

SAPTARSHI DAS

Electrical and Computer Engineering
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RESEARCH INTERESTS

Wireless Embedded Systems, Energy-efficient Networking, Energy-Harvesting-Powered Networked Systems, Continuous Structural Health Monitoring, Network Protocol Design (MAC, Routing), Software-Defined Networking (SDN)

EDUCATION

Michigan State University, East Lansing, USA
Doctoral Student, Electrical and Computer Engineering
(Passed Ph. D. Qualifier Exams)
Area: **Wireless Networking and Embedded Systems,**
Energy-Harvesting-Powered Networked Systems,
Energy-Aware Protocol Design
Advisor: **Prof. Subir Biswas**

Fall 2013 - Present
GPA: **3.75/4.0**
(Up to Fall '16)

Heritage Institute of Technology, Kolkata, India
B.Tech., **Electronics and Communication Engineering**
Undergrad Project: **An Efficient Adaptive Color Demosaicing Algorithm**

2007 - 2011
GPA: **8.88/10.0**
(Graduated Fall '11)

WORK EXPERIENCE

Networked Embedded and Wireless Systems Laboratory (NeEWS)
Michigan State University, East Lansing
Graduate Research Assistant

Aug 2013 - Present

Involved in design and implementation of networked, embedded sensing devices and energy-efficient network communication protocols

Have participated as a contributor in a variety of projects sponsored by the National Aeronautics and Space Administration (NASA) and the National Science Foundation (NSF)

Work in the NeEWS lab supplements own ongoing research pursuits in energy-efficient network protocol design for use in energy-harvesting-powered embedded sensor networks

Developing lightweight and adaptive network communication protocol approaches that can be used for continuous structural health monitoring (as in aircraft wings, bridges etc.) powered by energy harvesting techniques

Technical Exposure:

Substantial experience in programming on embedded platforms such as Mica2, IRIS, Cricket etc. using nesC programming language based on the TinyOS platform and Arduino and system-level C-variants on AtMega328P / AtTiny85 microcontroller platforms

Wrote and used a C++ based Discrete Event Simulation program for testing and evaluating developed network protocols

Designed and implemented programs for optimization of network protocols in dynamic network traffic conditions using Evolutionary Algorithms (NSGA-II inside ONE simulator) and Artificial Life (Avida platform)

Technologies used:

C/C++/Java 1.7 (General Purpose Programming), **MATLAB/Octave** (Computational), **TinyOS/nesc/Arduino** (Embedded Systems Programming), **ns3** simulator, **awk/Bash** (Scripting), **Avida** Evolutionary Platform and **NSGA-II** (Genetic Algorithms), **Android SDK** (Mobile App Design), **Blender** (3D Printing and Design)

Infosys Limited

Chennai, India and Mysore, India

Systems Engineer (2011-13) and **Systems Engineer Trainee** (2011)

Aug 2011 - Aug 2013

Worked in the Financial Services (banking) domain for about 2 years, delivering projects for one of the largest financial institutions in the world

Developed software solutions on a variety of projects including automatic check image processing and handling, customer information, risk and offers management

Have been involved in all phases of the software development life cycle (design, coding, testing, maintenance) across my projects

Took up the responsibilities of Configuration Controller for my sizable project team

Technical Exposure:

Extensive experience on the Java platform with a good working knowledge on other languages (C, C++, Javascript, Groovy, Python) and programming paradigms (functional e.g. Scala / CLisp, scripting e.g. Bash, computational e.g. MATLAB, Octave)

Exposed to a wide range of established programming frameworks, tools and design patterns

Technologies used:

Java1.6 (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)

RESEARCH PUBLICATIONS

JOURNALS:

1. "Towards Packet-less Ultrasonic Sensor Networks for Energy-harvesting Structures"

- S. Das, H. Salehi, Y. Shi, S. Chakrabartty, R. Bugueno, and S. Biswas
- **Published** in Elsevier **Computer Communications** Journal (Nov 2016)

2. "Towards Delay-Aware Overlay Routing for Better than Best-Effort Services"

- S. Mohamed, S. Das, and Subir Biswas
- **Submitted for review** in Elsevier **Computer Communications** Journal (Feb 2017)

CONFERENCES:

1. "Through-Substrate Event Reporting using Harvested Energy in Ultrasound Sensor Networks"

- S. Das, S. Lorenz, B. Dong, Q. Huo, and S. Biswas
- **Presented** in the **Ad-Hoc and Sensor Networks Symposium** at **Globecom 2015**,
- **Published** in **Proceedings of Globecom 2015**, San Diego, CA, USA (Dec 2015)

2. "Structural Assessment and Damage Identification Algorithms Using Binary Data"

