



## Naveed Anwar Bhatti

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Sex Male | Date of birth 22/09/1988 | Nationality Pakistani

**Research Themes:** Embedded Systems Security, IoT, Cyber Physical Systems, Energy Neutral Systems.

### EDUCATION

November, 2014 – Feb 2018

#### Ph.D. (Computer Science)

Politecnico di Milano, Milan, Italy

**Ph.D. Thesis:** *System Support for Transiently-Powered Embedded Sensing Systems*

**Advisor:** Prof. Luca Mottola

The focus of my doctoral research is to enable transiently-powered embedded sensing devices to make progress across periods of energy unavailability by developing software techniques. As energy availability is likely erratic in ambient harvesting or wireless energy transfer settings, applications may be unpredictably interrupted. To behave dependably, applications should resume from where they left as soon as energy is newly available.

August, 2011 – July 2013  
(Gold Medal)

#### MS (Computer Science)

National University of Computer and Emerging Sciences (FAST-NUCES), Islamabad

**MS Thesis:** *Long range RF-based ID (LRFID) System: Decoupling sensing and energy in sensor networks using energy transference*

**Advisor:** Dr. Affan Syed    **Co-Advisor:** Dr. Muhammad Hamad Alizai (LUMS)

August, 2007 – July 2011

#### BS (Telecommunication)

National University of Computer and Emerging Sciences (FAST-NUCES), Islamabad

**Final Year Project:** *Internet controlled unmanned ground vehicle (UGV)*

**Advisor:** Dr. Waseem Ikram

### WORK EXPERIENCE (~8 Years)

Sep, 2019 - Current

#### Assistant Professor

Air University, Islamabad, Pakistan

April, 2019 – Sep, 2019  
(6 months)

#### Senior Researcher

RISE SICS, Stockholm, Sweden

April, 2018 – March, 2019  
(1 year)

#### ERCIM Alain Bensoussan Post-Doctoral Fellowship

RISE SICS, Stockholm, Sweden

##### Smart Implicit Interactions:

This project is built around developing a new interface paradigm for IoT called “smart implicit interaction”. Implicit interactions stay in the background thriving on data analysis of speech, movements and other contextual data, avoiding unnecessarily disturbing us or grabbing our attention. This project is a collaborated work between researchers from RISE SICS, Stockholm University and KTH Royal Institute of Technology.

##### Internet of Things Security:

IoT is now becoming an integrated part of our society’s infrastructure. As we become increasingly reliant on IoT systems to perform critical functions, it becomes apparent that security and safety concerns must be taken seriously. An important step is to enable memory isolation, by means of compiler tools, OS mechanisms, and building on a memory-protection unit (MPU) and/or Trusted Execution Environments (TEE). In this project, we investigated security aspects for intermittent computing systems, which form the foundation for the next generation battery-less Internet of Things by using energy harvesting to power their operation.

Feb, 2012 – Oct, 2014  
(2 years and 8 months)

## Research Associate

SysNet Lab, National University of Computer and Emerging Sciences (FAST-NUCES), Islamabad

### Wireless Sensor Networks:

- Hands on experience of installation and configuration of TinyOS.
- Analyse different wireless energy transference techniques that can be used in WSNs.
- Hands on experience on TelosB, Waspote, Arduino and several others

### Botnet Detection:

- Hands on experience of installation and configuration of Bro- Intrusion Detection System.
- Worked on the detection of different kinds bot's and study the life cycle of a botnet.
- Analysis of a 2.7TB (4 days) network trace for botnet detection using Bro-IDS & tshark.
- Lead a team of researchers to deliver a project on real time ISP based detection of botnets.

