Departmental Seminar

Seminar Title	: LSTM-MLP Based CSI Feedback Analysis for Massive MIMO OTFS System.
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Venue	: EC303, Seminar Room
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Abstract : The need for novel modulation techniques has increased significantly because of the data throughput requirements, reliability, and flexibility of fifth-generation (5G) cellular systems. The wireless cellular networks beyond 5G and sixth-generation (6G) aim to assist reliable communications in high-speed applications. Orthogonal time frequency space (OTFS), the recently proposed modulation technique has emerged as a potential solution to fulfill the diverse requirements of future-generation wireless communication systems due to its superior performance in high-mobility environments where the delay-Doppler shifts are significantly more. The base station (BS) requires precise downlink channel state information (CSI) to be sent back from the user equipment (UE) for precoding, multi-user scheduling, spatial multiplexing, and diversity gain for the systems operating in frequency division duplexing (FDD) due to absence of channel reciprocity. However, because of the large number of antennas in the massive MIMO (M-MIMO) OTFS system, it is difficult to send this substantial amount of data back to the BS which leads to the consumption of a large portion of the limited bandwidth resources available. The recent approaches utilize deep learning (DL) to compress the CSI at the UE to a lower dimension and recover it reliably at the BS. We design a novel DL framework in this paper that exploits long short-term memory (LSTM) to capture essential information in highly selective channel conditions taking into account the time correlation present in time-varying channels. In addition, an attention mechanism with a multi-layer perceptron (MLP) is used to identify the global information avoiding the problem of overfitting. The performance analysis of the proposed architecture is compared with the baseline frameworks DFECsiNet, CRNet, and CsiNet using a synthetically generated dataset. The experimental outcomes exhibit the superior performance of the proposed architecture for four different lengths of codeword (Ns) utilizing normalized mean square error (NMSE) as the performance indicator as well as maintaining low computational complexity.