ALIREZA POSHTKOHI

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EDUCATION

Doctor of Philosophy   June 2023
Computer Science | Computational Neuroscience
University of Ulster, Londonderry, United Kingdom
Thesis: *Computational Modelling of Plasma Membrane Electrophysiology and Calcium Dynamics in Microglia*
Download → https://pure.ulster.ac.uk/ws/portalfiles/portal/124021599/2023PoshtkohiAPhD.pdf
GPA: `Awarded`

Master of Science   Sep 2011
Electrical and Electronics Engineering
Shahed University, Tehran, Iran
Thesis: *Design and Implementation of a Grid-based Parallel Framework for the Simulation of Digital Systems and Power Calculations*
GPA: `17.59 out of 20 (87.95 out of 100)`

Bachelor of Science   Feb 2006
Electrical and Electronics Engineering
Azad University of Qazvin, Qazvin, Iran
Thesis: *Design and Implementation of a Highly Scalable Distributed Electronic Mail (Email) Infrastructure and an Embedded Controller Device Supporting Multiple Internet Protocols Including SMTP, POP3 and IMAP4*
GPA: `17.16 out of 20 (85.8 out of 100)`

PROFESSIONAL QUALIFICATIONS

PGCert Learning and Teaching in Higher Education   Sep 2023 –
University of Hertfordshire, Hatfield, United Kingdom
Associate Fellow of The Higher Education Academy (AFHEA): Download Certificate → https://interdisciplinary.team/AFHEA.pdf
Fellow of The Higher Education Academy (FHEA): in progress

RESEARCH INTERESTS

- **Computer Science**
    - High-performance computing (HPC): parallel algorithms, parallel programming languages and compiler design, software engineering for HPC, concurrent data structures, many-core operating systems, and computer architecture
    - Software engineering: model-driven engineering, domain-specific languages, web engineering, and systems engineering

- o <u>Distributed systems</u>: file systems, synchronisation, middleware, Grid and Cloud Computing
- o Modelling and simulation, and parallel and distributed simulation (PADS)
- o <u>Computer networks</u>: network protocols, network security, cryptography, network modelling and simulation, and InfiniBand

- **Applied Mathematics**
  - o Mathematical modelling, numerical analysis, numerical optimisation, matrix functions, differential equations, Multiphysics modelling, mathematical physiology, and parallel scientific computing

- **Electrical and Electronics Engineering**
  - o <u>Digital electronics</u>: system-on-chip (SoC), NoC, embedded systems, low-power circuit design, VLSI circuits, computer-aided design (CAD) and electronic design automation (EDA)
  - o <u>Analogue electronics</u>: non-linear circuit theory, integrated circuits, parallel modelling and simulation of electrical circuits, and analogue-mixed signal (AMS)
  - o <u>Semiconductor device modelling</u>: solid-state physics, quantum electronics, and semiconductor device modelling and simulation (TCAD)

- **Medicine**
  - o Neuroscience, human physiology, biophysics, ageing, computational biology/neuroscience, and systems biology

TEACHING EXPERIENCE

Lecturer — 2023 – Present
Department of Computer Science, University of Hertfordshire, Hatfield, England, United Kingdom

Teaching Assistant — 2020 – 2023
School of Computing, University of Ulster, Londonderry, United Kingdom

Lecturer — 2013 – 2014
Department of Computer Engineering, Sharif University of Technology, Tehran, Iran

Lecturer — 2012 – 2017
Department of Computer Engineering, Shahed University, Tehran, Iran

Lecturer — 2015 – 2017
Department of Electrical and Computer Engineering, Azad University of Shahr-e Rey, Tehran, Iran

Lecturer — 2014 – 2015
Department of Computer Engineering, Azad University of Buin Zahra, Buin Zahra, Iran

COURSES TAUGHT AS A LECTURER

In the Departments of Computer Engineering and Computer Science

• Parallel algorithms • Advanced algorithms • Parallel and distributed simulation • Modelling and performance evaluation of computer systems • Operating systems • Advanced programming (C/C++/C#/Java) • Hardware/software co-design • Internet engineering • Web design and development • Cloud computing • Linux systems programming • Computer networks lab • Operating systems lab • Team research and project management • Embedded systems • Software Engineering Project

In Departments of Electrical Engineering

• Computer architecture • Logic circuits • Circuit theory • Advanced programming (C/C++)

In the Department of Dentistry: • Applications of computers in dentistry

COURSES PRESENTED AS A TEACHING ASSISTANT

• Computer hardware • Concurrent and distributed systems • Networked operating systems • Software Development I & II • Object-oriented programming in C++ • Web application development • Mobile application development • Internet technologies • Cybersecurity • Intro to Renewable Energy