August 2013- Dec 2013  
August 2012- Dec 2012  
August 2011- Dec 2011  
(1 year and 4 months)

## Teacher Assistant of “Advance Embedded Systems” course for MS (TE)

National University of Computer and Emerging Sciences (FAST-NUCES), Islamabad

- Conducted tutorial labs for TelosB, Mbed and MSP430 platforms.
- Mark Quizzes, Sessionals and Finals

## ACADEMIC SERVICES

- 2021 ▪ Reviewer **ACM Computing Survey**
- 2019 ▪ Reviewer Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies
- 2019 ▪ Technical Program Committee (TPC) member of **IEEE ICPADS'19** Conference
- 2019 ▪ Technical Program Committee (TPC) member of **IEEE ISIoT'19** Conference
- 2019 ▪ Technical Program Committee (TPC) member of **ACM/IEEE IoTDI'19** Poster/Demo
- 2019 and 2018 ▪ Web and Social Chair of **ACM/IEEE IPSN 19** and **IPSN 18** conferences
- 2019 ▪ Reviewer Springer Swarm Intelligence
- 2019 ▪ Reviewer IET Electronic Letters
- 2019, 2018 and 2016 ▪ Reviewer IEEE Transactions on Sensor Networks (TOSN)
- 2015 ▪ Reviewer International Journal of Distributed Sensor Networks (IJDSN)
- 2015 ▪ Reviewer ACM Internetware'15 Conference

## FUNDED PROJECTS

- 2022 "Cleanify: AI-Based Waste management system using Battery-less IoT devices" NRPU Research Fund. **Rs. 9.5/- Million.**
  - Role: PI
  - Awarded: Dec 2022 – Dec 2024
- 2021 "SCYDES - Self Cyber Defense Evaluation System" NCCS Research Fund. **Rs. 14.972/- Million.**
  - Role: PI.
  - Awarded: Feb 2021 – Sep 2022
- 2021 "ReCyP:HER - Rethinking Cybersecurity in Pakistan Human factors' Essential Role" Erasmus+ Research Fund.
  - Role: Leader WP3 and WP7.
  - Awarded: Jan 2021 – Jan 2024

## AWARDS & ACHIEVMENTS

- 2022 ▪ Vice Chancellor Commendation Award (Air University)
- 2022 ▪ Best Teacher Award (Cyber Security Department, Air University)
- 2018 ▪ Recipient of a 12 month ERCIM Alain Bensoussan Postdoc fellowship
- 2017 ▪ Best Ph.D. Forum Presentation award in IPSN 2016
- 2014 ▪ Recipient of a Ph.D. grant from the Italian govt at Politecnico di Milano
- 2013 ▪ Recipient of the Gold Medal of MS (CS) graduating class of 2011 (at FAST-NUCES)
- 2012 ▪ Best Cloud Computing course project Issued by: Microsoft Research and FAST-NUCES Islamabad

- 2011 ▪ Best Final Year Project BS (Telecom) – Issued by: FAST-NUCES Islamabad
- 2010 ▪ Winner ROBOTON Issued by: IEEE GIKI

## TEACHING

### 9 different courses taught, two of which were newly developed courses

- 2022 ▪ Embedded Systems Security (ESS) (CyS-367)
- 2022 ▪ Critical Infrastructure Security (CyS-697)
- 2022 and 2021 ▪ Research Methodology (CS-692)
- 2021 ▪ Cyber Security Tool Development (CyS-353)
- 2021 and 2020 ▪ Object Oriented Programming (CS-210)
- 2020 ▪ Embedded System (CS-602)
- 2020 ▪ Drone and Autonomous Vehicle Security (CS-634)
- 2019 ▪ Introduction to Computing (CS-156)
- 2019 ▪ OOP and Data Structures (CS-200)
- 2013, 2012 and 2011 ▪ Teacher Assistant for EE522(Advance Embedded System at FAST-NUCES)

## PUBLICATIONS

### 18 peer-reviewed publications, including:

- 8 journal articles, of which 3 ACM or IEEE Transactions articles
- 8 papers at conferences with CORE rank A\* or A, of which 2 ACM/IEEEIPSN papers, 1 ACM SENSYS papers, and 1 ACM EWSN papers.

–Totalling 430+ citations, H index is 9 with first paper published in 2014 (source: Google Scholar).

