



Baker Khaldoun Abdalhaq

I am a computer science associate professor and researcher. My main research area is in applying AI, machine learning, and soft computing to complex optimization problems in science and engineering. For the last two decades, my focus has been on Meta-Heuristic Optimization algorithms and their applications (such as traffic light control, forest fire simulation, and circuit design).

Place of Birth

July 27, 1970 **Nablus, Palestine.**

Languages

Arabic **Mother tongue**
English **Fluent**
Spanish **Fluent**

Education

- 2004 **PhD, Computer Science**, *Universitat Autònoma de Barcelona*, Spain, dissertation title: "A methodology to enhance the prediction of forest fire propagation".
www.uab.es
- 2002 **MS, Computer Science**, *Universitat Autònoma de Barcelona*, Spain.
www.uab.es
- 1999 **Non-degree study, MBA coursework with honors**, *An-Najah National University*, Palestine.
www.najah.edu
- 1994 **BSc, Computer Science with honors**, *Princess Sumaya University for Technology*, Jordan.
www.psut.edu.jo

Identifiers

ORCiD **<https://orcid.org/0000-0002-9101-4955>**
Scopus **6506853448**
Author ID
Web of Science **ID Y-1261-2019**
Researcher

Research Interests

BDD theory and applications.

Machine Learning.

Meta-Heuristic Optimization Techniques.

Research Grants

- 2021 **Visiting scholar to Colorado University at Boulder**, funded by Fulbright.
During my visit I worked on developing machine learning techniques to be used in LHC at CERN.
- 2020 **Reversible Logic Synthesis Optimization**, *reference:ANN-1920-Sc006*, funded by An-Najah National University.
Developing fast reversible logic synthesis framework using meta-heuristic optimization techniques

Research Projects

- 2002 **FOREMMS: Forest Environment Monitoring and Management.**
To develop and demonstrate an advanced forest environmental monitoring and management system prototype.
- 2002 **GRID.**
I have participated in administration of the GRID in UAB-Spain during my stay there.
- 2001 **SPREAD.**
A research project supported by the European Commission under the Fifth Framework Program within the Energy, Environment and Sustainable Development. Contract EVG1-2001-00043.

Professional Work

- 2022–present **Associate Professor**, *An-Najah National University*, Nablus, Palestine,
www.najah.edu.
- Teaching courses
 - Advising students
 - Supervising graduate projects
 - Supervising master theses
 - Participating in curricula development
 - Member of CS department committee
 - Member of Advanced computing program committee
 - Reviewing research papers
- 2004–2022 **Assistant Professor**, *An-Najah National University*, Nablus, Palestine,
www.najah.edu.
- Teaching courses
 - Advising students
 - Supervising graduate projects
 - Supervising master theses
 - Participating in curricula development
 - Member of CIS department committee
 - Member of Advanced computing program committee
 - Reviewing research papers

- 2012–2013 **Dean Faculty of Information Technology**, *An-Najah National University*, Nablus, Palestine.
- Managing and developing curricula
 - Managing and recruitment of faculty members (evaluation, promotion, etc.)
 - University strategic plan development
- 2005–2012 **Head of CIS department at Faculty of IT**, *An-Najah National University*, Nablus, Palestine.
- Managing and developing curricula
 - Managing and recruitment of faculty members (evaluation, promotion, etc.)
 - University strategic plan development
- 1994–1999 **Programmer/Analyst**, *An-Najah National University*, Nablus, Palestine.
Projects: Library management system, Students Information System, Payroll, Inventory, Accounting, Personnel
- Analysis, design and implementation of MIS
 - Database Administration and tuning
 - OS Administration (VMS, UNIX, Linux)
 - Participated in many committees for computer HW and SW procurement

Committees

Faculty of engineering and IT strategic planning committee.

University IT policy.

E-learning committee.

Procurement committees.

University Hospital Information system consultation committee.

