

# Sidharth Kumar

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## EDUCATION

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2019–	Ph.D. in ELECTRICAL AND COMPUTER ENGINEERING Current Supervisor : Prof. Jonathan I Tamir <b>The University of Texas at Austin</b>	CGPA: 4/4
2017–19	M.S.(Research) in ELECTRICAL ENGINEERING Advisor : Prof. Swades De <b>Indian Institute of Technology, Delhi</b>	CGPA: 9.935/10
2013–17	B.Tech in ELECTRICAL ENGINEERING <b>Indian Institute of Technology, Delhi</b>	CGPA: 8.905/10

## RESEARCH INTERESTS

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MR Image reconstruction, wireless communication, Machine learning

## PUBLICATIONS

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- **Sidharth Kumar**, and Robert W. Heath Jr., “Multicasting in Frequency Selective Channels with One-bit DACs”, Manuscript under preparation
- **Sidharth Kumar**, Suraj Suman, and Swades De, “Dynamic Resource Allocation in UAV-enabled mmWave Communication Networks”, *IEEE Internet of Things Journal* (early access), ([\\*Link](#))
- Suraj Suman, **Sidharth Kumar**, and Swades De, “Impact of Hovering Inaccuracy on UAV-aided RFET”, *IEEE Communication Letter*, vol. 23, no. 12, pp. 2362 - 2366, Dec. 2019, ([\\*Link](#))
- Suraj Suman, **Sidharth Kumar**, and Swades De, “UAV-assisted RFET: A Novel Framework for Sustainable WSN”, *IEEE Transactions on Green Communications and Networking*, vol. 3, no. 4, pp. 1117 - 1131, Dec. 2019, ([\\*Link](#))
- Chi Zhang<sup>†</sup>, **Sidharth Kumar**<sup>†</sup> and Dinesh Bharadia, “Capttery: Scalable Battery-like Room-level Wireless Power”, *ACM MobiSys’19*, Seoul, South Korea, 17-21 June, 2019, ([\\*Link](#)) (<sup>†</sup> Co-primary authors)
- Suraj Suman, **Sidharth Kumar**, and Swades De, “Path Loss Model for UAV-assisted RFET”, *IEEE Communication Letter*, vol. 22, no. 10, pp. 2048-2051, Oct. 2018, ([\\*Link](#)),
- **Sidharth Kumar**, Swades De and Deepak Mishra, “RF Energy Transfer Channel Models for Sustainable IoT”, *IEEE Internet of Things Journal*, vol. 5, no. 4, pp. 2817-2828, Aug. 2018, ([\\*Link](#))
- Suraj Suman, **Sidharth Kumar** and Swades De, “UAV-assisted RF Energy Transfer”, *IEEE International Conference on Communications (ICC)*, Kansas City, USA, 20-24 May, 2018, ([\\*Link](#))
- **Sidharth Kumar**, Suraj Suman, and Swades De, “Backhaul and Delay-aware Placement of UAV-enabled Base Station”, *IEEE INFOCOM Workshop on Wireless Sensor, Robot and UAV Networks (WiSARN)*, Honolulu, USA, 15-19 April, 2018, ([\\*Link](#))
- **Sidharth Kumar**, Deepak Mishra and Swades De, “An Accurate Channel Model for Optimizing Effect of Non-LOS Component in RF Energy Transfer,” in *Proceedings Twenty Third National Conference on Communication (NCC)*, pp. 1–6, Chennai, India, Mar. 2017, ([\\*Link](#)).

## RESEARCH PROJECTS

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### Summer Internship: Link Error Prediction for Terrestrial Broadcast

Manager:- Alberto Rico Alvarino, Mentor:- Ayan Sengupta, Qualcomm, San Diego

[June 2020 - Aug 2020]

- Performed system-level simulations for single-frequency networks (SFN) for wide-area terrestrial broadcast having very large delay spread due to large inter-site distances.
- Explored different link-error prediction models and proposed a new indicator variable accounting ISI and ICI to predict BLER values for different TDL channel profiles.

### Millimeter-Wave Multicasting with Low-resolution transceivers

Supervised by Prof. Robert W. Heath Jr., UT Austin

[Sep 2019 - May 2020]

- Designed frequency domain precoding for multicasting with low resolution digital to analog convertors (DACs).

