Sumanta BOSE **Senior Research Engineer, NTU Singapore**

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Research Interests
- Full-stack distributed ledger technology system research, with specialization in blockchain.
- Mathematical modeling and simulation of semiconductor quantum nanostructures.

Work Experience

Nanyang Technological University, Singapore Nov 2017 – Ongoing
Senior Research Engineer *Advisor*: Prof. K. Y. Lam, Asst. Prof. A. Chattopadhyay
'Cybersecurity Protocol and Mechanism for e-Logistics of Dangerous Goods Tracking Using Blockchain' funded by a ∼$1 million National Research Foundation (NRF) Singapore grant.
I work on full-stack distributed ledger technology systems, with specialization in blockchain.

Research Experience

KdotP Soft., (NTU) Singapore Aug 2016 – Jan 2017
Software Engineering Intern *Advisor*: Assoc. Prof. Weijun Fan
Worked on the simulation engine, database creation and development of a GUI for KdotP Soft, a scientific software for semiconductor physics and device physics simulation.

Indian Institute of Science (IISc) Bangalore, India May 2012 – Oct 2012
Research Intern, Microwave R&D Lab *Advisor*: Prof. K. J. Vinoy
Worked on delay engineering using cascaded microwave all-pass filters for acoustic imaging by chirp waveforms for application in transmission lines acting as dispersive structures.

Qualcomm Inc., Bangalore, India (Offer Declined) Summer 2012
Interim Engineering Intern, Corporate R&D Lab
Selected among top 6 students from NIT Trichy. Not pursued due to personal reasons.

National Institute of Technology (NIT) Trichy, India Dec 2011 – Feb 2012
Research Intern, Antennas Lab *Advisor*: Assoc. Prof. D. S. Kumar
Worked on smart-fractals employing algorithms for rapid beam-forming in smart antennas.

Intl. Institute of Information Technology (IIIT) Hyderabad May 2011 – June 2011
Research Intern, VLSI and Embeded Systems Lab *Advisor*: Asst. Prof. S. R. Chowdhury
Built an intelligent health security system for automated real-time breath rate tracking.

Oil India Limited (OIL), Duliajan, India Dec 2010
Industry Trainee *Advisor*: Mr. T. N. Madhavan
Worked on various electronic/pneumatic instruments and developed a control system model.

Education

Doctor of Philosophy (Ph.D.), Electrical & Electronic Engineering CGPA: 4.63/5.00
Nanyang Technological University (NTU) Singapore 2013 – 2017
Thesis: Semiconductor Quantum Nanostructures for Optoelectronic Applications
Advisor: Assoc. Prof. Weijun FAN and Prof. Dao Hua ZHANG

Bachelor of Technology, Electronics & Communication Engineering CGPA: 8.36/10.0
National Institute of Technology (NIT) Trichy, India 2009 – 2013
FYP: Mathematical Modeling of a Metamaterial Regular Polygon Split Ring Resonator
Advisor: Prof. S. Raghavan

Skillset

Programming: Golang, C++, C/Embedded C, Python, Fortran, Perl, Verilog HDL.
Engineering tools/libraries: MATLAB, Origin, COMSOL, OpenCV, NumPy, SciPy.
Blockchain Platforms: Hyperledger Fabric, Ethereum (Solidity), Corda.
Web technologies: NodeJS, HTML, PHP, CSS, JavaScript.
Operating systems: Linux, Unix, RTOS, ROS, Windows, DOS.
Firmware development: BLE, NFC, RFID Zigbee, I2C, SPI and UART.
Development platforms: Arduino, Raspberry Pi, Beagleboard, TI Launchpad, FPGAs.

Mentoring

Nanyang Technological University (NTU) Singapore
Mentor — Aug 2015 – Aug 2017
Mentored 2 students in their Final Year Projects (FYPs) on semiconductor simulation.

Teaching

Nanyang Technological University (NTU) Singapore
Language consultant, HG4045 Structure of a Language — Spring 2016 – 2017
Recording, transcription, phonemic analysis and documentation of Assamese as a language.

Laboratory assistant, E2004L Digital Electronics — Fall 2016 – 2017
Combinational logic circuits, counter and shift registers, logic circuit simulation.

Teaching assistant, EE1003 Introduction to Materials for Electronics — Spring 2015 – 2016
Characteristics of semiconductors, biomaterials, smart materials and nanomaterials.

Laboratory assistant, EE1071 Introduction to EEE laboratories — Fall 2015 – 2016
Electronic components, working with AC waveforms, soldering and circuit-building.

