ESAM A. AL-QARALLEH

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Academic Background

A B.Sc. degree in Electrical Engineering at the University of Jordan ('90-'95) and a PhD in Electronics at the National Chiao Tung University in Taiwan (2000-2006) / Computer Engineering Department.

Dissertation Title
"***Design of Motion Estimation for MEPG-4 and H.264 Video Coding***"

Professional Appointments

'23	**Professor**, Computer Engineering Department, (KASE) Princess Sumaya University for Technology, Amman, Jordan.
'21 - 23	**Dean**, King Abdullah II School of Engineering (KASE) Princess Sumaya University for Technology, Amman, Jordan.
'19 - 21	**Vice Dean**, King Abdullah II School of Engineering (KASE) Princess Sumaya University for Technology, Amman, Jordan.
'16 - 23	**Associate Professor**, Computer Engineering Department, (KASE) Princess Sumaya University for Technology, Amman, Jordan.
'10 - '12 '16 - '17	**Department Head**, Computer Engineering Department, (KASE) Princess Sumaya University for Technology, Amman, Jordan.
'06 - '16	**Assistant Professor**, Computer Engineering Department, King Abdullah II School of Engineering (KASE) Princess Sumaya University for Technology, Amman, Jordan.

WORK EXPERIENCE

Academic Leadership Experience

Dean, School of Engineering, Princess Sumaya University for Technology, Jordan 09/2021 – 09/2023
Vice-Dean, School of Engineering, Princess Sumaya University for Technology, Jordan 09/2019 – 09/2021

Highlights:

- Chair the School of Engineering Faculty Council and School of Engineering Graduate Studies Committee.
- Member several councils and committees such as the University Council, Deans Council, Computer Engineering Department Council, University Graduate Studies Council and QA Center Board.
- Chair the School of Engineering ABET Committee.
- Provide leadership in the quality and development of Engineering programs. Works with members of senior management and academic department chairs to promote high academic standards in designing, delivering and assessing Engineering programs.
- Develop mechanisms and processes to ensure programs are current and responsive to the community's needs and lead international and professional accreditation efforts.
- Promote and facilitate collaboration with other higher education institutions in research and facilitate student and faculty exchange.
- Oversee the continuous improvement cycle of engineering programs and curricula and determine the appropriate instructional resources for program delivery.
- Develop and foster mechanisms to ensure that strategic plans and initiatives are effectively implemented within the engineering school.
- Participate in establishing all academic and non-academic policies and procedures in the university.
- Develop an annual plan and budget for the School of Engineering, ensuring the efficient utilization of allocated resources.
- Keep abreast of developments in the field by engaging in professional development activities and by networking with local and international industry to ensure a responsive curriculum.
- Promote industry trends, developments, and research findings externally to the community and internally throughout the university.
- Oversee the recruitment and selection of staff and ensure the effective management and development of staff.
- Chair the Organizing committee of, the Innovations in Engineering, Technology and Science Education Conference (IETSEC 2021) IEEE Technically sponsored scientific conference.
- Attained ABET EAC accreditation for the Networks & Information Security Engineering Bachelor Program and maintained the accreditation for all other programs.
- Participating in establishing the Communications Engineering – IoT Bachelor Program.

Chairman, Computer Engineering Department, Princess Sumaya University for Technology, Jordan 09/2010 – 09/2012, and 09/2016 – 09/2017

Highlights:
Appointed chairman of the Computer Engineering Department at Princess Sumaya University for Technology in Sept. 2010 and 2016.

- Provided leadership to the department's ABET accreditation committees, playing a pivotal role in laying the foundation for the successful attainment of ABET accreditation in 2014
- Member several councils and committees such as the University Council, Computer Engineering Department Council, University Graduate Studies Council and QA Center Board.
- Development and management of department workload policy
- Management of annual performance evaluation
- Management of teaching assignments, course offerings, and ad-hoc instructors
- Development of strategic plans for the Computer Engineering department: setting goals and objectives
- Updating the Computer Engineering undergraduate curriculum
- Developing several lab modernization proposals for various courses

Industrial Experience

Computer Systems Maintenance Engineer, Euro-Gulf Electronics Co., Amman, Jordan. 1995 – 1996

Regularly inspect and maintain computer hardware components, diagnose and repair hardware issues and arrange hardware replacements. Moreover, installing, configuring, and maintaining operating systems and software applications on servers and workstations.