Teaching Experience

- Master's Courses
- **Heuristic Optimization Techniques**
 - **Modeling and simulation (Advanced computing)**
 - **Simulation models (Engineering Management)**
 - **Software Project Management (Engineering Management)**
 - **Programming for advanced computing Master's students**

- Bachelor's courses
- **Heuristic Optimization Techniques**
 - **Principles of Scientific Research**
 - **Compilers**
 - **AI**
 - **Data Science Tools(special topics)**
 - **Simulation**
 - **Programming Languages Concepts**
 - **Computer Graphics**
 - **Operating systems**
 - **Algorithms**
 - **Data Mining**
 - **Report writing**
 - **Object-Oriented Analyses and design**
 - **Internet Programming**
 - **System Development using 4gl**
 - **Information Retrieval Systems**
 - **User Interface Design and Programming**
 - **Software Project Management**
 - **Information System Infrastructure**
 - **Decision support systems**
 - **Decision Analyses**
 - **Project Management**
 - **Database Management Systems**
 - **Database Administration**
 - **Introduction to programming**
 - **Graduation project**

Supervision of Master's Thesis

- 2020 **"Algorithms of Optimization Techniques for Bin Packing Problems: A comparative study"**, *Yasmeen Karmy*, Program: Advanced Computing.
- 2018 **"Optimization of Traffic Signals Timing Using Parameter-less Metaheuristic Optimization Algorithms"**, *Thaer Thaer*, Program: Advanced Computing.
- 2017 **"Increasing Customer Satisfaction on After Sales Service by Simulation Modeling in an Automobile Company"**, *Husam Mohammad Demaide*, Program: Engineering Management.
- 2017 **"Factors Affecting the Acceptance of E-Health System – A Case Study of Nablus Governorate Hospitals"**, *Mai Sameer Qutob*, Program: Engineering Management.
- 2015 **"A Framework for Acceptance of E-learning Technology in Palestinian Universities by Lecturers/ An Extension of Technology Acceptance Model TAM3"**, *Farid Al-Sayed*, Program: Engineering Management.
- 2015 **"Benchmark for Tuning Metaheuristic Optimization Technique to Optimize Traffic Light Signals Timing"**, *Rami Abu Shehab*, Program: Engineering Management.
co-supervision
- 2013 **"Impact of Information and Communication Technology on Healthcare in Health Centers in Palestine"**, *Said Ibrahim*, Program: Engineering Management.

- 2013 **“Introducing Agile Software Development Methodology (Scrum) into a Software Development Project at a Local Firm”**, *Adham Mohammad Wasfe Hannoun*, Program: Engineering Management.
- 2012 **“The Impact of IS/IT strategy and business strategies alignment on business performance in the Palestinians firms”**, *Mohammad Helaly*, Program: Engineering Management.
- 2011 **“Software Development Process Improvement for Small Palestinian Software Development Companies”**, *Asem Isawi*, Program: Engineering Management.
- 2011 **“E-banking Adoption Model in Palestine”**, *Ahmed Khrewesh*, Program: Engineering Management.
- 2011 **“Opportunities and Challenges of Open-source Initiatives in the Palestinian e-Government Program”**, *Fadi Souqia*, Program: Engineering Management.

Other Experience

- 2019 **Participated in design and accreditation of Master of “Artificial Intellegence”**, *An-Najah National University*, Nablus, Palestine.
- 2017 **Certified for Outstanding Contribution in Reviewing, Journal of Computational Science**, Amsterdam, The Netherlands.
- 2015 **Participated in design of national water information system WIS**, Palestine.
- 2013 **Participated in design and accreditation of Master of “Advanced Computing”**, *An-Najah National University*, Nablus, Palestine.
- 2011 **Founding member of “Center of Excellence in Learning and Teaching (CELT)”**, *An-Najah National University*, Nablus, Palestine.

E-learning Experience

- LIT **Participated in e-learning project LIT, during the project I developed the “internet programming” course as blended course using Moodle.**
- CELT **TOT at Center of Excellence in Learning and Teaching: Designed and facilitated workshops about using technology in teaching and learning.
Developing and teaching “Algorithms Applications” as blended course.**

Scientific Publications

- [1] **Abdalhaq, Baker**, A. Awad, and A. Hawash. “Toward Instance-Aware Swarm Intelligence for TSP via Distance Uniqueness”. In: *IEEE Access* 14 (2026), pp. 25264–25285. doi: 10 . 1109/ACCESS . 2026 . 3664310.
- [2] **Baker Abdalhaq**, A. Hawash, and A. Awad. “Diversity enforced Genetic Algorithm (GA) for Binary Decision Diagram (BDD) reordering”. In: *Applied Soft Computing* 155 (2024), p. 111453. issn: 1568-4946. doi: <https://doi.org/10.1016/j.asoc.2024.111453>. url: <https://www.sciencedirect.com/science/article/pii/S1568494624002278>.
- [3] A. Awad, A. Hawash, and **Abdalhaq, Baker**. “A Genetic Algorithm (GA) and Swarm Based Binary Decision Diagram (BDD) Reordering Optimizer Reinforced with Recent Operators”. In: *IEEE Transactions on Evolutionary Computation* (2022), pp. 1–1. doi: 10 . 1109/TEVC . 2022 . 3170212.
- [4] **Baker Abdalhaq**, A. Awad, and A. Hawash. “A fast Binary Decision Diagram (BDD)-based reversible logic optimization engine driven by recent meta-heuristic reordering algorithms”. In: *Mi-*

