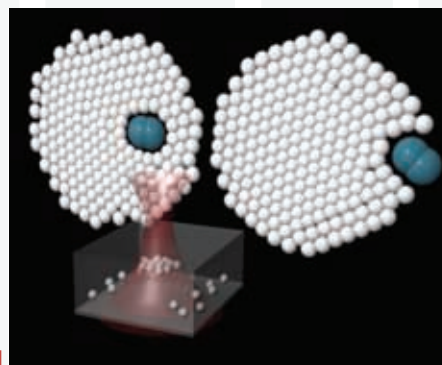
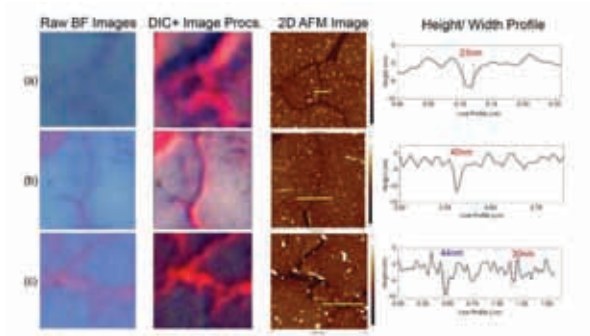


In order to make photonic crystals which are used to make a variety of optical devices, it is important to study how particles interact in a small system and give rise to new properties. This image shows fate of an intruder (impurity) governed by entropy (Kakoty H, Banerjee R, Dasgupta C and **Ghosh A**. Role of Entropy in the Expulsion of Dopants from Optically Trapped Colloidal Assemblies. *Physical Review Letters*. 2016, 117:258002).



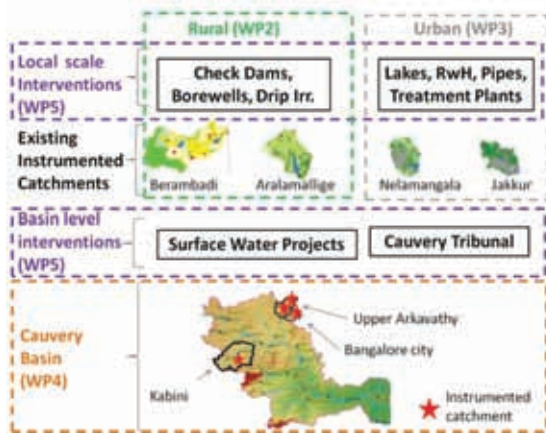
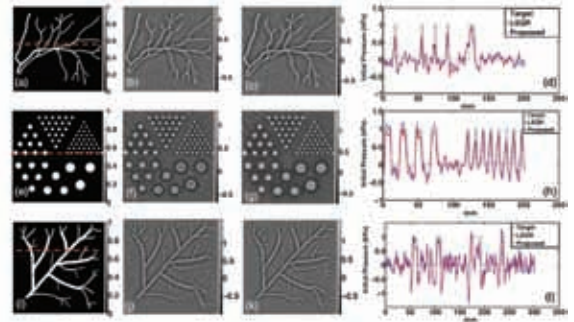
A wearable health-monitoring device for neonates developed at the Robert Bosch Centre for Cyber Physical Systems (RBCCPS) is helping in the prevention of neonatal deaths (Rao H, Saxena D, Kumar S, Sagar GV, **Amrutur B**, Mony P, Thankachan P, Shankar K, Rao S and Bhat S. Design of a Wearable Remote Neonatal Health Monitoring Device. *Biomedical Engineering Systems and Technologies*. 2016. 511:34-51).

A novel technique called bright-field nanoscopy was developed to visualize nanostructures down to a few nanometers using a conventional bright-field microscope without requiring additional molecular tags such as fluorophores. This technique will help image extremely small objects and may have future implications in biomedical tests, water purification, etc. (Suran S, Bharadwaj K, Raghavan S and **Varma MM**. Bright-field Nanoscopy: Visualizing Nano-structures with Localized Optical Contrast Using a Conventional Microscope. *Scientific Reports*. 2016. 6:25011).