National Institute of Technology (NIT) Trichy, India
Teaching assistant, EC204 Transmission Lines and Waveguides — Spring 2012 – 2013
Planar transmission lines, composite substrates and electromagnetic CAD tools.

Teaching assistant, EC307 Antennas and Propagation — Spring 2012 – 2013
Microstrip antennas, CNT antennas, metamaterial loaded antennas and wearable antennas.

Non-affiliated teaching
Maker Faire, Singapore — 2015 – 2016
Introduction to Robotics, Arduino, Raspberry Pi, PCB CAD design and 3D printing.

Organization

TheBlockchainSPIRIT Hackathon
Lead Organizer — Jun 2018
Organized a Singapore wide 2-day blockchain hackathon on leading blockchain platforms – Hyperledger, Ethereum and NEM with 100+ participants and international representation.

TEDxNTU
Lead Curator — Apr 2016 – Mar 2017
Co-Curator — Apr 2015 – Mar 2016
Involved in the planning and organization of TEDx (Technology, Entertainment, Design) chapter of NTU Singapore. Served as the lead organizer of the TEDxNTU 2016 edition.

NTU – World of Wisdom (WOW)
Co-Founder and Vice-Chairman — Apr 2015 – Mar 2017
Involved in the development of a think tank bringing together students and providing them with opportunities to mould their skills in diverse areas of science, economics, arts, etc.

NTU – Graduate Student Council (GSC)
Committee Director Apr 2015 – Mar 2016
Involved in the planning and organization of academic workshops and talks. The flagship event is the 3-minute-thesis (3MT) in collaboration with NTU library, Student Life Office.

IEEE Young Professionals, Singapore Chapter
Executive Committee Member Nov 2015 – Nov 2016
Involved in facilitating young graduates to become world class professionals, enhancing their skills and establishing a diverse professional network, through workshops and networking.

Robotics and Machine Intelligence (RMI), NIT Trichy
Head, Electronics division July 2011 – June 2013
Involved in robotics project including micromouse, line-follower, PIR motion sensor, accelerometer controller. Other projects involved image processing and PID control systems.

Honors and Awards

- IEEE Region-10 Young Professionals Affinity Group Award in recognition and appreciation of valued services and contributions; Aug 2016.
- NTU Research Scholarship, for the duration of Aug 2013 – July 2017
- University Graduate Scholarship, University of Glasgow, *offered* 2013
- *Grant for Student* of EUR 750 to present a paper at the 6th Intl. Congress on Adv. Electromagnetic Materials in Microwaves & Optics, St. Petersburg,; Sept 2012.
- Govt. of India's University Grant Commission (UGC) Sponsored Fellowship for Summer Research Internship at Indian Institute of Science (IISc), Bangalore; May – July 2012.

Academic Services

Journal Reviewer
- Institute of Electrical and Electronics Engineers (IEEE): *Journal of Lightwave Technology.*
- Institute of Physics (IOP): *Journal of Physics D: Applied Physics*; *Materials Research Express*; *Nanotechnology*; *2D Materials.*
- Springer Open: *Nanoscale Research Letters.*
- Multidisciplinary Digital Publishing Institute (MDPI): *Computation*; *Applied Sciences*; *Journal of Low Power Electronics and Applications.*

Talks (*Invited*)
- 7th Annual World Congress of Advanced Materials 2018 in Xiamen, China; Sep 2018.
- 4th Annual World Congress of Smart Materials 2018 in Osaka, Japan; Mar 2018.
- 3rd Annual World Congress of Smart Materials 2017 in Bangkok, Thailand; Mar 2017.
- EMN Meeting on Optical Communications 2016 in Dubai; Nov 2016.

Conference Reviewer
- IEEE TENCON 2016 – IEEE Region 10 Conference
- IEEE CRALT 2016 – Conference on Recent Advances in Lightwave Technology
- OPAL'18 – First International Conference on Optics, Photonics and Lasers

Conference International Program Committee Member
- OPAL'18 – First International Conference on Optics, Photonics and Lasers

Professional Memberships

- *Member*, Institute for Electrical and Electronics Engineers (IEEE)
- *Member*, IEEE Photonics Society
- *Life Member*, Society of Electromagnetic Compatibility (EMC) Engineers India, SEMCE(I)

Media Coverage

- 'NIT-T student gets grant to attend conference on metamaterials', The Hindu, Aug 2012
- 'Young India', a mass broadcast radio program by All India Radio (AIR), Oct 2012

Citation Indices

- Citations: 161
- h-index: 7
- i10-index: 5

Thesis Publication

- S. Bose, "Semiconductor Quantum Nanostructures for Optoelectronic Applications", *Doctoral Dissertation*, Nanyang Technological University Singapore, 2018.