WORK EXPERIENCE

University of Hertfordshire   2023 – Present
Lecturer (Assistant Professor) in Computer Science (Software Engineering)
• Teaching general undergraduate/postgraduate-level computer science and specialised software engineering modules accompanied by active learning techniques, interactive computing tools, research-informed teaching and adaptive feedback from students • Supervising BSc and MSc theses with areas in software engineering, high-performance computing, machine learning and cybersecurity • Coordinating UG Software Engineering Projects • Developing a three-dimensional mathematical model of the human neuroimmune system for studying the interaction of glial cells with neurons and the underlying neuroinflammatory pathways implicated in neurodegeneration, stroke and brain tumours in close collaboration with experimental neuroscientists from the University of Reading by utilising human neurophysiology, partial differential equations, numerical analysis and supercomputers • Writing research proposals for attracting external grants to recruit prospective PhD students and talented postdoctoral researchers in experimental and computational neuroscience

University of Ulster   2019 – 2023
PhD Researcher in Computational Neuroscience & Biophysics
• Constructed novel mathematical models for microglial cells in the human brain using an assortment of biochemistry, neurophysiology and applied mathematics • Took advantage of dynamical systems, differential equations, numerical optimisation, applied statistics, approximation theory and numerical analysis to model the central nervous system • Brought the power of Computer Modelling & Simulation into the hands of neuroscientists to cope with a myriad of unanswered questions in brain diseases • Established new hypotheses to explain intricate biophysical processes in the human brain • Successfully collaborated with experimental neuroscientists from the University of Reading

Shahed University   2008 – 2019
Administrator of High-Performance Computing Centre (HPCC)
• Deployed, installed, configured, automated and managed two many-core HPC clusters for hardware, InfiniBand network and Linux CentOS software stack • Developed new numerical analysis tools • Invented a new parallel simulation & programming language for electronic system level • Built a compiler infrastructure written in C++17 with LLVM/Clang • Developed a middleware infrastructure for Cloud Computing • Designed and implemented a novel high-throughput, Internet file transfer protocol • Developed in-kernel Linux components for HPC • Held workshops on parallel programming • Assisted many MSc & PhD students to get acquainted with HPC concepts in different departments • Wrote a book proposal and a new book title on HPC for CRC Press

Researcher in Integrated Circuits & Systems Lab (ICSL)
• Developed Cloud-based CAD/EDA & UML tools for analogue/digital circuits and systems, mathematical models, graph algorithms, hardware IP cores, GUIs, frontends, compilers, web interfaces and ML[1]-based algorithms • Assisted many MSc & PhD students with tools and computer algorithms for their theses • Held workshops on academic writing

Researcher in Semiconductor Device Modelling Lab (SDML)
• Implemented high-quality parallel MPI codes written in C/C++ on supercomputers for applications in computational physics and electronics • Worked with applied mathematics (numerical analysis and optimisation, finite element method, exponential integrators,

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[1] Machine Learning (ML)

Padé-derived approximants, scientific computing), solid-state physics and quantum mechanics • Developed a novel spacetime-parallel PDE[1] solver • Developed a massively parallel device simulator

Research Outputs at Shahed University → https://interdisciplinary.team/research-overview.pdf

Sharif University of Technology   2013 – 2018
Research Director in Parallel & Distributed Systems Lab (PDSL) as Part of EPCA Group
• Founded PDSL in the Department of Computer Engineering in collaboration with Prof. Shaahin Hessabi as part of EPCA (Efficient Processing and Communication Architectures) research group • Held workshops on parallel modelling and simulation for MSc students • Designed the lab website • Designed and taught operating systems lab

Full-Stack Software and Web Developer   2002 – 2015
• Developed two highly scalable, national online social network platforms with millions of users by using Grid Computing techniques, DNS-level load balancing and distributed file systems • Implemented many software projects and large-scale automation portals with hundreds of thousands of lines of code written in C, C++, C#, Java, ASP.NET/MSSQL and PHP/MySQL • Designed complex distributed relational databases and wrote advanced SQL queries • Developed many websites for customers • Implemented GUI applications by Java and .NET Windows Forms

RESEARCH GRANT FUNDING

1. **A. Poshtkohi**, M. Dallas (University of Reading), *Mathematical and Experimental Modelling of Microglial Cells in the Human Brain*, **work in progress**, 2024.

PUBLICATIONS (PUBLISHED OR ONGOING)

Books

1. **A. Poshtkohi**, M. B. Ghaznavi-Ghoushchi, *Implementing Parallel and Distributed Systems*, Taylor & Francis/CRC Press, New York, 2023. <https://www.taylorfrancis.com/books/9781003379041>

   Book preview by publisher → https://interdisciplinary.team/book-preview.pdf

   Book source codes → https://github.com/poshtkohi/pads

2. **A. Poshtkohi**, *Encyclopaedia of Mathematical Modelling and Computer Simulation*, **work in progress**, 2024.