# RESEARCH SNAPSHOTS 2016

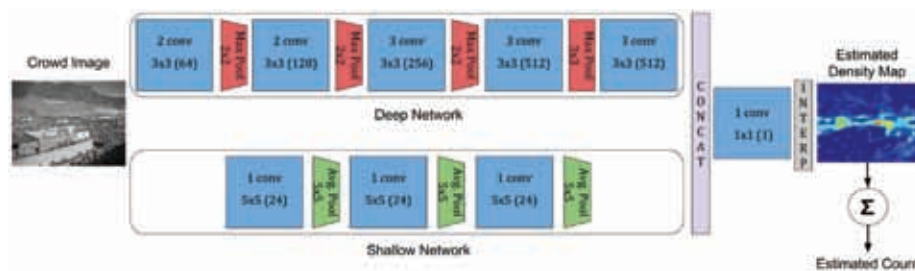
This photoacoustic tomography image combines near infrared light and ultrasound to image blood vessels. An error estimate method provides a 4.5X speed-up without compromising image quality [Bhatt M, Acharya A and **Yalavarthy PK**. Computationally Efficient Error Estimate for Evaluation of Regularization in Photoacoustic Tomography. *Journal of Biomedical Optics*. 2016. 21(10):106002].



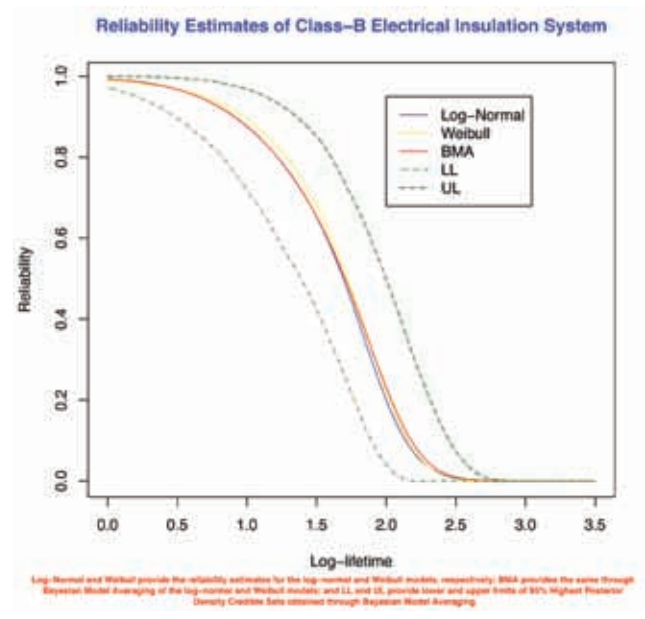
Upscaling Catchment Processes for Sustainable Water Management in Peninsular India (UPSCAPE) is part of the Newton Bhabha “Sustaining Water Resources Programme”, funded jointly by the UK Natural Environment Research Council and the India Ministry of Earth Sciences. It aims to solve water management challenges in Cauvery basin, one of the largest growing urban areas and rapidly expanding agricultural fields through innovative research on how localized, small-scale water management interventions like check-dams, bunds and boreholes, affect water availability at the wider basin-scale, and influence large-scale decision-making [**Mujumdar PP**, unpublished].



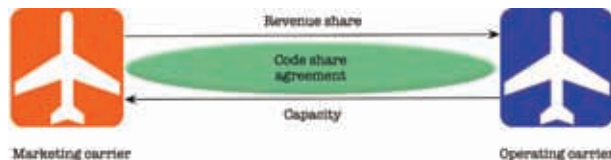
CrowdNet is a deep learning framework that can estimate the number of people in scenes, from a few hundred to a few thousand people. It achieves this by detecting entire person or blob like heads, adaptively, depending on visibility in the scene [Boominathan L, Kruthiventi S and **Babu RV**. CrowdNet: A Deep Convolutional Network for Dense Crowd Counting. *Proceedings of the 2016 ACM on Multimedia Conference, Amsterdam*. 2016].