- H. Salehi, S. Das, S. Chakrabartty, S. Biswas, R. Burgueno
- **Published** in **Proceedings of the ASME 2015 Conference on Smart Materials, Adaptive Structures and Intelligent Systems**, Colorado Springs, CO, USA (Sep 2015)

3. "Pulse Position Coded PDUs: A New Approach to Networking Energy Economy"

- D. Feng, F. Hajiaghajani, S. Das, and S. Biswas
- **Accepted for publication** in **Proceedings of the IEEE Consumer Communications and Networking Conference**, Las Vegas, NV, USA (Jan 2017)

WORKSHOPS:

1. "An Experimental Wearable IoT for Data-driven Management of Autism"

- Y. Shi, S. Das, S. Douglas, and S. Biswas
- **Accepted for publication** in **Proceedings of COMSNETS 2017**, Bengaluru, KA, INDIA (Jan 2017)

INVENTION PATENTS

1. "Method and Device For Transmitting Data Using Inter-Pulse Interval Modulation Technique."

- S. Biswas, D. Feng, F. Hajiaghajani, S. Das
- **Filed with U.S. Patent Office** (Dec 2016)
- Contributed in protocol design, verification and documentation

RESEARCH PROJECTS (Ongoing)

1. NASA Badge System for Behavioural Monitoring

(Funded by NASA - Collaboration with team from Psychology department, MSU)

Developed software components of a wireless, networked wearable badge system for behavioural monitoring of human subjects.

Data generated is used for analysis of team cohesion dynamics by Psychology researchers from MSU. Modalities captured by the badges include motion, position, heart rate, and other environmental conditions.

Used nesC(TinyOS) for programming the embedded Cricket platform that forms the heart of the badges. Rudimentary familiarity with 3D printing and design of the badge cases using Blender.

2. Ultrasonic Pulse Modems for Event Monitoring and Through-substrate communication (Funded by SPG (MSU) and NSF – Collaboration with teams from Electrical and Civil Engineering)

Collaborated in the design of platform architecture for structural health monitoring using energy harvested networked sensing devices.

Developed an adaptive and energy-efficient networking protocol for energy harvested networked sensing devices and evaluated the same using simulation experiments.

3. A Wearable Monitoring System for Early Detection of Autism using Classroom Social Interaction Analysis (Collaboration with MSU Human Development and Family Studies)

Collaborated in the design and deployment of wearable, wireless monitoring system for social interaction measurement.

Worked with MSU Human Development team to perform a study with young children in a representative early childhood classroom for evaluation of the system.

Helped develop algorithms for quantifying social interaction using various sensor modalities collected using monitoring system and early detection of autistic conditions for quick intervention.

4. Solar-Powered Ultra Low Energy Sensor Network

Collaborated in the design and development of an end-to-end system (environment to cloud storage) for environmental monitoring using an ultra-low power wireless system driven by harvested solar energy.

Participated in deployment of a proof-of-concept system in MSU Greenhouse for maintenance monitoring of greenhouse ambient conditions.

TRAINING AND COURSES

1. Machine Learning

Completed an online offering of the Stanford University course on Machine Learning hosted on the Coursera Inc. platform and conducted by Prof. Andrew Ng.

The course included programming assignments focused on building practical ML systems like character recognition and recommending systems by implementing the algorithms explained in lectures using Octave programming language.

Completed the course in November 2012 with a final grade of 88% and received a Statement of Accomplishment from Prof. Ng.

2. Artificial Intelligence

Participated in an online course on Artificial Intelligence by Prof Sebastian Thrun, Research Professor at Stanford University and Google Fellow, and Peter Norvig, Director of Research at Google Inc.

The course included an introduction to Artificial Intelligence and discusses with practical examples how techniques such as Probabilistic inference, Unsupervised and Reinforcement Learning can be used to solve complex artificial intelligence problems in a variety of fields ranging from Computer Vision to Natural Language Processing.

The course also touched on theoretical topics such as Game Theory and discusses on filter designs such as Kalman filters, Particle Filters and Hidden Markov models which form the basis of most AI systems.

EXTRA-CURRICULAR ACTIVITIES

Acted as Secretary for League of Electrical Engineering Graduate Students (LEEGS) from 2014-16 helping to organize monthly meetings, peer-help sessions, technical workshops and social gatherings to help the ECE community in MSU and fostering collaboration and camaraderie among them.

Participated in amateur astronomy programmes like the Evening course in astronomy at the M.P. Birla Planetarium, Kolkata and helped to disseminate information and dispel popular superstitions about cosmic events through various awareness programs.

HOBBIES AND INTERESTS

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