- Numerically evaluated proposed beamforming algorithm for different mmWave channel realizations.

### **System Design for wireless power transfer using capacitive coupling methods**

Supervised by Prof. Dinesh Bharadia, UC San Diego

[May 2018 - Dec 2018]

- Investigated the feasibility of capacitive power transfer for IoT devices by conducting extensive simulations in Ansys Maxwell and Simplorer for different geometrical configurations.
- Proposed compensation network topologies for both the transmitter and receiver to maximize power transfer. Built an experimental setup to corroborate simulation results.

### **Wireless communication and networking system design for UAV-enabled base station**

Supervised by Prof. Swades De, IIT Delhi

[Dec. 2017 - July 2019]

- Proposed framework for evaluating the optimal UAV deployment altitude satisfying the coverage, load traffic constraints and backhaul limitations.
- Solved the mixed-integer non-convex power and subcarrier allocation problem using Lagrangian dual decomposition method.

### **UAV based wireless energy transfer to make sensor networks sustainable**

Supervised by Prof. Swades De, IIT Delhi

[July 2017 - July 2019]

- Presented new channel model for low altitude UAV platforms, suitable for wireless RF energy transfer. Introduced notion of RFET zone and calculated effective power available based on shadow statistics of new channel.
- Proposed two novel strategies for charging of sensors by UAV mounted RF transmitter. Charging time was evaluated by solving optimization problem under practical UAV energy constraints.
- Developed a super-capacitor charging and discharging model suitable for constant power stimulus given by RF-to-DC power converter circuit.

### **Wireless Channel Propagation Model for RF Energy Transfer**

Supervised by Prof. Swades De, IIT Delhi

[August 2016 - July 2017]

- Proposed a novel channel model for accurately characterizing harvested DC power at receiver in wireless RFET, further experimentally verified model by carrying out extensive experiments in anechoic chamber.
- Formulated an optimization problem by accounting for effect of NLOS component to maximize RFET efficiency, moreover presented a computationally-efficient golden section based iterative algorithm.
- Evaluated the statistical parameters for Rician and path loss with shadowing based wireless channel model for RFET through extensive energy measurements in real life scenarios.

## **SCHOLASTIC ACHIEVEMENTS**

- **UT Engineering Fellowship Award** from Cockrell School of Engineering (UT Austin) [2019]
- Awarded **SN Bose fellowship** for pursuing research internship at University of California San Diego [2018]
- Awarded **Rajiv Bambewale award** for best project work in B.Tech Thesis [2017]
- Recipient of **BOSS award, IIT Delhi** for best experimental project in B.Tech Thesis [2017]
- Recipient of **IIT Delhi Semester Merit Award** in 6<sup>th</sup>, 7<sup>th</sup>, & 8<sup>th</sup>, semester for making it to **top 7%** [2016-17]
- Awarded Alumni Association IIT Delhi Award for **best academic improvement** [2014-2015]
- Secured **All India Rank 295** (GE) in JEE Advanced given by 150,000 students [2013]
- Awarded merit certificate in NSEP (Physics Olympiad) for ranking among **national top 1%** [2012]
- Awarded merit certificate in NSEC (Chemistry Olympiad) for ranking among **state wise top 1%** [2012]

## **MISCELLANEOUS**

### **Teaching Assistantship:**

- Microwaves Laboratory (ELP719), July 2018 - December 2018
- Digital Signal Processing (ELL319), July 2017 - December 2017
- Signal and Systems (ELL205), January 2017 - May 2017
- Introduction to Electrical Engineering (ELL100), July 2016 - December 2016

### **Technical Skills:**

- Familiar with: MATLAB, Python, C++, TensorFlow, Verilog,  $\LaTeX$
- **Softwares:** Ansys (Maxwell, Simplorer), Wireless InSite, LTspice, GNU Radio, FDTD (Lumerical, meep)

### **Relevant Coursework:**

- Wireless Communication, Digital Communication, Antenna Theory & Techniques, Signal Theory, MIMO wireless communication, Computer Communication, Digital Signal Processing, Biomedical Imaging Modalities
- Data Mining, Online Learning, Machine Learning, Optimizations in Communication Networks, Game theory models in distributed network opt.