SAPTARSHI DAS

Address: 4904 Belle Chase Blvd, APT 208, Lansing, MI – 48910.
Phone: (517)-643-0469
Email: das.saptarshi@outlook.com

LinkedIn: https://www.linkedin.com/in/dassap
Webpage: https://egr.msu.edu/~dassapta
Google Scholar:
https://scholar.google.com/citations?user=BL1ZY88AAAAJ

PROFESSIONAL OBJECTIVE

ECE Ph.D. candidate looking for challenging **Full-Time** opportunities **(Research Scientist / Data Scientist / Applied Scientist / Machine Learning Engineer)** starting **Dec 2019.**

RESEARCH INTERESTS

Wireless Networking, **Embedded Systems**, **Energy-Efficient** and **Energy-Harvesting**-Aware **Networking Protocol Design** (Medium Access Control, Routing), **Machine Learning**, **Neural Networks** (Deep Recurrent, Reinforcement Learning, Spiking Neural Networks) for **Prediction / Pattern Recognition**, **Evolutionary Multi-Objective Optimization**, Autonomous / Continuous **Structural Health Monitoring**

EDUCATION

Michigan State University (MSU), East Lansing, USA _____ Aug 2013 - Present
Ph.D. Candidate, Electrical and Computer Engineering _____ GPA: **3.75 / 4.0**
Advisor: Prof. Subir Biswas _____ (Planned Graduation:
Thesis Title: "*Towards Energy-Efficient and Harvesting-Aware Sensor Networking* _____ **Dec 2019**)
 and Event Detection Architectures for Energy-Harvesting-Powered Structural Health Monitoring Systems"

Heritage Institute of Technology (HITK), Kolkata, India _____ 2007 - 2011
Bachelor of Technology (B.Tech.), **Electronics and Communication Engineering** _____ GPA: **8.88 / 10.0**
Undergrad Project: "*An Efficient Adaptive Color Demosaicing Algorithm*"

RESEARCH PROJECTS (SELECTED)

1. Energy-Aware Through-Substrate Ultrasonic Pulse Communication for Structural Health Monitoring Systems
Development of novel and state-of-the-art energy-aware and energy-efficient communication protocol architecture (pulse-time-based encoding), Exposition of hybrid sensing, harvesting and communication paradigm using piezoelectric devices for Structural Health Monitoring, Airplane ambient vibrations, Piezo-electric harvesting model and Event-driven network simulation (C++) for networking protocol performance evaluation, Physical Layer feasibility / reliability verification using Hardware Prototype
Collaboration with teams from Michigan State University (MSU), Civil Engineering and Washington University at St. Louis, Electrical Engineering
Funded by the National Science Foundation (NSF)

2. Wearable Networked Multi-Modal Sensing System for Cost-Effective and Privacy-Friendly Detection and Measurement of Meaningful Behavioural Interactions in Limited Space Environments
Complete sensor system development including nodes (wearable badges) with multiple sensing modalities networked using a custom round-robin protocol and with a central Base Station for data collection and real-time system monitoring, Sensed data (proximity, facetime, movement, speech levels, heart rate, galvanic skin resistance etc.) logged and used to quantify interaction between team-members to infer team cohesion and inform team-building decisions, Hardware (Cricket platform), Software (nesC / TinyOS), Case (3D Printed / Blender design) as well as Realtime GUI development, Multiple iterations supported at various space settlement analogue deployments including the NASA HERA / HI-SEAS projects
Collaboration with team from MSU Industrial Psychology
Funded by the National Aeronautics and Space Administration (NASA)

3. Ultra-Energy-Efficient Solar-Harvesting-Powered Distributed Wireless Sensing System for Greenhouse Environment Monitoring and Control
Design and development of novel energy-efficient communication paradigm (pulse-interval-encoding), Design and implementation of ultra-low power solar-energy-based sensing hardware networked using pulse-interval encoding for use in precision agriculture applications, Deployment of hardware modules at MSU Greenhouse for monitoring multiple modalities including Photosynthetic Active Radiation, CO_2 levels, Temperature, Humidity etc., Data export to the cloud (Google

