

Research Interest

I work towards building a sustainable future for computing by providing system support for battery-less embedded devices. My research revolves around developing compiler and run-time techniques to enable long-running and computationally complex applications on embedded devices powered by harvested energy. I apply my work to mobile health, and building novice/maker tools for working with energy harvesting devices. My research interests also include wearable computing, low-power wireless sensors, and computer architecture.


I have published in 8 A*/A conferences (according to CORE rankings) such as Ubi-Comp(2x), SenSys, IPSN, EuroSys, EWSN, LCTES (2x), and top computing journal such as TECS and TCPS. My work has been covered by top media outlets such as Scientific American, TechCrunch, Gizmodo, Forbes, the ACM Tech News and many more.

Education

- 2016–2020 **PhD, Computer Science**, *LUMS School of Science and Engineering*, Pakistan.
Advisor: Dr. Muhammad Hamad Alizai
Dissertation: *Fast and Energy-efficient Intermittent Computing*
- 2014–2016 **MS, Computer Science**, *LUMS School of Science and Engineering*, Pakistan.
Advisor: Dr. Asim Karim
- 2009–2013 **BS, Computer Science**, *National University of Computer and Emerging Sciences*, Pakistan.
Advisor: Dr. Fakhar-ul-Islam Lodhi
Project: *PL/SQL to MySQL Conversion*
🏆 **Bronze Medal: Among top 2% in a batch of 200 students**

Selected Five Publications

- EuroSys'23 **Efficient and Safe I/O Operations for Intermittent Systems.**
Eren Yildiz*, Saad Ahmed, Bashima Islam, Josiah Hester, Kasim Sinan Yildirim
To appear in European Conference on Computer Systems (EuroSys'23)
Acceptance rate = 14%
* I was the lead advisor for the student
- SenSys'22 **Protean: Adaptive Battery-free Computing Platform.**
Abu Bakar, Rishabh Goel, Jasper de Winkel, Jason Huang, Saad Ahmed, Bashima Islam, Przemysław Pawełczak, Kasim Sinan Yildirim, Josiah Hester
InACM Conference on Embedded Networked Sensor Systems (SenSys'22)
ACM SIGMOBILE Research highlight

- UbiComp'22 **Battery-free MakeCode: Accessible Programming for Intermittent Computing.**
Chris Kraemer, Amy Guo, Saad Ahmed, Josiah Hester
ACM Conference on Pervasive and Ubiquitous Computing (UbiComp'22)
Published in PACM IMWUT, Volume 5, Issue 4
Covered by ACM Tech News
- UbiComp'22 **FaceBit: Smart Facemask Platform.**
Alexander Curtiss, Blaine Rothrock, Abu Bakar, Nivedita Arora, Jason Huang, Zachary Englehardt, Aaron-Patrick Empedrado, Chixiang Wang, Saad Ahmed, Yang Zhang, Nabil Alshurafa, Josiah Hester
ACM Conference on Pervasive and Ubiquitous Computing (UbiComp'22)
Published in PACM IMWUT, Volume 5, Issue 4
Fast Company's Innovation by Design Award Finalist
Covered by Top media outlets including Scientific American, TechCrunch, Forbes, Gizmodo and many more.
- EWSN'20 **Intermittent Computing with Dynamic Voltage and Frequency Scaling.**
Saad Ahmed, Qurat-u-Ain, Junaid Haroon Siddiqui, Luca Mottola, Muhammad Hamad Alizai
International Conference on Embedded Wireless Systems and Networks (EWSN'20)
 **Best Paper Nominee**
- ACM TCPS **ASHRAY: Enhancing Water-usage Comfort in Developing Regions using Data-driven IoT Retrofits.**
Samar Abbas, Ahmed Ehsan, Saad Ahmed, Sheraz Ali Khan, Tariq Muhammad Jadoon, Muhammad Hamad Alizai
ACM Transactions on Cyber-Physical Systems (ACM TCPS)

Academic Achievements & Recognitions

- 2023 Nomination for the College of Computing Postdoctoral Researcher Award
- 2023 Protean got selected for the **ACM SIGMOBILE Research Highlight**
- 2022 FaceBit was the **Fast Company's Innovation by Design Award Finalist**
- 2021 Selection for the prestigious **Alexander Von Humboldt** postdoctoral fellowship, Germany.
- 2020 D²VFS nominated for **Best Paper Award** nominated at EWSN
- 2017 **First position** in Intermittent Computing Hackathon at IDEA League Doctoral School
- 2013 **Bronze Medal**, Faculty of Computing, NUCES, Pakistan
- 2010-12 **Dean's Honor List**, Faculty of Computing, NUCES, Pakistan
- 2013 Final Year Project among **top 10%**, Faculty of Computing, NUCES
- 2010 Merit Based Selection for visiting UK's & EU's Top Universities, Govt. Of Punjab, Pakistan
- 2009-13 National Talent Scholarship, Govt. Of Punjab, Pakistan
- 2009 Academic Roll of Honour, Govt. College University Lahore, Pakistan
- 2009 **Gold Medal**, Higher Secondary School Exam, Pakistan

