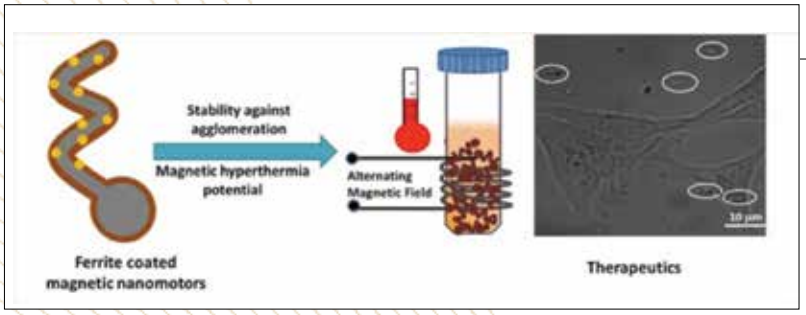
DIVISION OF

Interdisciplinary Research

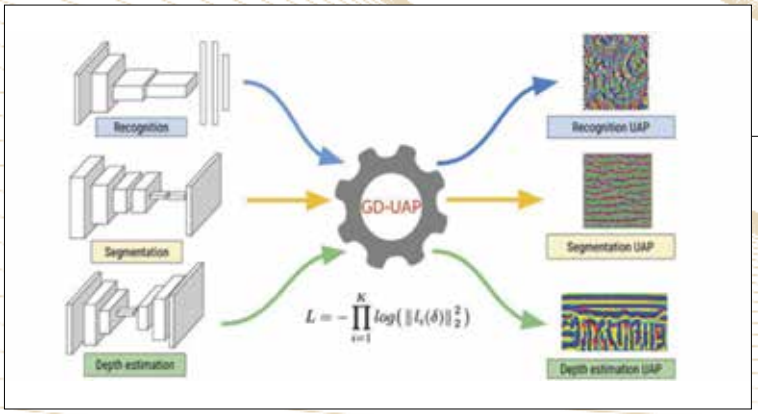
RESEARCH SNAPSHOTS 2018



A GHOSH (CeNSE)

Magnetic nanomotors contain ferromagnetic materials, such that small magnetic fields can be used to maneuver and localize them in fluidic or gel-like environments. The research by IISc scientists demonstrates how the application of a microwave-synthesized ferrite layer on these nanomotors renders them suitable as magnetic hyperthermia agents, as demonstrated by their cytotoxic effects on cancer cells. A crucial advantage is their scalability which would allow large scale production, taking us a step closer to the vision of a swarm of fantastic nano-voyagers deployed in human patients.

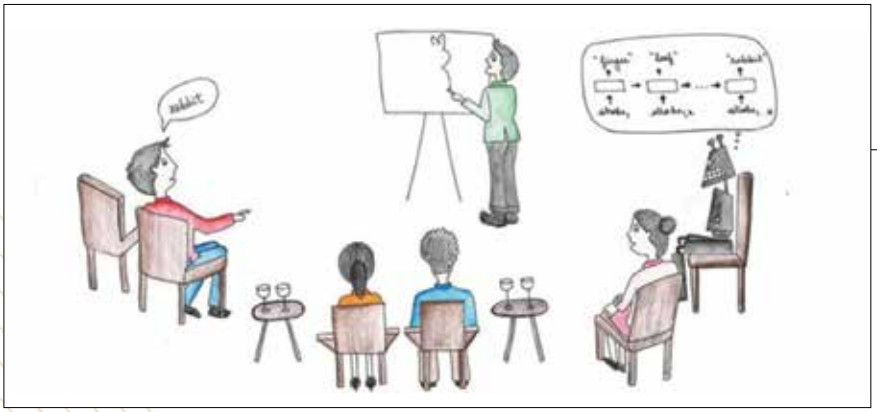
Reference: P.L. Venugopalan, S. Jain. S.A. Shivashankar and A.Ghosh, Single coating of zinc ferrite renders magnetic nanomotors therapeutic and stable against agglomeration, Nanoscale, 10, 2327-2332, (2018).



R VENKATESH BABU (CDS)

In recent years, multiple innovations in Artificial Intelligence and Machine Learning has led to the ubiquitous presence of brain-inspired neural networks in many real life applications. From robotic automation, to enhancing your 'selfies', there are a plethora of tasks performed by neural networks. Crucially, deep neural networks are also employed in making critical decisions in applications such as medical diagnostics. Due to the omnipresence of neural networks, an important question to ask is, 'How reliable are they?'. In this research, we present an approach to craft a small, imperceptible noise, which, when added to the network's input, can completely decimate it's discriminative ability, and in essence 'fool' the network.