Maintenance Engineer, Royal Scientific Society, Amman, Jordan. 1996 – 2000

ensuring the proper functioning, safety, and reliability of various equipment within a laboratory. Conducting regular inspections and preventive maintenance on laboratory equipment, computers, and electrical machinery to identify and address potential issues before they cause significant problems. Assisting in setting up new laboratory equipment and electrical machinery.

Testing and Evaluation Engineer – Part Time-. Industrial Technology Research Institute, Hsin-Chu, Taiwan. 2003 – 2006

Perform technical analysis and simulations to evaluate the feasibility and performance of circuit designs—design and set up testing environments and automation systems to execute tests efficiently and accurately.

Administrative activities:

- ✓ Dean of Engineering School 2021 – 2023
- ✓ Vice Dean of Engineering School 2019 – 2021
- ✓ Chairman of the Computer Engineering Department 2016-2017.
- ✓ Chairman of the computer engineering department 2009-2011.
- ✓ Mentor for the PSUT Electronics and Robotics Club (PERC) since 2010 - 2017.
- ✓ ABET Accreditation Committee member, 2010, 2019
- ✓ Member of Engineering Dean Council, 2008, 2010,2011, and 2013, 2019
- ✓ Member of many committees that serve PSUT as requested.
- ✓ Member of the National Committee for writing exam questions to the Civil Service Bureau.

Scientific Activities:

- ✓ Conference Organization: Steering committee chair for IETSEC 2021 (IETSEC.org)
- ✓ IEEE RAS Chair elected starting 1/1/2016 – 31/12/2018
- ✓ Member of the organizing committee for the first IEEE Amman Metro Area Workshop 2016. (http://www.ieee.org/membership_services/mga_maw.html)
- ✓ Conference Organization: Steering committee for AEECT2011 (Vice-Chair), AEECT2013 (Treasurer), and AEECT2015 (Secretary). (http://ewh.ieee.org/conf/aeect/)
- ✓ IEEE Professional Activities Officer - Jordan section starting 1/6/2014
- ✓ Steering Committee of Universities Robotics Competition (URC 2013) (http://urc.ju.edu.jo)

Workshops and visiting scholars:

- ✓ Huawei Academy HCIA- AI (Artificial Intelligence Technology and Application TTT) workshop. 19 – 23 Jun 2021.
- ✓ Online Workshop entitled "FTIR Spectrometers Data Analysis I" at RCSSTEWA, August 10-13, 2020

- ✓ workshop on "Training of Assessors of the Accreditation Centers" within MEDACCR EU-funded project on 12-14 November 2019. Visiting Scholar, Minho University, Portugal, Department of Industrial Electronics. Summer, 2014.
- ✓ Research Proposal Workshop, 2009.
- ✓ Visiting Scholar, TU Berlin: Technical University of Berlin, computer engineering, Winter 2008.

Teaching

Teaching a wide variety of courses in Computer Engineering (Microprocessors, Digital Logic Design, Computer Architecture, Computer Organization and many more), Electrical Engineering (Electric Circuits I & II, Electronics, Digital Electronics). For the graduate studies, I taught (Advanced Computer Architecture, Special Topics, " Advanced Computer Arithmetic" and Seminars in scientific research).
Throughout my academic journey, I had the privilege of mentoring numerous Senior Design projects. I'm proud that many of them received recognition and awards in local and regional competitions. Additionally, I played a pivotal role in developing several new courses and overseeing the enhancement of various practical laboratories. Below, I provide some developed curricula:

Computer Architecture (2006)

Developed the syllabus for the Computer Architecture course, updating the textbook to *Computer Architecture: A Quantitative Approach* to align with the latest trends in the field. Incorporated a term project to enhance students' understanding and practical application of core concepts.
Moreover, when **Advanced Computer Architecture** was offered to master's students for the first time, I developed the course materials using the textbook and the latest published papers in this field to ensure comprehensive and up-to-date content.