Firebase) and real-time visualization (Angular JS / HTML5), Long-Short-Term Memory (LSTM) Network-based prediction architecture for harvesting availability / plant photosynthetic output using collected data
Collaboration with MSU Plant Biology

4. Networked Smart Cube System for Privacy-friendly and Granular Measurement of Structured Task Learning Efficacy and Cognitive Flexibility in Early Childhood Settings
Complete hardware / software system development for structured task data collection using electromagnetic interactions between device faces, Real-time visualization (Python) of user actions and logging of action timing for analysis and inference
Inference of participant learning efficacy and cognitive flexibility using various games (Tower-Of-Hanoi etc.) and structured tasks (building blocks, puzzles etc.) recorded using developed hardware
Collaboration with MSU Human Development

5. Wearable Networked Sensing System for Cost-effective and Privacy-friendly Detection and Measurement of Meaningful Social Interactions in Early Childhood Classrooms
Wearable child-friendly device system development for interaction data collection using ultrasonic sensing, Multi-modal sensing (proximity, activity, sound levels etc.) to infer participant pair-wise interaction levels, Automatic identification of anomalies in interaction behaviour to infer early markers of autism and guide intervention measures
Collaboration with MSU Child Development Laboratory

6. Energy-efficient Event Pattern Recognition using Spiking Neural Network-based Learning and Sparse Pulse-based Networking in Wireless Sensor Networks
Novel learning and networking paradigm development, Human brain-spired Spiking Neuron-based learning and adaptation with pulse time encoded networking, implementation and evaluation in Nest Spiking Neuron Simulator

7. Cost-effective Dissemination of Vehicle Software Updates over Vehicular Networks using Smart Caching and Segmentation
Smart Caching mechanism development for low-cost software update delivery over DSRC channels, Evaluation of developed algorithms in ONE simulator using various real-life network mobility traces

RESEARCH PUBLICATIONS

PEER-REVIEWED JOURNALS:
1. S. Das, H. Salehi, Y. Shi, S. Chakrabartty, R. Burgueño, and S. Biswas, **"Towards Packet-less Ultrasonic Sensor Networks for Energy-harvesting Structures"**, **Elsevier Computer Communications Journal (Published),** Vol. 101, Pg. 94 – 105, **https://doi.org/10.1016/j.comcom.2016.11.001**, **2017.**

2. H. Salehi, **S. Das**, S. Chakrabartty, S. Biswas, and R. Burgueño, **"Structural damage identification using image-based pattern recognition on event-based binary data generated from self-powered sensor networks"**, Structural Control and Health Monitoring Journal (Published),** Vol. 25, Issue 4, e2135, **https://doi.org/10.1002/stc.2135**, **2018.**

3. H. Salehi, **S. Das**, S. Chakrabartty, S. Biswas, and R. Burgueño, **"Damage identification in aircraft structures with self-powered sensing technology: A machine learning approach"**, Structural Control and Health Monitoring Journal (Published),** Vol. 25, Issue 12, e2262, **https://doi.org/10.1002/stc.2262**, **2018.**

4. H. Salehi, **S. Das**, S. Chakrabartty, S. Biswas, and R. Burgueño, **"Data mining methodology employing artificial intelligence and a probabilistic approach for energy-efficient structural health monitoring with noisy and delayed signals"**, Expert Systems with Applications (Published),** Vol. 135, Pg. 259-272, **https://doi.org/10.1016/j.eswa.2019.05.051**, **2019.**

5. D. Feng, **S. Das**, F. Hajiaghajani, and S. Biswas, **"Pulse Position Coded Medium Access in Energy-starved Networks for Sensors and Internet of Things"**, **Elsevier Computer Communications Journal (Under Final Review), 2019.**

6. D. Feng, Y. Shi, **S. Das**, S. Biswas, **"Energy-Efficient and Secure Data Networking Using Chaotic Pulse Position Coded PDUs"**, **IEEE Transactions on Green Communications and Networking Journal (Under Review), 2019.**

7. S. Das, S.K. Kasi, Y. Shi, B. Harrington, S. Biswas, **"Towards Energy-Efficient Distributed Networked Cognition Using Spiking Neural Networks and Pulse Networking"**, **IEEE Transactions on Mobile Computing Journal (In Final Preparation), 2019.**