An-Najah National University – P.O. Box 707 Nablus, Palestine

☎ +970 0599674265 • ✉ baker@najah.edu • ✉ baker.abdalhaq@gmail.com

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croelectronics Reliability 123 (2021), p. 114168. ISSN: 0026-2714. DOI: <https://doi.org/10.1016/j.microrel.2021.114168>. URL: <https://www.sciencedirect.com/science/article/pii/S0026271421001347>.

- [5] N. Dabeek, R. Jaber, Y. Bsharat, A. Hawash, and **Abdalhaq, Baker**. “Visualizing Ruwah Related Data By Interactive Graph”. In: *2021 International Conference on Innovation and Intelligence for Informatics, Computing, and Technologies (3ICT)*. IEEE. 2021, pp. 268–273.
- [6] **B. Abdalhaq**, A. Awad, and A. Hawash. “A Swarm Based Binary Decision Diagram (BDD) Reordering Optimizer For Reversible Circuit Synthesis”. In: *Conference: IEEE 15th International Conference on Design Technology of Integrated Systems in Nanoscale Era At: Morocco*. Apr. 2020.
- [7] **B. Abdalhaq**, A. Awad, and A. Hawash. “Reversible Logic Synthesis Using Binary Decision Diagrams With Exploiting Efficient Reordering Operators”. In: *IEEE Access* 8 (Aug. 2020), pp. 156001–156016. DOI: 10.1109/ACCESS.2020.3019356.
- [8] A. Hawash, A. Awad, and **Abdalhaq, Baker**. “Reversible Circuit Synthesis Time Reduction Based on Subtree-Circuit Mapping”. In: *Applied Sciences* 10.12 (2020). ISSN: 2076-3417. DOI: 10.3390/app10124147. URL: <https://www.mdpi.com/2076-3417/10/12/4147>.
- [9] A. Hawash, A. Awad, and **B. Abdalhaq**. “Towards Reducing Reversible Circuit Synthesis Time”. In: *Conference: The 2019 IEEE Jordan International Joint Conference on Electrical Engineering and Information Technology (JEEIT)At: Amman/Jordan*. Feb. 2019.
- [10] T. Thaher, M. Mafarja, **B. Abdalhaq**, and H. Chantar. “Wrapper-based Feature Selection for Imbalanced Data using Binary Queuing Search Algorithm”. In: *2019 2nd International Conference on new Trends in Computing Sciences (ICTCS)*. Oct. 2019, pp. 1–6. DOI: 10.1109/ICTCS.2019.8923039.
- [11] T. Thaher, **B. Abdalhaq**, A. Hawash, and A. Awad. “Whale Optimization Algorithm for Traffic Signal Scheduling Problem”. In: *Conference: ICICCT 2019 – International Conference on Innovative Computing and Cutting-edge Technologies At: Istanbul/Turkey*. Oct. 2019.
- [12] A. Awad, **B. Abdalhaq**, and A. Hawash. “A Comparative Analysis of Binary Decision Diagram Reordering Algorithms for Reversible Circuit Synthesis”. In: *IEEE-SSCI 2018 SYMPOSIUM SERIES ON COMPUTATIONAL INTELLIGENCE*. Sept. 2018, pp. 104–111. DOI: 10.1109/SSCI.2018.8628765.
- [13] F. Al-Sayyed and **B. Abdalhaq**. “Interventional factors affecting instructors adoption of e-learning system: A case study of Palestine”. In: *Journal of Theoretical and Applied Information Technology* 1083 (Feb. 2016).
- [14] F. Al-Sayyed and **B. Abdalhaq**. “Interventional factors affecting instructors adoption of e-learning system in Palestine”. In: *4th Palestinian International Conference on Computer and Information Technology (PICCIT 2015)* (2015).
- [15] R. K. Abushehab, **B. K. Abdalhaq**, and B. Sartawi. “Genetic vs. particle swarm optimization techniques for traffic light signals timing”. In: *2014 6th International Conference on Computer Science and Information Technology (CSIT)*. Mar. 2014, pp. 27–35. DOI: 10.1109/CSIT.2014.6805975.
- [16] **B. K. Abdalhaq** and M. Abu Baker. “Using Meta Heuristic Algorithms to Improve Traffic Simulation”. In: *Journal of Algorithms and Optimization* 2 (4 Oct. 2014), pp. 110–128.
- [17] M. Hawash, **B. Abdalhaq**, A. Hawash, and M. Perkowski. “Application of Genetic Algorithm for Synthesis of Large Reversible Circuits using Covered Set Partitions”. In: *International Symposium on Innovation in Information and Communication Technology (ISIICT 2011)*. Sept. 2011.