Computer Organization (2010)

*In the **Computer Organization** course, introduced new topics on Verilog coding to enable students to implement and use FPGA as a proof of their designs for arithmetic circuits taught in class. This hands-on approach allowed students to apply theoretical concepts to real-world hardware implementations, enhancing their understanding of digital systems design and Computer Organization.*

Microprocessors Course (2012)

*Redesigned the syllabus for the **Microprocessors** course by combining two courses,* Microprocessor Interface *and* Assembly Language*, into a single comprehensive course. The challenge was to effectively cover the essential topics of both subjects while integrating them through two term projects: a software project using x86 assembly language and a hardware project to design and implement a simple application, reinforcing students' understanding of these concepts.*

Workshop Lab (2019)

This essential introductory course was developed to introduce the “Design Thinking” teaching module to freshmen students. The lab gradually builds critical skills beyond the common mathematical and analytical skills. Such skills are becoming mandatory by the fourth industrial revolution and jobs of future skill sets. It gradually and solidly introduces design thinking concepts through a number of experiments where students are fully exposed to the stages of design thinking: empathize, define, ideate, prototype and test.

Work placement (2019)

Developing a work-placement syllabus describing the course objectives, weekly plans and assessment plans. Weekly logbooks are introduced to students to document progress and training plans properly. Assessment rubrics were introduced to assist students' progress properly. Finally, the student's final report and presentation were evaluated based on a predesigned rubric. All this work is well organized on the MOODLE eLearning platform.

Self-Learning Courses:

LinkedIn Premium (Esam Al-Qaralleh | LinkedIn)
IoT Foundations: Operating Systems Fundamentals
Internet of Things with Python and Raspberry Pi
IoT Foundations: Low-Power Wireless Networking
Artificial Intelligence Foundations: Machine Learning
Artificial Intelligence Foundations: Thinking Machines
Deep Learning: Face Recognition
Symmetric Cryptography Essential Training
Cybersecurity with Cloud Computing

Research

My research interests cover three main areas: efficient video coding, modern engineering education, and deep learning. Recently, I have been enthusiastically exploring new connections between the areas of Artificial Intelligence, the Internet of Things (IoT), and Embedded Systems. I am actively working to apply my background in hardware design and software to build intelligent and practical connected devices.

My journey in Artificial Intelligence started with a project on recognizing handwritten Arabic words using neural networks. I have enjoyed expanding this knowledge to new applications, such as license plate recognition for smart cities, analyzing medical images, and developing smart video surveillance systems.

In Video Coding and Embedded Systems, my work has focused on finding ways to make video compression faster and more efficient for standards like H.264 and HEVC. This experience with optimizing software for hardware has been a great foundation for my current projects.

I am also passionate about Engineering Education. I love improving how we teach by using hands-on projects and by bringing entrepreneurial skills into the classroom, which I have documented in several publications.

Now, I am excited to bring these experiences together. I am actively learning and working on projects that combine AI with IoT and Embedded Systems.

Book Chapter(s)

J. Pereira, D. Oliveira, P. Matos, R. Machado, S. Pinto, T. Gomes, V. Silva, E. Qaralleh, N. Cardoso, P. Cardoso "Hardware- assisted Real-Time Operating System Deployed on FPGA" in A. Bukowiec, G. Borowik, M. Doligalski (Eds.)"New Trends in Digital Systems Design" vol. 836 of Fortschritt-Berichte - Informatik/Kommunikationstechnik, VDI Verlag, Düsseldorf, 2014, pp.81-93.