Research Impact

8 peer-reviewed conference papers (all of them are A or A* conferences as per CORE 2018 Conference Ranking)

3 peer-reviewed papers in ACM Transactions journals 3 refereed poster abstracts

Professional Experience

Georgia Institute of Technology, USA

Oct 2022 – **Postdoctoral Researcher**
Present **Mentor: Dr. Josiah Hester.**

Northwestern University, USA

Dec 2020 – **Postdoctoral Researcher**
Sep 2022 **Mentor: Dr. Josiah Hester.**

Techlogix Inc., Pakistan

May 2013 – **Software Engineer.**
Nov 2014

Research Experience

LUMS School of Science and Engineering, Pakistan

May 2020 – **Research Associate**
Nov 2020 **Advisor: Dr. Muhammad Hamad Alizai.**

May 2016 – **Graduate Research Assistant**
Nov 2020 **Advisor: Dr. Muhammad Hamad Alizai.**

RWTH Aachen, Germany

July 2016, **Visiting Researcher**
Aug 2017 **Host: Dr. Klaus Wehrle.**

LUMS School of Science and Engineering, Pakistan

Jan 2016 – **Research Assistant**
Aug 2016 **Advisor: Dr. Muhammad Hamad Alizai.**

Community Service

Peer Review

Feb. 2023 IMWUT

Feb. 2023 Ad Hoc Networks
Oct. 2022 Journal of Systems Architecture
March. 2021 Ad Hoc Networks
Oct. 2020 IEEE Transactions on Mobile Computing
July 2020 ACM Transactions on Sensor Networks
Oct. 2019 International Journal of Computer and Telecommunications Networking
Sept. 2019 IEEE International Conference on Parallel and Distributed Systems (ICPADS)
Undergraduate Research
July 2022 Judge for the undergraduate research expo, Northwestern University

Talks

Nov-2020 Fast and Energy-efficient Intermittent Computing,
University of Southampton, UK
Nov-2020 Fast and Energy-efficient Intermittent Computing,
KTH Royal Institute of Technology, Stockholm, Sweden
Feb-2020 Intermittent Computing with Dynamic Voltage and Frequency Scaling,
EWSN, Lyon, France
June-2019 Differential Checkpointing for Intermittent Programs,
LCTES, Phoenix AZ, USA
June-2019 Finding the Missing Joules of Transiently-powered Computers,
LCTES, Phoenix AZ, USA
Aug-2016 Incremental Checkpoints for Interruptible Computations,
RWTH Aachen, Aachen, Germany

Fellowships & Grants

2021 Alexander Von Humboldt Research Fellowship (Selection), Germany
2020 National Data Center Travel Grant to attend EWSN, LUMS
2019 Student Travel Grant worth to attend LCTES, LUMS
2018 CPS Week Travel Grant to attend IPSN, CPS Week
2017 Travel Grant to attend Doctoral Colloquium at RWTH Aachen, DAAD
2016 Travel Grant to attend Doctoral Colloquium at RWTH Aachen, DAAD

Publications

In Preparation

P2 **Batteryless Health Sensing powered by Intra-body Power Transfer.**
Saad Ahmed, Eren Yildiz, Bashima Islam, Kasim Sinan Yildirim, Josiah Hester

P1 Data Cache for Intermittent Computing Systems with Non-Volatile Main Memory.

Vito Kortbeek, Sourav Mohapatra, Saad Ahmed, Przemysław Pawełczak

In Conference Proceedings

C8 Efficient and Safe I/O Operations for Intermittent Systems.

Eren Yildiz*, Saad Ahmed, Bashima Islam, Josiah Hester, Kasim Sinan Yildirim

To appear in European Conference on Computer Systems (EuroSys'23)

Acceptance rate = 14%

***I was the lead advisor for the student**

C7 Protean: Adaptive Battery-free Computing Platform.

Abu Bakar, Rishabh Goel, Jasper de Winkel, Jason Huang, Saad Ahmed, Bashima Islam, Przemysław Pawełczak, Kasim Sinan Yildirim, Josiah Hester

In ACM Conference on Embedded Networked Sensor Systems (SenSys'22)

ACM SIGMOBILE Research highlight

C6 Battery-free MakeCode: Accessible Programming for Intermittent Computing.

Chris Kraemer, Amy Guo, Saad Ahmed, Josiah Hester

ACM Conference on Pervasive and Ubiquitous Computing (UbiComp'22)

Published in PACM IMWUT, Volume 5, Issue 4

Covered by Microsoft Research, ACM Tech News, and Hackster.io and many more

C5 FaceBit: Smart Facemask Platform.

Alexander Curtiss, Blaine Rothrock, Abu Bakar, Nivedita Arora, Jason Huang, Zachary Englehardt, Aaron-Patrick Empedrado, Chixiang Wang, Saad Ahmed, Yang Zhang, Nabil Alshurafa, Josiah Hester

ACM Conference on Pervasive and Ubiquitous Computing (UbiComp'22)

Published in PACM IMWUT, Volume 5, Issue 4

Fast Company's Innovation by Design Award Finalist

Covered by Top media outlets including Scientific American, Forbes, TechCrunch, Gizmodo and many more.