- [18] **B. Abdalhaq** and I. Yaseen. “Factors affecting information technology adoption for learning in Palestinian schools (using TAM)”. In: *An-Najah University Journal for Research*. Vol. 22. 2008, pp. 1063–1097.
- [19] **B. Abdalhaq**, A. Cortés, T. Margalef, G. Bianchini, and E. Luque. “Between classical and ideal: enhancing wildland fire prediction using cluster computing”. In: *Cluster Computing* 9.3 (July 2006), pp. 329–343. ISSN: 1573-7543. DOI: 10.1007/s10586-006-9745-4. URL: <https://doi.org/10.1007/s10586-006-9745-4>.
- [20] **B. Abdalhaq**, A. Cortés, T. Margalef, and E. Luque. “Accelerating Wildland Fire Prediction on Cluster Systems”. In: *Computational Science - ICCS 2004*. Ed. by M. Bubak, G. D. van Albada, P. M. A. Sloot, and J. Dongarra. Berlin, Heidelberg: Springer Berlin Heidelberg, 2004, pp. 220–227. ISBN: 978-3-540-24687-9.
- [21] **B. Abdalhaq**, A. Cortés, T. Margalef, and E. Luque. “Accelerating Optimization of Input Parameters in Wildland Fire Simulation”. In: *Parallel Processing and Applied Mathematics*. Ed. by R. Wyrzykowski, J. Dongarra, M. Paprzycki, and J. Waśniewski. Berlin, Heidelberg: Springer Berlin Heidelberg, 2004, pp. 1067–1074. ISBN: 978-3-540-24669-5.
- [22] **B. Abdalhaq**, G. Bianchini, A. Cortés, T. Margalef, and E. Luque. “Improving Wildland Fire Prediction on MPI Clusters”. In: *Recent Advances in Parallel Virtual Machine and Message Passing Interface*. Ed. by J. Dongarra, D. Laforenza, and S. Orlando. Berlin, Heidelberg: Springer Berlin Heidelberg, 2003, pp. 520–528. ISBN: 978-3-540-39924-7.
- [23] **B. Abdalhaq**, A. Cortés, T. Margalef, E. Luque, and D. Viegas. “Improving convergence speed of optimization of input parameters in wild-land fire simulation”. In: *XIV Jornadas de Paralelismo*. 2003.
- [24] **B. Abdalhaq**, A. Cortés, T. Margalef, and E. Luque. “Optimization of Fire Propagation Model Inputs: A Grand Challenge Application on Metacomputers”. In: *Euro-Par 2002 Parallel Processing*. Ed. by B. Monien and R. Feldmann. Berlin, Heidelberg: Springer Berlin Heidelberg, 2002, pp. 447–451. ISBN: 978-3-540-45706-0.
- [25] **B. Abdalhaq**, A. Cortés, T. Margalef, and E. Luque. “Evolutionary Optimization Techniques on Computational Grids”. In: *International Conference on Computational Science*. Apr. 2002, pp. 513–522. DOI: 10.1007/3-540-46043-8_52.
- [26] **B. Abdalhaq**, A. Cortés, T. Margalef, and E. Luque. “Optimization of parameters in forest fire propagation models”. In: *IV International Conference on Forest Fire Research*. Nov. 2002, p. 114.
- [27] B. Qazzaz, **Abdalhaq, Baker**, D. Tamajon, D. I. Rexachs, and E. Luque. “A System for Data Collection of Environmental Information1”. In: *Environmental Communication in the Information Society - Proceeding of the 16th conference* (2002), pp. 428–431.