- JOURNAL ▪ Dileep Kumar Soother, Sanaullah Mehran Ujjan, Kapal Dev, Sunder Ali Khowaja, **Naveed Anwar Bhatti**, Tanweer Hussain" Towards soft real-time fault diagnosis for edge devices in industrial IoT using deep domain adaptation training strategy", **Elsevier Journal of Parallel and Distributed Computing, November 2021. (Impact Factor = 3.734)**
- JOURNAL ▪ Ali Akbar Shah, **Naveed Anwar Bhatti**, Kapal Dev, B.S Chowdhry, "MUHAFIZ: IoT-based Track Recording Vehicle for the Damage Analysis of the Railway Track" **IEEE Internal of Things Journal (IoTJ), March 2021. (Impact Factor = 9.9)**
- JOURNAL ▪ Saad Ahmed, **Naveed Anwar Bhatti**, Martina Brachmann, Muhammad Hamad Alizai" A Survey on Program-state Retention for Transiently-powered Systems", **Journal of Systems Architecture, Elsevier, Jan 2021. (Impact Factor = 2.552)**
- CONFERENCE ▪ Afanasov, Mikhail, **Naveed Anwar Bhatti**, Dennis Campagna et al. "Battery-less zero-maintenance embedded sensing at the mithræum of circus maximus." **In Proceedings of the 18th Conference on Embedded Networked Sensor Systems (SenSys), November 2020..**
- TRANSACTION ▪ Saad Ahmed, **Naveed Anwar Bhatti**, Muhammad Hamad Alizai, Junaid Haroon Siddiqui, Luca Mottola: Fast and Energy-efficient State Checkpointing for Intermittent Computing, **ACM Transactions on Embedded Computing Systems (TECS), 2020, (Impact Factor = 1.72).**
- TRANSACTION ▪ Saad Ahmed, Abu Bakar, **Naveed Anwar Bhatti**, Muhammad Hamad Alizai, Junaid Haroon Siddiqui, Luca Mottola: Demystifying Energy Consumption Dynamics in Transiently-powered Computers, **ACM Transactions on Embedded Computing Systems (TECS), 2020, (Impact Factor = 1.72).**
- JOURNAL ▪ Syeda Sundus Zehra, Rehan Qureshi, Kapal Dev, Saleem Shahid, **Naveed Anwar Bhatti**. "Comparative Analysis of Bio-Inspired Algorithms for Underwater Wireless Sensor Networks", **Wireless Personal Communications, Springer, May 2020. (Impact Factor = 1.2)**
- CONFERENCE ▪ Saad Ahmed, Abu Bakar, **Naveed Anwar Bhatti**, Muhammad Hamad Alizai, Junaid Haroon Siddiqui and Luca Mottola, "*The Betrayal of Constant Power × Time: Finding the Missing Joules of Transiently-Powered Computer*", Languages, Compilers, and Tools for Embedded Systems 2019 (LCTES '19), **June 2019, Arizona (USA).**

- CONFERENCE ▪ Saad Ahmed, **Naveed Anwar Bhatti**, Muhammad Hamad Alizai, Junaid Haroon Siddiqui and Luca Mottola, "*Efficient Intermittent Computing with Differential Checkpointing*", Languages, Compilers, and Tools for Embedded Systems 2019 (LCTES '19), **June 2019, Arizona (USA)**.
- POSTER ▪ Saad Ahmed, MH Alizai, JH Siddiqui, **Naveed Anwar Bhatti**, L Mottola, "Towards smaller checkpoints for better intermittent computing", ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN), **April 2018, Porto (Portugal)**.
- CONFERENCE ▪ **Naveed Anwar Bhatti** and Luca Mottola, "*HarVOS: Efficient Code Instrumentation for Transiently-powered Embedded Devices*", ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN), **April 2017, Pittsburgh (USA)**.
- CONFERENCE ▪ **Naveed Anwar Bhatti** and Luca Mottola "*Compiler-assisted Automatic Checkpointing for Transiently powered Embedded Devices*", EWSN, **Feb 2017, Uppsala (Sweden)**.
- POSTER ▪ **Naveed Anwar Bhatti**, "*Back to The Future: Sustainable Transiently Powered Embedded Systems*", IPSN, **April 2016, Vienna (Austria)**. **Best PhD Forum Presentation**
- TRANSACTION ▪ **Naveed Anwar Bhatti**, Hamad Alizai, Affan A.Syed and Luca Mottola, "*Energy Harvesting and Wireless Transfer in Sensor Network Applications: Concepts and Experiences*", **ACM Transactions on Sensor Networks (TOSN)**, April **2016**. (Impact Factor = 2.7).
- CONFERENCE ▪ **Naveed Anwar Bhatti**, Luca Mottola, "*Efficient State Retention for Transiently-powered Embedded Sensing*", International Conference on Embedded Wireless Systems and Networks (**EWSN 2016**), **Feb 2016, Graz (Austria)**.
- JOURNAL ▪ **Naveed Anwar Bhatti**, Affan A.Syed and Hamad Alizai, "*Laser based Energy Distribution Architecture for Decoupling Energy and Sensing Planes in WSN*", **International Journal of Distributed Sensor Networks (IJDSN)**, **2015**.
- CONFERENCE ▪ Osama Haq, Zainab Abaid, **Naveed Anwar Bhatti**, Zaafar Ahmed and Affan A.Syed, "*SDN-inspired, Real-time Botnet Detection and Flow-blocking at ISP and Enterprise-level*", IEEE International Conference on Communications (**ICC 2015**), **June 2015, London (UK)**
- CONFERENCE ▪ **Naveed Anwar Bhatti**, Affan A.Syed and Hamad Alizai, "*Sensors with Lasers: Building a WSN Power Grid*", The 13th ACM/IEEE Conference on Information Processing in Sensor Networks (IPSN), **April 2014, Berlin (Germany)**.

