List of IC@N Research Projects and Supervisors

School of Computer Science and Engineering (SCSE)

Name of Supervisor	Research Project Description
Assoc Prof Kwoh Chee Keong ASCKKWOH@ntu.edu.sg	**Software tool for rendering DNA nano-structures** The research on the structural stability of 3-Dimensional Origami is attracting many to consider the possibility to make useful tools for simulating thermodynamically stable DNA structures. Most of the major architectural monuments around the world are a conglomeration of basic geometric structures such as cylinders, spheres, tetrahedrons, cuboids. For example, the Big Ben Tower of London, is roughly a collection of four cuboids, one truncated pyramid and one pyramid in a fixed structural ratio. Combining these basic structures to form such complex structures is still a difficult task in 3-Dimensional Origami. The ultimate key is to create such architectural monuments or other such structures using Origami. The primal aim is to formulate a software that can render such basic geometric structures of any input length from the existing data available about them. The software must learn from the statistical data available about a particular structure and approximate the result from it. The output will be the possible structure and its corresponding data such as the total base pairs required, total crossovers, edge/ radius length, error in the length, base pairs/turn etc. After a successful rendering algorithm for these basic structures is deduced, the subsequent step is to input complex 3 Dimensional Structures such as architectural buildings. This software should be able to take into account of the structural ratio (in terms of size) of these basic structures and output the required stable complex structure by customising the sizes of the basic structures.
Prof. Thambipillai Srikathan astsrikan@ntu.edu.sg	**Stereo Region-of-Interest Generation for Pedestrian Protection** Advanced driver assistance systems (ADAS), and particularly pedestrian protection systems (PPS), have become an active research area due to the increasing need for improving traffic safety. Robust and real-time pedestrian detection is a challenging task as there is a need to take into account cluttered background, non-rigid appearance of pedestrians, etc. Region of Interest (ROI) generation is an essential component in vision-based PPS.

	In this project, the candidate will evaluate stereo vision-based ROI generation techniques for robust and real-time pedestrian detection in ADAS.
Asst Prof Anupam Chattopadhyay anupam@ntu.edu.sg	**Evolvable Video COMPression(EVoComp) system design for online video compression** With increase in the resolution of videos, higher bandwidth is required for transmission, thereby necessitating the need for compression. The project aims at development of an FPGA based system that is – adaptive, so that it adapts according to changes in video characteristics and – on-line so that it can compress/decompress a video stream as it is being transmitted/received. The EvoComp system will allow evolutionary algorithms to change the hardware configuration in real time to change compression methodology depending on video characteristics. We aim to benchmark the developed system with the existing video compression techniques.
	Collaborative energy-aware downloading for locally connected Android Mobile Devices Energy conservation is a critical aspect of mobile devices. Services like downloading content are energy hungry. The project aims at development of energy efficient techniques to manage downloading large files by collaborative downloading across locally connected (over Bluetooth or Wifi) Android devices to maximize throughput and at the same time taking into account the characteristics of the peers such as network usage, current cpu utilization, battery level, etc for partitioning the download.
Assoc Prof Erik Cambria cambria@ntu.edu.sg	**Sentic Computing Projects** At SenticNet, we are working on several projects spanning from fundamental affective computing research to the application of sentiment analysis techniques to domains like finance, healthcare, and the arts. Each project leverages the specific expertise of one or more members of the Sentic Team but, in fact, all projects are highly interdependent and interconnected with each another. Some of the main current projects include: • Sentic Computing for Human-Computer Interaction • Sentic Computing for Business Intelligence • Sentic Computing for Finance • Sentic Computing for Healthcare

	• Sentic Computing for Social Media Monitoring • Sentic Computing for Social Good • Sentic Computing for the Arts For more information, please visit https://sentic.net/projects
Asst Prof Lam Siew Kei **siewkei_lam@pmail.ntu.edu.sg**	**Reliability-Aware High-Level Synthesis for Embedded Computing Platforms** Single Event Upsets (SEU) induced faults poses a serious reliability problem in safety-critical embedded systems. Existing SEU mitigation techniques often incur unacceptable performance-power-cost overhead. The main objective of this project is to devise techniques that automatically synthesize reliable embedded systems from high-level design descriptions guided by constraints and target hardware architecture specifics. The candidate will investigate lightweight SEU mitigation techniques for fault tolerant custom hardware and realize the proposed techniques on state-of-the-art FPGA platforms. The candidate is expected to be experience in digital design and Verilog HDL, good foundation in data structures and algorithms, and good programming skills (C/C++).
	Accelerating Feature Detectors for Real-time Vision-based Applications Feature detection is a fundamental step in many real time applications such as video tracking, visual SLAM and robotic navigation. However, existing implementations for feature detection is highly compute intensive and becomes a bottleneck for real time vision tasks. This project aims to develop hardware-efficient feature detectors on FPGA.
Assoc Prof Vun Chan Hua, Nicholas **ASCHVUN@ntu.edu.sg**	**RNS based embedded signal conversion and processing techniques** RNS enables highly efficient hardware based signal acquisition and processing techniques. This project is to investigate the optimization of the novel Residue Number System (RNS) based signal processing techniques that were invented in SCSE as listed below. a) RNS encoding based folding ADC. ISCAS 2012: 814-817 b) A New RNS based DA Approach for Inner Product Computation. IEEE Trans. on Circuits and Systems 60-I(8): 2139-2152 (2013)

	The project involves finding the most suitable moduli set to implement the most efficient system based on the above techniques, in term of balanced moduli, efficient reverse conversion, as well as further novel features such as error detection and correction in the acquisition and processing stages