C4 No-frills Water Comfort for Developing Regions.

Samar Abbas, Ahmed Ehsan, Saad Ahmed, Sheraz Ali Khan, Tariq Muhammad Jadoon, Muhammad Hamad Alizai

International Conference on Information Processing in Sensor Networks (IPSN'20)

C3 Intermittent Computing with Dynamic Voltage and Frequency Scaling.

Saad Ahmed, Qurat-u-Ain, Junaid Haroon Siddiqui, Luca Mottola, Muhammad Hamad Alizai

International Conference on Embedded Wireless Systems and Networks (EWSN'20)

🏆 Best Paper Nominee

C2 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

Proceedings of the 20th ACM SIGPLAN/SIGBED International Conference on Languages, Compilers, and Tools for Embedded Systems (LCTES'19)

C1 **Efficient intermittent computing with differential checkpointing.**

Saad Ahmed, Naveed Anwar Bhatti, Muhammad Hamad Alizai, Junaid Haroon Siddiqui, Luca Mottola
Proceedings of the 20th ACM SIGPLAN/SIGBED International Conference on Languages, Compilers,
and Tools for Embedded Systems (LCTES'19)

Journal Articles

J3 **ASHRAY: Enhancing Water-usage Comfort in Developing Regions using Data-driven IoT Retrofits.**

Samar Abbas, Ahmed Ehsan, Saad Ahmed, Sheraz Ali Khan, Tariq Muhammad Jadoon, Muhammad Hamad Alizai
ACM Transactions on Cyber-Physical Systems (TCPS)

J2 **Fast and Energy-efficient State Checkpointing for Intermittent Computing.**

Saad Ahmed, Naveed Anwar Bhatti, Muhammad Hamad Alizai, Junaid Haroon Siddiqui, Luca Mottola
ACM Transactions on Embedded Computing Systems (TECS)

J1 **Demystifying Energy Consumption Dynamics in Transiently-powered Computers.**

Saad Ahmed, Muhammad Nawaz, Abu Bakar, Naveed Anwar Bhatti, Muhammad Hamad Alizai, Junaid Haroon Siddiqui, Luca Mottola
ACM Transactions on Embedded Computing Systems (TECS)

Workshops, Posters & Demos

W3 **Towards smaller checkpoints for better intermittent computing.**

Saad Ahmed, Muhammad Hamad Alizai, Junaid Haroon Siddiqui, Naveed Anwar Bhatti, Luca Mottola
17th ACM/IEEE International Conference on Information Processing in Sensor Networks (IPSN'18)

W2 **Incremental Checkpointing Techniques for Transiently Powered Computers.**

Saad Ahmed
Doctoral School on Transiently Powered Computing-Collocated with SenSys'17

W1 **Incremental checkpointing for interruptible computations.**

Saad Ahmed, Muhammad Hamad Alizai, Junaid Haroon Siddiqui, Naveed Anwar Bhatti, Luca Mottola
Proceedings of the 14th ACM Conference on Embedded Network Sensor Systems (SenSys'16)

Teaching Experience

Spring, 2022 : **Internet-of-things**, *Co-Instructor*, Northwestern University.

Fall, 2020 : **Introduction to Internet of Things**, *Co-Instructor*, LUMS.

Fall, 2018 : **Internet of Things**, *Teaching Assistant*, LUMS.

Fall, 2014 : **Operating Systems**, *Teaching Assistant*, NUCES.

Spring, 2014 : **Operating Systems**, *Lab Instructor*, NUCES.

Operating Systems, *Teaching Assistant*, NUCES.

Fall, 2013 : **Operating Systems**, *Teaching Assistant*, NUCES.

Fall, 2013 : **Operating Systems**, *Teaching Assistant*, NUCES.

Student Mentorship

- 2023-Present **Shashank Holla**, *Research Assistant*, Georgia Institute of Technology .
2022-2023 **Eren Yildiz**, *Kamoamoa's Visiting Student*, Ege University Turkey .
2019-2020 **Qurat-ul-Ain**, *MS-Thesis*, LUMS.
2018-2019 **Muhamamd Nawaz**, *Research Assistant*, LUMS, Software Engineer-**SIEMENS**.
2017-2018 **Abu Bakar**, *Research Assistant*, LUMS, **Ph.D. candidate at Georgia Institute of Technology**.
2016-2017 **Hassan Ali Khan**, *MS-Thesis*, LUMS, **Ph.D. student at NC State University**.
2016-2017 **Ans Fida**, *UG*, LUMS, Senior MTS-**SalesForce**.
2016-2017 **Kamran Khalil**, *UG*, LUMS, **Ph.D. Purdue University**.
2016-2017 **Natasha Khan**, *MS-Thesis*, LUMS, **Software Engineer-CERN**.

References

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