Transformers) for efficient beam prediction

#### **Tasks**

- Basic understanding of 3GPP defined beam management tracking procedure
- Understand 3GPP defined scenarios and KPIs for temporal domain beam prediction [2]
- Development of LSTM and/or AI Transformers based beam prediction algorithm
- Investigate and possibly enhance generalization of proposed solution over scenarios with different UE mobility speed
- Performance evaluation over 3GPP defined beam prediction KPIs

#### **Expected Skills**

- Knowledge of Wireless Communications
- Experience with MATLAB and PYTHON
- Basic knowledge of LSTMs and AI Transformers is a plus

#### **Contact Person**

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#### **Recommended References**

1. M. Qurratulain Khan, A. Gaber, P. Schulz, and G. Fettweis, "Machine learning for millimeter wave and Terahertz beam management: A survey and open challenges," IEEE Access, vol. 11, pp. 11880–11902, 2023.
2. 3GPP, "Study on artificial intelligence (AI)/machine learning (ML) for NR air interface," 3GPP, TR. 38.843, V.2.0.0, Dec. 2023.