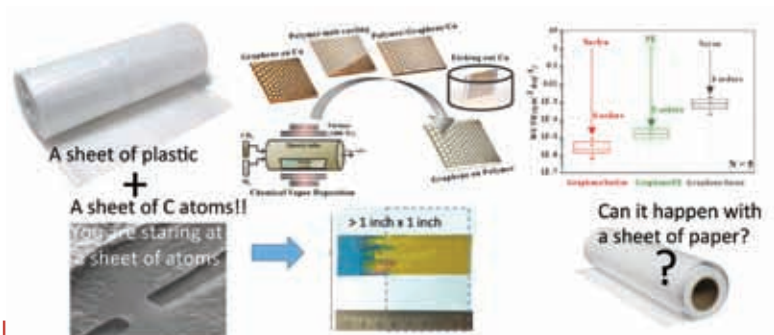
Reliability estimates of Class-B Electrical Insulation System: Log-Normal and Weibull provide the reliability estimates for the log-normal and Weibull models, respectively; BMA provides the same through Bayesian Model Averaging of the log-normal and Weibull models; and LL and UL provide lower and upper limits of 95% Highest Posterior. Density Credible Sets obtained through Bayesian Model Averaging (Roy S and **Mukhopadhyay C.** Bayesian D-optimal Accelerated Life Test plans for series systems with competing exponential causes of failure.v2016. 43(8):1477-1493).



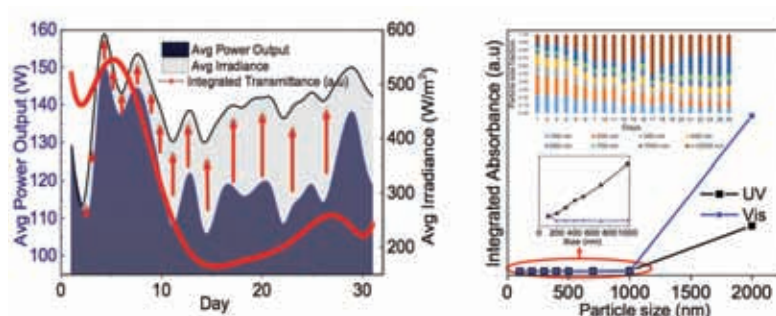
An airline's self-valuation of their shared capacity under code share agreements is typically private information and could be overstated to increase their share of revenue generated through codeshare agreements. We develop a bargaining framework and derive the conditions under which a specific point in Core of the cooperative game can be achieved (Vanamala VS and **Ramachandran P.** A bargaining framework for the airline alliance revenue sharing problem. **International Journal of Revenue Management.** 2016. 9(4):201-220).



Graphene has been combined with plastic to make a hybrid sheet, thus reducing water permeability by a million times. The hybrid sheet which can be used in electronics is flexible, transparent and can be made in large sizes exceeding a square inch (Seethamraju S, Kumar S, Bharadwaj K, Madras G, **Raghavan S** and Ramamurthy PC. Million-Fold Decrease in Polymer Moisture Permeability by a Graphene Monolayer. *ACS Nano.* 2016. 10(7):6501-6509).



Influence of dust on Ultra-Violet and Visible region during early stage of deposition on performance of photovoltaics. The present study primarily aims at unraveling the effect of dust deposition at the initial days on the light absorbance and hence conversion efficiency. (A) Major decrease in power output from the solar panel, happens during 5 – 15 days of dust deposition. (B) Drop in power output during early stage of dust deposition, is due to the UV spectral range absorbance, by the smaller dust particles (Hemaprabha E, Upasna R, Jagdish AK, **Ramamurthy PC** and Chattopadhyay K. Performance of Monocrystalline Silicon solar cell: Influence of dust on Ultra-Violet and Visible region during early stage of deposition. Act Number: 253 IEEE-PVSC 44, Washington D.C).



## RESEARCH HIGHLIGHTS

The Division of Interdisciplinary Research consists of the Centre for BioSystems Science and Engineering, Centre for Contemporary Studies, Centre for Infrastructure, Sustainable Transportation and Urban Planning, Centre for Nano Science and Engineering, department of Computational and Data Sciences, Department of Management Studies, Interdisciplinary Centre for Energy Research, Interdisciplinary Centre for Water Research, Robert Bosch Centre for Cyber Physical Systems and Supercomputer Education & Research Centre.