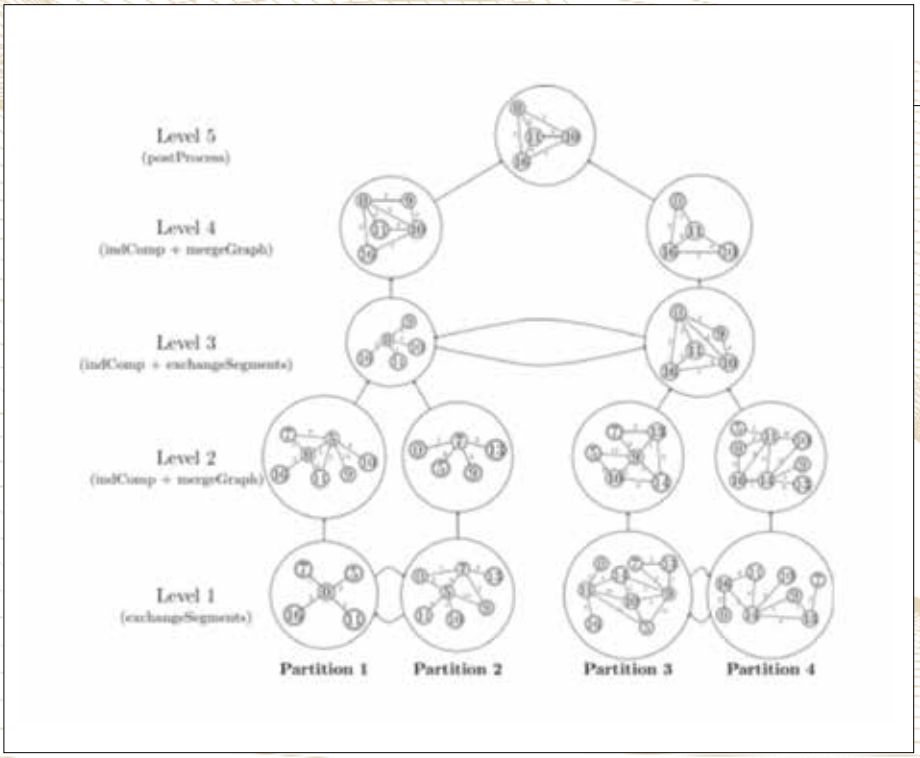
Reference: Mopuri Reddy, Aditya Ganeshan and R. Venkatesh Babu, "Generalizable Data-free Objective for Crafting Universal Adversarial Perturbations", accepted in IEEE Trans. Pattern Analysis and Machine Intelligence (PAMI), 2018.



R VENKATESH BABU (CDS)

Common parlour games have been used to design game engines that mimic human-like game moves. This research introduces the first computational model aimed at Pictionary, a popular word-guessing game, which is characterized by a relaxed cooperative game-play where players use speech/lexical and visual modalities, asynchronous turn-taking, and a high-level notion of what constitutes a 'win'. The Video Analytics Lab in CDS designed a deep network-based approach to model human guessing enabling characterization of realistic, possibly suboptimal, human actions which arise in Pictionary, and has the potential ability to encode non-trivial human behaviour and mimic human responses.

Reference: Ravi Kiran Sarvadevabhatla, Shiv Surya, Trisha Mittal, R. Venkatesh Babu, "Pictionary-style word-guessing on hand-drawn object sketches: dataset, analysis and deep network models" accepted in IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), 2018.



SATHISH VADHIYAR (CDS)

Efficient processing of large-scale graph applications on heterogeneous CPU-GPU systems requires effectively harnessing of the combined power of both the CPU and GPU devices. Finding minimum spanning tree (MST) is an important graph application and is used in different domains. In this research, a multi-node multi-device algorithm is proposed for MST, MND-MST). algorithm exhibits almost linear scalability for large size graphs and shows that the use of GPUs result in up to 23% improvement in performance over multi-node CPU-only performance.

Reference: Rintu Panja, Sathish Vadhiyar: MND-MST: A Multi-Node Multi-Device Parallel Boruvka's MST Algorithm. ICPP 2018: 20:1-20:10.