Journal Publications

- Y. Liu, S. Bose, W. J. Fan, "Effect of size and shape on electronic and optical properties of CdSe quantum dots", *Optik – International Journal for Light and Electron Optics*, **155**, 242-250, 2018.
- S. Bose, S. Shendre, Z. Song, V. K. Sharma, D. H. Zhang, C. Dang, W. J. Fan, H. V. Demir, "Temperature-dependent Optoelectronic Properties of Quasi-2D Colloidal Cadmium Selenide Nanoplatelets", *Nanoscale*, **9**, 6595-6605, 2017.
- S. Bose, W. J. Fan, D. H. Zhang, "Optoelectronics of Inverted Type-I CdS/CdSe Core/Crown Quantum Ring", *Journal of Applied Physics*, **122** (16), 163102, 2017.
- Z. Song, S. Bose, W. J. Fan, D. H. Zhang, Y. Y. Zhang, S. S. Li, "Quantum Spin Hall Effect and Topological Phase Transition in $InN_xBi_ySb_{1-x-y}$/InSb Quantum Wells", *New Journal of Physics*, **19** (7), 073031, 2017.
- S. Bose, Z. Song, W. J. Fan, D. H. Zhang, "Effect of lateral size and thickness on the electronic structure and optical properties of quasi two-dimensional CdSe and CdS nanoplatelets", *Journal of Applied Physics*, **119** (14), 143107, 2016.
- Z. G. Song, S. Bose, W. J. Fan, S. S. Li, "Electronic band structure and optical gain of $GaN_xBi_yAs_{1-x-y}$/GaAs pyramidal quantum dots", *Journal of Applied Physics*, **119** (14), 143103, 2016.
- W. J. Fan, S. Bose, D. H. Zhang, "Electronic bandstructure and optical gain of lattice matched III-V dilute nitride bismide quantum wells for 1.55μm optical communication systems", *Journal of Applied Physics*, **120** (9), 093111, 2016.
- K. Prabu, S. Bose, D. S. Kumar, "BPSK based subcarrier intensity modulated free space optical system in combined strong atmospheric turbulence", *Optics Communications*, **305**, 185-189, 2013.
- M. Levy, S. Bose, D. S. Kumar, A. V. Dinh, "Rapid beam forming in smart antennas using smart-fractal concepts employing combinational approach algorithms", *International Journal of Antennas and Propagation*, vol. 2012, ID **467492**, 2012.
- M. Levy, S. Bose, A. V. Dinh, D. S. Kumar, "A novelistic fractal antenna for ultra wideband (UWB) applications", *Progress In Electromagnetics Research B*, **45**, 369, 2012.
- S. Bose, M. Ramaraj, S. Raghavan, S. Kumar, "Mathematical modeling, equivalent circuit analysis and genetic algorithm optimization of an N-sided regular polygon split ring resonator (NRPSRR)", *Elsevier Procedia Technology* **6**, 763-770, 2012.
- S. Bose, S. Delikanli, V. K. Sharma, C. Dang, W. J. Fan, D. H. Zhang, H. V. Demir, "Electronic Bandstructure and Excitonic Absorption in CdSe Nanoplatelets", *Nanoscale*. [to submit]
- S. Bose, W. J. Fan, D. H. Zhang, "Optoelectronics of Quasi Two-dimensional CdS_xSe_{1-x} Nanoplatelets", *Journal of Physics D: Applied Physics*. [to submit]