PEER-REVIEWED CONFERENCES:
1. S. Das, S. Lorenz, B. Dong, Q. Huo, and S. Biswas, **"Through-Substrate Event Reporting using Harvested Energy in Ultrasound Sensor Networks"**, **Proceedings of IEEE Globecom 2015,** San Diego, USA, **2015.**

2. H. Salehi, **S. Das**, S. Chakrabartty, S. Biswas, and R. Burgueño**, "Structural Assessment and Damage Identification Algorithms Using Binary Data", Proceedings of the ASME 2015 Conference on Smart Materials, Adaptive Structures and Intelligent Systems**, Colorado Springs, USA**, 2015**

3. S. Das, Y. Shi, B. Dong, and S. Biswas**, "Impacts of structural vibration on the performance of ultrasound sensor networks powered by vibration-harvested energy", Proceedings of the SPIE Smart Structures and Materials + Non-destructive Evaluation and Health Monitoring**, Las Vegas, USA, **2016.**

4. H. Salehi, **S. Das**, S. Chakrabartty, S. Biswas, and R. Burgueño**, "Structural Health Monitoring from Discrete Binary Data through Pattern Recognition", Proceedings of the Sixth International Conference on Structural Engineering**, Cape Town, South Africa, **2016.**

5. Y. Shi, **S. Das**, S. Douglas, and S. Biswas, **"An Experimental Wearable IoT for Data-driven Management of Autism", Proceedings of COMSNETS 2017**, Bengaluru, India, **2017.**

6. D. Feng, F. Hajiaghajani, **S. Das**, and S. Biswas**, "Pulse Position Coded PDUs: A New Approach to Networking Energy Economy", Proceedings of the IEEE Consumer Communications and Networking Conference**, Las Vegas, USA, **2017.**

7. H. Salehi, **S. Das**, S. Chakrabartty, S. Biswas, and R. Burgueño**, "A machine-learning approach for damage detection in aircraft structures using self-powered sensor data", Proceedings of SPIE Smart Structures and Materials + Non-destructive Evaluation and Health Monitoring**, Portland, USA, **2017.**

8. H. Salehi, R. Burgueño, **S. Das**, S. Biswas, and S. Chakrabartty, **"Localized Damage Identification of Plate-Like Structures with Time-Delayed Binary Data from a Self-Powered Sensor Network", Proceedings of ASME 2017 Conference on Smart Materials, Adaptive Structures and Intelligent Systems**, Snowbird, USA, **2017.**

9. S. Das, and S. Biswas, **"A Scalable Pulse Protocol for Structural Health Monitoring", Proceedings of COMSNETS 2018**, Bengaluru, India, **2018.**

10. H. Salehi, **S. Das**, S. Chakrabartty, S. Biswas, and R. Burgueño**, "A methodology for structural health diagnosis and assessment using machine learning with noisy and incomplete data from self-powered wireless sensors", Proceedings of Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems,** Denver, USA, **2018.**

11. D. Feng, Y. Shi, **S. Das**, S. Biswas, **"Chaotic Pulse Position Coded PDUs for Secure and Energy-Efficient Data Networking", Proceedings of IEEE Globecom 2018**, Abu Dhabi, UAE, **2018.**

PATENTS

1. S. Biswas, D. Feng, F. Hajiaghajani, **S. Das, "Method and Device For Transmitting Data Using Inter-Pulse Interval Modulation Technique.", U.S. Patent, US 10051663 B2, 2018.**

2. S. Biswas, D. Feng, **S. Das**, **"Data Packet Position Modulation System"**, U.S. Patent application submitted, **2019.**

PRESENTATIONS

1. "A Scalable Pulse Protocol for Structural Health Monitoring", Symposium on Wireless and Sensor Networks, **International Conference on Communication Systems and Networks (COMSNETS) 2018.**

2. "Impacts of structural vibration on the performance of ultrasound sensor networks powered by vibration-harvested energy", Symposium on Sensors and Smart Structures Technologies for Civil, Mechanical, and Aerospace Systems at **SPIE Smart Structures and Materials + Non-destructive Evaluation and Health Monitoring 2016.**