Refereed ISI Journal Articles (a total Impact Factor of 23.6)

1. **A. Poshtkohi**, J. Wade, L. McDaid, J. Liu, M. Dallas, A. Bithell, *Mathematical Modelling of PI3K/Akt Pathway in Microglia*, Neural Computation, 36:4 (2024). (**IF=2.9, Q1**), doi: 10.1162/neco_a_01643
2. **A. Poshtkohi**, J. Wade, L. McDaid, J. Liu, M. Dallas, A. Bithell, *Mathematical Modelling of Human P2X-mediated Plasma Membrane Electrophysiology and Calcium Dynamics in Microglia*, PLoS Computational Biology, 17:11 (2021). (**IF=4.3, Q1**), doi: 10.1371/journal.pcbi.1009520
3. **A. Poshtkohi**, M. B. Ghaznavi-Ghoushchi, K. Saghafi, *Optimistic Modeling and Simulation of Complex Hardware Platforms and Embedded Systems on Many-Core HPC Clusters*, IEEE Transactions on Parallel and Distributed Systems, 30:2 (2019), 428-444. (**IF=5.3, Q1**), doi: 10.1109/TPDS.2018.2860014
4. **A. Poshtkohi**, M. B. Ghaznavi-Ghoushchi, K. Saghafi, *PSML: Parallel System Modeling and Simulation Language for Electronic System Level*, Journal of Supercomputing, 75:5 (2019), 2691–2724. (**IF=3.3, Q2**), doi: 10.1007/s11227-018-2682-1
5. **A. Poshtkohi**, M. B. Ghaznavi-Ghoushchi, K. Saghafi, *The Parvicursor Infrastructure to Facilitate the Design of Grid and Cloud Computing Systems*, Computing, 99:10 (2017), 979–1006. (**IF=3.7, Q2**), doi:10.1007/s00607-017-0541-1
6. M. MollaMotalebi, R. Maghami, A. S. Ismail, **A. Poshtkohi**, *The Efficiency Challenges of Resource Discovery in Grid Environments*, Cybernetics and Systems, 45:8 (2014), 671-692. (**IF=1.7, Q3**), doi: 10.1080/01969722.2014.972100

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[1] Partial Differential Equation (PDE)

7. **A. Poshtkohi**, M. B. Ghaznavi-Ghoushchi, *DotDFS: A Grid-based High-Throughput File Transfer System*, Parallel Computing, 37 (2011) 114–136. (**IF=1.4, Q3**), doi: 10.1016/j.parco.2010.12.003
8. **A. Poshtkohi**, A.H. Abutalebi, S. Hessabi, *DotGrid: A .NET-based Cross-Platform Software for Desktop Grids* (**Invited Paper**), Int. J. Web Grid Serv. 3 (3) (2007) 313–332. (**IF=1.0, Q3**), doi: 10.1504/IJWGS.2007.014955
9. **A. Poshtkohi**, M. Dallas, *Mathematical Modelling of Human P2Y-mediated Plasma Membrane Electrophysiology in Microglia*, **work in progress**, 2024.
10. **A. Poshtkohi**, M. Dallas, *Mathematical Modelling of Human Neuroinflammation Pathways*, **work in progress**, 2024.

Conference Proceedings

1. **A. Poshtkohi**, M. B. Ghaznavi-Ghoushchi, A Concurrent Framework for High Performance File Transfers in Grid Environments, in: Proceedings of the 3th International Conference on Computer and Electrical Engineering (ICCEE 2010), 16-18 November 2010, Chengdu, China.
2. **A. Poshtkuhi**, A. Abutalebi, L. Ayough, S. Hessabi, DotGrid: A .NET-based Infrastructure for Global Grid Computing, in: Proceedings of the 6th IEEE International Symposium on Cluster Computing and the Grid, 16–19 May 2006, (CCGrid'2006), Singapore. doi: 10.1109/CCGRID.2006.1630951
3. A. Abutalebi, **A. Poshtkuhi**, L. Ayough, S. Hessabi, DotGrid: A .NET-based Cross-Platform Grid Computing Infrastructure, in: Proceedings of the IEEE International Conference On Computing and Informatics 2006 (ICOCI'06), June 6–8, Malaysia, 2006. doi: 10.1109/ICOCI.2006.5276479

