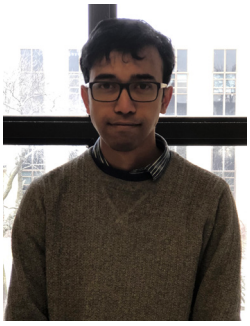
Computer Science Seminar

bioSmartSense: A Bio-inspired Data Collection Framework for Energy-efficient, QoI-aware Smart City Applications

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10:00 - 10:50 am
209 Computer Science Building



Recent years have seen a proliferation of intelligent (automated) decision support systems for various smart city applications such as energy management, transportation, healthcare, environment monitoring, and so on. A key enabler in the smart city paradigm is the Internet-of-Things (IoT) network of smart sensing and actuation devices assisting in real-time detection and monitoring of physical phenomena. The underlying IoT network must be energyefficient for application sustainability and also quality of information (QoI)-aware for nearperfect device actuation. To this end, this paper proposes bioSmartSense, a novel bio-inspired distributed event sensing and data collection framework, based on the gene regulatory networks (GRNs) in living organisms. The idea is to make the sensing and reporting tasks energy-efficient through self-modulation of IoT device energy levels, analogous to the activation or repression of genes by the regulating proteins, called Transcription Factors (TFs). To support energy-efficient and QoI-aware information dissemination, we first customize a heuristic designed for the Maximum Weighted Independent Set problem encompassing both `quality' and `quantity' of sensed data, where the former depends on the device energy levels while the latter on the number of events sensed. We utilize the heuristic to propose a suboptimal device selection mechanism constrained on the IoT network's overall residual energy. Simulation experiments demonstrate that the bioSmartSense framework achieves better energy-efficiency while maximizing event reporting compared to a state-of-the-art data collection approach for smart city applications.

Bio: Satyaki Roy is a PhD student in the Department of Computer Science at Missouri University of Science and Technology, Rolla, USA. His research interest is bio-inspired networks, in which he analyzes the graph theoretic properties of biological networks like the Gene Regulatory Networks (GRNs) and utilizes them to design robust and efficient communication topologies such as Wireless Sensor Networks (WSNs).

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