3. "Through-Substrate Event Reporting using Harvested Energy in Ultrasound Sensor Networks", Ad-Hoc and Sensor Networks Symposium at **Globecom 2015.**

WORK EXPERIENCE

1. Networked Embedded and Wireless Systems Laboratory (NeEWS)
Michigan State University, East Lansing
Graduate Research Assistant / Teaching Assistant   Aug 2013 – Present

Worked in various projects funded by NASA, NSF, MSU Foundation / SPG etc. involving design / implementation of networked, embedded sensing devices / systems for varied applications and energy-efficient network communication protocols / architectures for these, in collaboration with diverse teams.

Research Output:

15 accepted peer-reviewed publications (**95 citations, h-index: 6, i-10 index: 5**), 3 conference presentations (1 International), 1 U.S. Patent granted (2018), 1 U.S. patent applied (2019), Multiple Research / Travel Fellowships (Domestic / International) received

Technical Exposure:

Substantial experience in systems / architecture / communication protocol design and programming on various software (full stack) and hardware (embedded devices such as Mica2, IRIS, Cricket, Arduino Uno / Yun / Pro Mini etc.) platforms, Development familiarity with a large variety of sensors (piezoelectric, IR, audio, temperature, CO_2 detection, Photosynthetically Active Radiation etc.) and embedded sensor communication interfaces (I2C, SPI, UART)

Technologies used:

Languages: C / C++ / Java / Python / Scala (General Purpose), **MATLAB / R** (Computational / Statistics), Awk / Bash / Groovy / JavaScript (Scripting), **NesC / Arduino / Assembly** (Embedded Systems)

Platforms: Keras / TensorFlow / Torch / Google Cloud (Machine Learning), Nest (Spiking Neural Nets), NS3 / **ONE** (Network Simulation), Avida / NSGA (Genetic Algorithms), **Android SDK / AngularJS / HTML5 / CSS3** (Mobile / Web App Design), Blender (3D Printing / Design), **D3.js** (Data Visualization), **OracleDB / SQLite** / MongoDB / **PL-SQL / Firebase** (Database Systems), **Spark / Pandas** (Big Data)

2. Infosys Limited
Chennai, India and Mysore, India
Systems Engineer (2011-13) and **Systems Engineer Trainee** (2011)   Aug 2011 – Aug 2013

Worked as a developer in the Financial Services (banking) domain, delivering projects for a Big-4 U.S. Bank.

Projects:

1. Automatic Check Image Processing and Handling
2. Customer Information, Risk and Offers Management

Involved in all phases of the software development life cycle (design, coding, testing, maintenance) across multiple projects
Handled the responsibilities of Configuration Controller for a multi-city project team (20-30 members)

Technical Exposure:

Extensive full-stack development experience on the Java platform, Oracle / IBM Database systems, SOAP / REST Web Services etc. and wide exposure to a range of established programming frameworks, tools and design patterns

Technologies used:

Java (*General Purpose Programming*), **Groovy/JavaScript/Bash/Korn** (*Scripting*), **OracleDB/PL-SQL** (*Databases*), **Dozer/Drools/Spring/Java Reflection API/Apache ServiceMix/Apache Tomcat/JBoss/IBM WAS/SOAPUI** (*Frameworks and Tools*), **Windows/Linux/Unix** (*Operating Systems*)

SELECTED PH.D. COURSEWORK

Neural Networks and Deep Learning, Advanced Computer Architecture, **Advanced Operating Systems**, **Stochastic Processes and Applications**, Evolutionary Computation, Evolutionary Multi-Criterion Optimization and Decision-Making, **Design and Theory of Algorithms**, Algorithmic Graph Theory

LEADERSHIP ACTIVITIES

Secretary for League of Electrical Engineering Graduate Students (LEEGS)   2014 – 2016
Organized monthly meetings, peer-help sessions, technical workshops and social gatherings to help the ECE community in MSU and foster collaboration and camaraderie among them

OTHER INTERESTS

Amateur Astronomy, Cycling, Photography, Soccer, Open Source Software Development and Advocacy