Journal Publications (peer-reviewed)

(J1). Esam A. AlQaralleh, Halah Nassif, Bassam A. Y. Alqaralleh, “Fusion Based Tongue Color Image Analysis Model for Biomedical Applications,” CMC-Computers, Materials & Continua, Vol.71, No.3, pp. 5477-5490, 2022

(J2). Bassam A. Y. Alqaralleh, Fahad Aldhaban, Feras Mohammed A-Matarneh, Esam A. AlQaralleh, “Automated Handwriting Recognition and Speech Synthesizer for Indigenous Language Processing,” CMC-Computers, Materials & Continua, Vol.72, No.2, pp. 3913-3927, 2022,

(J3). Bassam A. Y. Alqaralleh, Fahad Aldhaban, Esam A. AlQarallehs, Ahmad H. Al-Omari, “Optimal Machine Learning Enabled Intrusion Detection in Cyber-Physical System Environment,” CMC-Computers, Materials & Continua, Vol.72, No.3, pp. 4691-4707, 2022

(J4). Esam A. AlQaralleh, Fahad Aldhaban, Halah Nasseif, Malek Z. Alksasbeh, Bassam A. Y. Alqaralleh, “Smart Deep Learning Based Human Behaviour Classification for Video Surveillance,” CMC-Computers, Materials & Continua, Vol.72, No.3, pp. 5593-5605, 2022

(J5). Esam A. AlQaralleh, Fahad Aldhaban, Halah Nasseif, Bassam A.Y. Alqaralleh, Tamer AbuKhalil, “Hybrid Metaheuristics Based License Plate Character Recognition in Smart City,” CMC-Computers, Materials & Continua, Vol.72, No.3, pp. 5727-5740, 2022

(J6). Bassam A. Y. Alqaralleh, Fahad Aldhaban, Anas Abukaraki, Esam A. AlQaralleh, “Evolutionary Intelligence and Deep Learning Enabled Diabetic Retinopathy Classification Model,” CMC-Computers, Materials & Continua, Vol.73, No.1, pp. 87-101, 2022,

(J7). Alqudah, Y., Sababha, B., Qaralleh, E. & Yousseff, T. (2021). Machine Learning to Classify Driving Events Using Mobile Phone Sensors Data. International Association of Online Engineering

(J8). Sababha, B.H., Abualbasal, A., Al-Qaralleh, E., & Al-Daher, N. (2020). Entrepreneurial mindset in engineering education. Journal of Entrepreneurship Education. Journal of Entrepreneurship Education, 23(S1)

(J9). Belal Sbabha, Yazan Alqudah, Abelraheem Abulbasal, Esam AlQaralleh, “Project-Based Learning to Enhance Teaching Embedded Systems” Eurasia Journal of Mathematics, Science and Technology Education. 12.9 (2016): 2311-2321

(J10). Osama MF Abu-Sharkh , AlQaralleh, EsamA and Omar Hassan, “Adaptive Device-to-device Communication Using Wi-Fi Direct in Smart Cities” Wireless Networks. (2016): 1-17

(J11). Osama MF Abu-Sharkh , and AlQaralleh, EsamA., “A HARDWARE-EFFICIENT BLOCK MATCHING UNIT FOR H.265/HEVC MOTION ESTIMATION ENGINE USING BIT-SHRINKING” Jordanian Journal of Computers and Information Technology, Vol 2, No. 2

(J12). AlQaralleh, EsamA., and Osama MF Abu-Sharkh. "Low-complexity motion estimation design using modified XOR function." Multimedia Tools and Applications (2015): 1-26.

(J13). Qaralleh, E. A. and Darabkh, K. A. (2014), “A new method for teaching microprocessors course using emulation.” Comput Appl Eng Educ. doi:10.1002/cae.21616

(J14). Qaralleh, Esam, Gheith Abandah, and Fuad Jamour. "Tuning recurrent neural networks for recognizing handwritten Arabic words." Journal of Software Engineering and Applications 6.10 (2013): 533.

(J15). Abandah, Gheith A., Fuad T. Jamour, and Esam A. Qaralleh. "Recognizing handwritten Arabic words using grapheme segmentation and recurrent neural networks." International Journal on Document Analysis and Recognition (IJDAR) (2014): 1-17.

(J16). Alqudah, Yazan A., Esam Qaralleh, and Michelle D. Mace. "Enhancing the Teaching of Digital Signal Processing through Project-Based Learning." International Journal of Online Engineering 9.2 (2013).

(J17). Al Qaralleh, Esam A., and Tian-Sheuan Chang. "Fast variable block size motion estimation by adaptive early termination." IEEE transactions on circuits and systems for video technology 16.8 (2006): 1021-1026.