SELECTED R&D PROJECTS

1. A cross-platform middleware infrastructure for Cloud Computing (written in C/C++) → https://github.com/poshtkohi/pads
2. An object-oriented, hierarchical, component-based parallel modelling and simulation language for electronic system level (crafted in C++17) → https://github.com/poshtkohi/psml
3. A .NET-based middleware for Cloud Computing (written in C# and .NET Framework) → https://github.com/poshtkohi/dotgrid
4. Fully fledged web-based platforms for social networks, shopping sites, etc. → https://github.com/poshtkohi/web-development
5. A distributed electronic mail infrastructure (written in C#/ASP.NET with MSSQL) → https://github.com/poshtkohi/pmail
6. An event-driven, parallel network programming language for many-core processors (crafted in C++17) → https://tinyurl.com/asyncsocket
7. A parallel simulation engine for many-core processors (written in C++17) → https://github.com/poshtkohi/pdes
8. A parallel simulator for computational physics (written in Fortran/MPI) → https://github.com/poshtkohi/computational-physics
9. Parallel sparse matrix operations for supercomputers (written in C/C++ with MPI) → https://tinyurl.com/parallelsparse
10. Mathematical modelling for the neuroscience community (written in MATLAB) → https://github.com/poshtkohi/computational-neuroscience
11. An electronic design automation tool (written in Java) → https://github.com/poshtkohi/jpad

WORKSHOPS PRESENTED

1. Numerical Solution of Differential Equations, Spring 2023, University of Ulster, Londonderry, UK
2. Web Programming Fundamentals in PHP, Summer 2018, Shahed University, Tehran, Iran
3. HPC Fundamentals and Parallel Programming, Spring 2017, Shahed University, Tehran, Iran
4. Fundamentals and Applications of Parallel Discrete Event Simulation (PDES), Spring 2015 and 2016, Sharif University of Technology, Tehran, Iran
5. Applications of Information Technology (IT) in Pharmaceutical Industries, Winter 2015, Azad University Pharmaceutical Sciences Branch, Tehran, Iran
6. Research on Desktop Grids, Spring 2006, CCGrid2006, Singapore
7. Windows Systems Programming, Summer 2005, Azad University of Qazvin, Qazvin, Iran

PRESENTATION AT IEEE CONFERENCES

- 6th IEEE International Symposium on Cluster Computing and the Grid, 2006, (CCGrid'2006), Singapore

AWARDS

- Vice Chancellor's Research Scholarship (VCRS) for a PhD studentship at Ulster University

PROFESSIONAL SERVICE

• CRC Press (Taylor & Francis): Author • IEEE Access (IEEE): Reviewer • Computers & Electrical Engineering (Elsevier): Reviewer • Journal of Supercomputing (Springer): Reviewer • Simulation Modelling Practice and Theory (Elsevier): Reviewer • Computers in Biology and Medicine (Elsevier): Reviewer • Microprocessors and Microsystems (Elsevier): Reviewer • Soft Computing (Springer): Reviewer • Journal of Systems Architecture (Elsevier): Reviewer • Journal of Applied Mechanics (ASME): Reviewer • Mathematics (MDPI): Reviewer • Entropy (MDPI): Reviewer • Materials (MDPI): Reviewer • Applied Sciences (MDPI): Reviewer

TECHNICAL SKILLS

Programming	C/C++17, C#, Java, Python, MATLAB, Assembly, Fortran, MPI, OpenMP, CUDA, LLVM/Clang
Software Engineering	Model-Driven Engineering, UML, Design Patterns, Middleware, Microservices, MVC, Agile Dev., Git
Web Development	ASP.NET, PHP, CSS, HTML, XML, JavaScript, Ajax, MSSQL, MySQL, WordPress
Frameworks	.NET, J2EE, Linux Kernel Modules, MFC, STL, Win32 API, Managed C++, CryptoPP
Cloud Computing	VMware, MapReduce, Microsoft Azure, Amazon EC2, OpenStack, Docker, Apache, Sandboxing, Hadoop
Computer Networks	Socket Programming, InfiniBand, Linux/Windows Network Administration, Network Security
Protocols & Standards	HTTP, SMTP, FTP, NFS, SSL/TLS, SSH, RDP, AES, DES, SHA, TCP/IP, InfiniBand
Hardware Design	CAD, RTL, HLS, EDA, SoC, Verilog, SystemC, VHDL, AMS, FPGA, ARM, Cadence, Digital Testability
Simulation	TCAD, Spice, Xyce, NS2, DES, CloudSim, Multiphysics, Simulink
General	Bash, Shell, Linux, UNIX, Windows, OpenSSL, LATEX, MS Office, Visio, MS Teams, MS Visual Studio

POSTGRADUATE COURSES TAKEN

- Analogue integrated circuits • Semiconductor processing & manufacturing • Semiconductor devices • object-oriented programming • Hardware description languages - Verilog • System-on-chip methodologies & tools with SystemC • High-performance and low-power circuits & systems • VLSI I

SELECTED SELF-TAUGHT COURSES

- Numerical analysis • Optimisation • Matrix functions • Scientific computing • Computational electronics • Geometry • Real analysis • Compilers • Cryptography • Biology • General chemistry • Biochemistry • Neurophysiology • Neuroscience

PERSONAL

- Running, photography, studying linguistics and new languages, English literature, history, and archaeology