

ABU BAKAR

Ph.D. Student (Computer Science)

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🌐 <http://abubakar.info/>

RESEARCH INTERESTS

I am interested in building batteryless sensors and enabling their large scale deployment in daily life applications—from smart cities to smart buildings, wildlife tracking and wearables. My goal is to develop new hardware designs, software techniques, and tools so that novice developers and hobbyists can easily design, debug, and deploy sustainable batteryless sensors in dynamic and constrained energy harvesting environments.

EDUCATION

Northwestern University

Ph.D. in Computer Science, GPA: 3.73/4.0

📍 Evanston, Illinois

📅 2018 – Current

Advisor: Josiah Hester

Focus: Adaptive Intermittent Computing

National University of Computer and Emerging Sciences (NUCES)

B.S. in Electrical Engineering, GPA: 3.59/4.0

📍 Islamabad, Pakistan

📅 2012 – 2016

PUBLICATIONS

Conference Papers

Time-sensitive Intermittent Computing Meets Legacy Software

Vito Kortbeek, Kasim Yildirim, **Abu Bakar**, Jacob Sorber, Josiah Hester, Przemyslaw Pawelczak
25th ACM International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS), 2020 [To Appear]

The Betrayal of Constant Power × Time: Finding the Missing Joules of Transiently-Powered Computers

Saad Ahmed, **Abu Bakar**, Naveed Anwar Bhatti, Muhammad Hamad Alizai, Junaid Haroon Siddiqui, Luca Mottola
ACM SIGPLAN/SIGBED 2019 Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES), 2019

Inverting HVAC for Energy Efficient Thermal Comfort in Populous Emerging Countries

Khadija Hafeez, Yasra Chandio, **Abu Bakar**, Ayesha Ali, Affan A. Syed, Tariq M. Jadoon, Muhammad Hamad Alizai
4th ACM International Conference on Systems for Energy-Efficient Built Environments (BuildSys), 2017

Design of a Laser Tracker Using 2-DOF Stepper Controlled Platform

Abu Bakar, Neelam Nasir, Mukhtar Ullah, Zeashan Hameed Khan
2nd IEEE International Conference on Robotics and Artificial Intelligence (ICRAI), 2016

Workshop Papers

Making Sense of Intermittent Energy Harvesting

Abu Bakar, Josiah Hester
6th International Workshop on Energy Harvesting & Energy-Neutral Sensing Systems (ENSsys), 2018

Journals

Demystifying Energy consumption Dynamics in Transiently Powered Computers

Saad Ahmed, M. NawaZ **Abu Bakar**, Naveed Anwar Bhatti, M. Hamad Alizai, Junaid Haroon Siddiqui, Luca Mottola
ACM Transactions on Embedded Computing Systems (TECS), 2020

Inverted HVAC: Greenifying Older Buildings, One Room at a Time

Samar Abbas, Abu Bakar, Yasra Chandio, Khadija Hafeez, Ayesha Ali, Tariq M. Jadoon, Muhammad Hamad Alizai
ACM Transactions on Sensor Networks (TOSN), 2018

Posters

The Energy Harvesting Mode Abstraction

Abu Bakar, Josiah Hester

16th ACM Conference on Embedded Networked Sensor Systems (SenSys), 2018

WORK EXPERIENCE

LUMS School of Science and Engineering (SSE) – SysNet Lab

📍 Lahore, Pakistan

Research Assistant

📅 2016 – 2018

Advisor: Muhammad Hamad Alizai, Junaid Haroon Siddiqui

Focus: Intermittent computing, Embedded systems, Building systems (Publications: BuildSys' 17, LCTES' 19)

Worked on developing: i) energy-efficient inverted HVAC system, ii) hardware platform for evaluating *DICE*, a system that achieves differential checkpointing in intermittent computing, and iii) mechanism for predicting dynamic energy consumption of batteryless devices at compile time.

NUCES – SysNet Lab

📍 Islamabad, Pakistan

Undergraduate Research Intern

📅 Summer 2014

Advisor: Affan A. Syed

Focus: Wireless Sensor Networks, Wireless energy transference (Publications: IPSN' 14)

Worked on decoupling energy from sensing activities by a wireless energy distribution architecture using 808nm laser.

TEACHING EXPERIENCE

CS365: Data Communication & Networks

Spring 2017, Information Technology University

CS677: Internet of Things

SSE Fall 2016, LUMS

CS214: Programming Fundamentals

Fall 2015, NUCES

EE112: Programming for Engineers-II

Fall 2014, NUCES

EE110: Programming for Engineers-I

Spring 2014, NUCES

AWARDS & ACHIEVEMENTS

NSF Travel Grant – ACM ENSsys, 2018

People's Choice Award – ACM BuildSys, 2017

Dean's Honor List – NUCES, Spring 2013 – Spring 2016

Silver and Bronze medal – NUCES, Spring 2013 – Spring 2016

Best Intern Award – SysNet, 2014

OTHER PROJECTS

32-bit pipelined CPU using MIPS architecture

Implemented CPU design in VHDL which supported 15 assembly instructions with full-forwarding and hazard detection capabilities

PID based autonomous line following mobile robot

Designed using IR sensors and implemented PID algorithm for efficient motion control. Won many competitions including zonal round of International Robotics Challenge (IRC) in Pakistan

Video Graphics Array (VGA) on FPGA

Implemented a Pac-Man like game and displayed it on a monitor directly from FPGA in real-time

SKILLS

Communication

English: Fluent Urdu: Native language

Platforms & Tools

Ekho, Flicker, MSP430, FPGA, Nucleo, mbed, Arduino, Atmel, Telosb, Z1 mote
TinyOS, Contiki, Modelsim, Xilinx Spartan-3, MATLAB, Keil, Proteus

Programming

C, C++, Python, CircuitPython, VHDL, Verilog, Assembly, NesC

Last updated: January 23, 2020