Conference Publications

- S. Bose, M. Raikwar, A. Chattopadhyay, D. Mukhopadhyay, K. Y. Lam, "BLIC: A Blockchain Protocol for IC Manufacturing and Supply Chain Management", *IEEE International Conference on Blockchain (Blockchain)*, 2018.
- S. Mitra, S. Bose, S. Sen Gupta, A. Chattopadhyay, "Secure and Tamper-resilient Distributed Ledger for Data Aggregation in Autonomous Vehicles", *14^{th} IEEE Asia Pacific Conference on Circuits and Systems (APCCAS)*, 2018.
- M. Raikwar, S. Ruj, S. Bose, S. Sen Gupta, A. Chattopadhyay, K. Y. Lam, "Security and Privacy of Permissioned Blockchains", [to submit]
- S. Bose, S. Delikanli, A. Yeltik, M. Sharma, O. Erdem, C. Dang, W. J. Fan, D. H. Zhang, H. V. Demir, "Anomalous Spectral Characteristics of Ultrathin sub-nm Colloidal CdSe Nanoplatelets", *Conference on Lasers and Electro-Optics (CLEO)*, 2017.
- S. Bose, S. Delikanli, M. Z. Akgul, Y. Gao, W. J. Fan, D. H. Zhang, H. V. Demir, "Inverted Type-I CdS/CdSe Core/Crown Colloidal Quantum Ring", *Conference on Lasers and Electro-Optics (CLEO)/Europe and the European Quantum Electronics Conference (EQEC)*, 2017.
- S. Bose, W. J. Fan, D. H. Zhang, "Theoretical Investigations of Excitonic Absorption in Quasi Two-dimensional CdSe Nanoplatelets", *12^{th} Conference on Lasers and Electro-Optics Pacific Rim (CLEO-PR)*, 2017.
- S. Bose, W. J. Fan, D. H. Zhang, "Strain Profile and Size Dependent Electronic Bandstructure of Type-I CdS/CdSe Quantum Ring", *12^{th} Conference on Lasers and Electro-Optics Pacific Rim (CLEO-PR)*, 2017.
- S. Bose, Z. Song, W. J. Fan, D. H. Zhang, "KdotPsoft: Modelling and Simulation of Semiconductors and Device Physics", *9^{th} International Conference on Materials for Advanced Technologies*, 2017.
- Z. Song, S. Bose, W. J. Fan, X. H. Tang, D. H. Zhang, S. S. Li, "Electronic structure and optical gain of $InAs_{1-x-y}N_xB_y$/InP pyramidal quantum dots", *9^{th} International Conference on Materials for Advanced Technologies*, 2017.
- T. Chaudhuri, Y. C. Soh, S. Bose, L. Xie, H. Li, "On assuming Mean Radiant Temperature equal to air temperature during PMV-based thermal comfort study in air-conditioned buildings", *42^{nd} Annual Conf. of the IEEE Industrial Electronics Society, (IECON)*, 2016.
- S. Bose, W. J. Fan, J. Chen, D. H. Zhang, C. S. Tan, "Strain Profile and Size Dependent Electronic Band Structure of GeSn/SiSn Quantum Dots for Optoelectronic Application", *International Conference on Fibre Optics and Photonics*, 2014.
- S. Bose, W. J. Fan, C. Jian, D. H. Zhang, C. S. Tan, "Strain profile, electronic band structure and optical gain of self-assembled Ge quantum dots on SiGe virtual substrate", *7^{th} International Silicon-Germanium Technology and Device Meeting (ISTDM)*, 2014.
- S. Bose, K. J. Vinoy, "Group delay engineering using cascaded all pass filters for wideband chirp waveform generation", *IEEE International Conference on Electronics, Computing and Communication Technologies (CONECCT)*, 2013.
- K. Prabu, S. Bose, D. S. Kumar, "Analysis of optical modulators for Radio over Free Space Optical Communication systems and Radio over Fiber systems", *Annual IEEE India Conference (INDICON)*, 2012.
- S. Bose, M. Ramraj, S. Raghavan, "Design, analysis and verification of Hexagon Split Ring Resonator based Negative Index Metamaterial", *Annual IEEE India Conference (INDICON)*, 2012.
- S. Bose, S. Raghavan, "Theoretical Investigations of a N-sided Regular Polygon Split Ring Resonator with Skew Rotation", *The 6^{th} International Congress on Advanced Electromagnetic Materials in Microwaves and Optics*, 2012 [accepted, but not presented]
  – Awarded 'Grant for Students' - registration fee waiver and travel allowance (EUR 750)

- M. Ramraj, S. Raghavan, S. Bose, S. Kumar, "Elliptical Split Ring Resonator: Mathematical Analysis, HFSS Modeling and Genetic Algorithm Optimization", *Progress In Electromagnetics Research Symposium (PIERS)*, 2012.
- M. Levy, D. S. Kumar, A. Dinh, S. Bose, "A novelistic approach for rapid beam forming in smart antennas for wireless applications using smart-fractal concepts and new algorithm", *International Conference on Advances in Mobile Network, Communication and its Applications (MNCAPPS)*, 2012.
- S. Bose, K. Prabu, D. S. Kumar, "Real-time breath rate monitor based health security system using non-invasive biosensor", *3rd International Conference on Computing Communication & Networking Technologies (ICCCNT)*, 2012.
- S. Bose, K. Prabu, D. S. Kumar, "Array Signal Processing & Optimization using Algorithms in Nature", *International Proceedings of Computer Science & Information Technology*, 2012.

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Personal Particulars

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- Family Name: Bose
- Gender: Male
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Last updated Sep 16, 2018.