NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE | Graduate College

Joint PhD Program Description

The description for the Joint PhD program will be posted online as a sub-page to Joint/Dual PhD Programmes | Graduate College | NTU Singapore.

Name of Partner University	Indian Institute of Technology, Madras
Country	India
Year of JPP Establishment	2018
Program	☒ Joint Degree ☐ Joint Supervision
Description of the Program (150-250 words)	The Joint PhD programmes are conducted on a full-time basis. Students in the programmes are registered at both NTU and the partner university. Upon successful completion of the programme, NTU and the partner university will jointly confer the PhD degree.
Disciplines	• Science • Engineering • Management • Computing • Social Sciences
PMC Names and Emails	NTU: • Assoc Prof Sunil Chandrakant Joshi (mscjoshi@ntu.edu.sg) • Assoc Prof Yusuf Ali (yusuf.ali@ntu.edu.sg) IITM: • Prof Raghunathan Rengasamy (deange@iitm.ac.in) • Prof Mahesh Panchagnula (mvp@iitm.ac.in)

Joint Projects

Home University	Nanyang Technological University	
Supervisors	**Home**	**Partner**
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Project Title	**Hardware-Efficient Deep Learning based Visual SLAM for UAVs**
Project Description (200-300 words)	Unmanned Aerial Vehicles (UAVs) are expected to play a significant role in surveillance, mapping, and monitoring weather and traffic conditions. Simultaneous Localization and Mapping (SLAM) is an essential technology used by UAVs to jointly perform localization and mapping especially in environments where GPS or GNSS are not available or are unreliable. Visual SLAM (vSLAM) has gained wide popularity with the advances in AI methods. However, existing embedded computing platforms, e.g., CPU and GPU, are unable to meet the real-time requirement especially when deep learning methods are infused into the vSLAM pipeline. In addition, existing AI based visual SLAM algorithms are not well suited for long-term (lifelong) operations where the scenes change over time. The research will first explore new hardware-efficient AI based vSLAM algorithms for UAVs that can continuously acquire new knowledge in a self (semi)-supervised manner to enable the UAV to learn unfamiliar objects and new environmental conditions different from the ones present during training. An FPGA design methodology will be developed to optimize latency and energy consumption of the AI based vSLAM algorithm, while meeting the accuracy requirements of the UAV scenario. It is envisioned that the proposed methodology can synthesize FPGA efficient implementations of lifelong SLAM algorithms for UAVs operating under challenging scenarios.
Program/Center Website(s)	https://www.ntu.edu.sg/hesl
Additional Information (e.g., files with project details)	