## TALKS AND WORKSHOPS

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- 18<sup>th</sup> April, 2018 ▪ **Transiently-powered Computing Tutorials (11<sup>th</sup> Cyberphysical Systems week (CPSWEEK) held in Porto, Portugal)**  
Tutorial on transiently-powered computing has been presented.
- 15<sup>th</sup> April, 2017 ▪ **Transiently-powered Embedded Systems (RISE-SICS, Stockholm, Sweden)**  
Gave talk on Transiently-powered Embedded Systems: challenges and applications
- 25<sup>th</sup> July, 2016 ▪ **Internet of things workshop (ComSys lab, RWTH Aachen, Germany)**  
Gave talk on Internet of Things Workshop with a focus on transiently-powered sensing systems
- 28<sup>th</sup> May, 2015 ▪ **Aerial drone showcase at Polifactory (Politecnico di Milano - Campus Bovisa)**  
Conducted a workshop to show the potential of drones as tools to enable advanced mobile sensing.
- 8<sup>th</sup> June, 2015 ▪ **Interactive lecture on embedded sensing (Politecnico di Milano - Campus Bovisa)**  
Gave talk on Embedded sensing, which is the technology behind the internet of things, cyberphysical systems, and wireless sensor networks.

## STUDENT MENTORSHIP

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**Currently advising 3 PhD students and 6 MS students**

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- 2022 • **Kashif Javed.** Towards a Sleep Mode-Enabled Interleaved Multi-Approximate Intermittent Computing (Master Student, Air University) – **Completed**
- 2019 • **Dragoş Perju,** Applying Memoization as an Approximation Technique for Transiently-powered Embedded Systems (Master Student, KTH) - **Completed**
- 2019 • **Erik Henricus Wouters,** Securing Intermittent Computing (Master Student, KTH) - **Completed**

## TECHNICAL SKILLS

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Hardware	Atmel SAM L11 (with ARM TrustZone)	WASP Motes	ST Nucleo L152RE	ST Nucleo F091RC
	TelosB mote	NXP Mbed LPC1786	HackRF	AVR ATMEGA-1
	MSP430 Launchpad	Arduino (multiple variants)	Raspberry Pi	ESP32 (Node MCU)
Software	TinyOS 2.1.1	Keil uVision v5	Visual Studio	Bro 2.1 (NIDS)
	Verilogger Pro	Django Web Framework	Atmel Studio 7	PyCharm
	Arduino IDE 2.0	Eclipse		
Languages	Python	C++	C#	Java
	nesC	Matlab	HTML/CSS	SQL

## REFERENCES

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- **Dr. Luca Mottola**  
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Dipartimento di Elettronica, Informazione e Bioingegneria  
Politecnico di Milano, Italy
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