

CS3550-ADMT25 Guests Lectures

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Title: Low-Cost Approximate and Adaptive Monitoring Techniques for IoT

Abstract: With the prevalence of the Internet of Things (IoT) we are starting to see intelligence aggressively deployed at the edge to produce real-time analytic insights for almost all industry sectors. However, to produce such an unprecedented wealth of insights intense processing and constant data dissemination over the network is still required. This results in increased energy consumption for monitored data sources while cloud services consuming IoT data are constantly overwhelmed and struggling to be effective. In this talk, we tackle real-time data processing and energy-efficiency on the "edge" by introducing AdaM, a lightweight framework embeddable in the software core of IoT devices and featuring low-cost approximate and adaptive monitoring techniques. If a degree of inaccuracy can be tolerated, approximate monitoring techniques such as adaptive sampling, filtering and model-based dissemination, can significantly reduce the energy consumption of monitored data sources and the amount of data flooding cloud services by dynamically adapting the data stream collection and dissemination rate. To achieve this, probabilistic algorithmic learning models are used to capture runtime knowledge from the data stream evolution and variability, adjusting the collection and dissemination rate based on the confidence of each algorithmic model to correctly estimate what will happen next in the data stream. Through a comprehensive experimentation study using real-world data from cloud applications, wearables and intelligent transportation services, we will show that AdaM is able to achieve a balance between efficiency and accuracy in comparison to other state-of-the-art adaptive frameworks.

Speaker: Demetris Trihinas is a Lecturer at the Department of Computer Science, University of Nicosia and a Senior Member at the University's Artificial Intelligence Lab. He holds a PhD in Computer Science from the University of Cyprus and a Dipl.-Ing. in Electrical and Computer Engineering from the National Technical University of Athens. His research interests focus on Data-Intensive Computing, including the design and development of scalable and self-adaptive systems for Big Data Management, Processing and Visualization over Cloud, IoT and Edge topologies. He has extensive experience in European research and innovation projects where he has participated as a Work Package Leader and Senior Researcher in multiple projects co-funded by the European Commission (e.g., RAINBOW, Unicorn, PaaSport, CELAR). Additionally, he is the developer of the open-source JCatascopia cloud monitoring system and the AdaM framework for IoT devices. Also, he is an active contributor to the StreamSight framework for IoT service query-driven analytics, and Fogify, a scalable emulator for testing data-intensive applications in geo-distributed realms. His work is published in IEEE/ACM journals and conferences such as TCC, TSC, Internet Computing, INFOCOM, BigData, ICDCS and CCGrid.