(J18). AlQaralleh, E.A.; Tian-Sheuan Chang; Kun-Bin Lee, "An Efficient Binary Motion Estimation Algorithm and its Architecture for MPEG-4 Shape Encoding," Circuits and Systems for Video Technology, IEEE Transactions on , vol.16, no.7, pp.859,868, July 2006

Conferences

(C1). Qaralleh, E. “Intra-prediction Complexity Reduction Using Machine Learning,” Ninth International Congress on Information and Communication Technology. ICICT 2024

(C2). Sababha, Belal H., Esam A. AlQaralleh, and Yazan A. Alqudah. "On the Development of a Model-Based Embedded Systems Design Laboratory Course." 2021

Innovation and New Trends in Engineering, Science and Technology Education Conference (IETSEC). IEEE, 2021.

(C3). Al-Qaralleh, Esam, Belal H. Sababha, and Khaldoun Abugharbieh. "Integrating Design Thinking in Freshmen-Level Engineering Curriculum." 2021 Innovation and New Trends in Engineering, Science and Technology Education Conference (IETSEC). IEEE, 2021.

(C4). Sababha, Belal H., Esam Al-Qaralleh, and Neda Al-Daher. "A New Student Learning Outcome to Strengthen Entrepreneurship and Business Skills and Mindset in Engineering Curricula." 2021 Innovation and New Trends in Engineering, Science and Technology Education Conference (IETSEC). IEEE, 2021.

(C5). AlQaralleh, Esam A., Yazan A. Alqudah, and Belal H. Sababha. "Reconfigurable Hardware-Friendly Early Termination Mechanism in Motion Estimation for HEVC." Procedia Computer Science 141 (2018): 40-47.

(C6). AlQaralleh, Esam A., Osama MF Abu-Sharkh, and Bassam AYAlqaralleh. “MATLAB/Simulink based verification environment for motion estimation in H. 264/AVC." Digital Information and Communication Technology and its Applications (DICTAP), 2015 Fifth International Conference on. IEEE, 2015.

(C7). AlQaralleh, Esam A., Yazan A. Alqudah, and Belal H. Sababha. "Hardware efficient early termination mechanism in motion estimation for H. 264 AVC." Digital Information and Communication Technology and its Applications (DICTAP), 2015 Fifth International Conference on.IEEE, 2015.

(C8). Qaralleh, E., Lima, D., Gomes, T., Tavares, A., & Pinto, S. (2015, September). HcM-FreeRTOS: Hardware-centric FreeRTOS for ARM multicore. In Emerging Technologies & Factory Automation (ETFA), 2015 IEEE

(C9). Pinto, S.; Pereira, J.; Oliveira, D.; Alves, F.; Qaralleh, E.; Ekpanyapong, M.; Cabral, J.; Tavares, A., "Porting SLOTH system to FreeRTOS running on ARM Cortex-M3," Industrial Electronics (ISIE), 2014 IEEE 23rd International Symposium on , vol., no., pp.1888,1893, 1-4 June 2014.

(C10). Darabkh, K.A.; Khalifeh, A.F.; Naser, M.; Al-Qaralleh, E.A., "New arriving process for convolutional codes with adaptive behavior," Systems, Signals and Devices (SSD), 2012 9th International Multi-Conference on , vol., no., pp.1,6, 20-23
(C11). March 2012.

(C12). Alqudah, Y.A.; Al-Qaralleh, E., "Project based learning to enhance teaching digital signal processing," Interactive Mobile and Computer Aided Learning (IMCL), 2012 International Conference on , vol., no., pp.32,35, 6-8 Nov. 2012.

(C13). Alqudah, Y.A.; AlQaralleh, E.A., "A cloud based web analysis and reporting of vital signs," Digital Information Processing and Communications (ICDIPC), 2012 Second International Conference on , vol., no., pp.185,189, 10-12 July 2012

(C14). Al Qaralleh, E.A.; Tian-Sheuan Chang “Fast Motion Estimation by Adaptive Early Termination”, Signal Processing Systems Design and Implementation, 2005, IEEE Workshop

References

Prof. Ahmad Hiasat, professor of Computer Engineering, Princess Sumaya University for Technology.
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