



MOHAMMAD AL-TOWAIQ

Associate Professor of Applied Mathematics and Computer Science

RESEARCH INTERESTS

Parallel Computing/ Numerical Analysis, Operations Research/ Markov Chains, and Mathematical Modeling.

RESEARCH AND DEVELOPMENT SUMMARY

IEEE and ACM professional member. Published 20 papers in various journals and conference proceedings, 2 papers submitted, and two papers in process. Author for a research book (in process). Supervised and examined a number of graduate (M.Sc.) theses. Developed several graduate (M.Sc.) and undergraduate programs in various fields of Mathematics and Computer Science.

HONORS AND AWARDS

- 1) Award and certificate of recognition, WM Paterson College, USA, 1979.
- 2) Award and certificate of recognition of performance with distinction in the college study of Statistics, American Statistical Association, USA, 1981.
- 3) Honors Certificate, WM Paterson College, USA, 1981.
- 4) School of Science Award for academic excellence and outstanding in mathematics, WM Paterson College, USA, 1981.

EDUCATION SUMMARY

<i>1985</i>	<i>Ph.D.</i>	<i>Applied Mathematics</i>	<i>SUNY at Stony Brook, USA</i>
<i>1983</i>	<i>M.Sc.</i>	<i>Applied Mathematics</i>	<i>SUNY at Stony Brook, USA (degree awarded in 1985)</i>
<i>1981</i>	<i>B.Sc.</i>	<i>Mathematics</i>	<i>W. Paterson College of State of New Jersey, USA</i>
<i>1971</i>	<i>Diploma</i>	<i>Mathematics</i>	<i>Amman Teachers Training Institute, Jordan</i>

EMPLOYMENT SUMMARY

Sept 1, 05 - Chairman and Associate Prof. Chairman of Dept. of Computer Science, Joint faculty with the Dept

Sept 1, 04 -	Chairman	of Math. and Stat, JUST, Jordan
Aug 31, 05	Associate Professor	and Chairman of Dept. of Math. and Stat., Joint faculty with the Computer Science Dept, JUST, Jordan.
Feb, 03 – Sep 04	Associate professor	Dept. of Math. and Stat., Jointly with the Computer Science Dept. since Feb 2004, JUST, Jordan.
99 – Feb, 03	Associate professor	Dept. of Computer Science, Sultar Qaboos Univ., Oman (Leave without payment from JUST).
1998- 99	Associate Professor	Dept. of Computer Science, A Bayan University, UAE (Leave without payment from JUST).
1997-98	Chair and Associate Professor	Dept. of Mathematical Sciences JUST ¹ , Jordan.
1996-97	Vice President of GSSR ² and Associate Professor	Dept. of Mathematics, Al al-Bayt University, Jordan (Sabbatical leave from JUST).
1995-96	Vice Dean & Associate Professor	Faculty of Arts and Sciences, JUST Jordan.
1992-96	Chair and Associate Professor	Dept. of Mathematical Sciences JUST, Jordan.
1991-92	Chairman	Dept. of Mathematical and Physical Sciences, JUST
1988-92	Assistant Professor	Faculty of Arts and Sciences, JUST Jordan.
1985-88	Assistant Professor	Dept. of Mathematics, Yarmouk University, Jordan.
1981-85	Teaching & Research Assistant	SUNY at Stony Brook, USA.
1971-78	Lecturer Mathematics	in Ministry of Education, Jordan.

TEACHING SUMMARY

20 years experience in teaching various topics in applied and pure mathematics as well as several topics in computer science at both undergraduate and graduate levels, such as Numerical Analysis, Differential Equations, Discrete Mathematics, Linear Programming and Game Theory, Operations Research, Optimization, Automata and Formal Languages, Theory of Computations, Foundation of Computer Science, Programming Languages as well as many other subjects.

¹ Jordan University of Science and Technology

² Graduate Studies and Scientific Research

SERVICE SUMMARY

20 years of active participation in almost every academic committee and extra curricular activities in all universities I served in.

PUBLICATIONS

Journal papers

- 1) **M. Al-Towaiq**, "Clustered Gauss-Jordan and Gauss-Huard Algorithms", submitted to *J. of Supercomputing*, 2004.
- 2) **M. Al-Towaiq**, F. Masoud, A.B. Mnaour, K. Day, " An Implementation of A Parallel Iterative Algorithm for the Solution of Large Banded Systems on a Cluster of Workstations", submitted to the *International Journal of Modeling and Simulation*, 2004.
- 3) **M. Al-Towaiq** , K. Day, and E. Al-Daoud, "*An Improved Algorithm for the Solution of Sparse Linear Systems*," *J. Inst. Math. & Computer Sciences*, (Comp. Sci. Ser.) Vol. 14, No. 1(2003) pp 63-69.
- 4) A. B. Mnaouer, K. Day, **M. Al-Towaiq**, F. Masoud, "Performance Evaluation of Database Systems Using Colored Petri Nets", *SQU Journal of Science and Technology*, 8(2003), pp33-46.
- 5) **M. Al-Towaiq** and B. Al-Eideh, "A Central Limit Theorem for Absorbing Markov Chains with Absorbing Subchain," *J. Advances in Modelling & Analysis, AMSE*, 2000-Vol. 37, No. 3, pp. 15-22.
- 6) **M. Al-Towaiq**, "An Improved Algorithm for the Iterative Refinement Method," *J. of Discrete Mathematical Sciences & Cryptography*, Vol.2 (1999), pp. 73-76.
- 7) **M. Al-Towaiq**, "Asymptotic Normality of Maximum Likelihood Estimators for Multiparameter Markov Chains," *J. of Information and Optimization Sciences*, vol. 20 (1999), pp. 309-312.
- 8) B. Al-Eideh and **M. Al-Towaiq**, "Limiting Distributions for Absorbing Markov Chains with r Absorbing States," *J. Advances in Modeling and Analysis, AMSE*, Vol. 29(1995), No.1, pp. 17-24.
- 9) **M. Al-Towaiq**, "Reverse Process of an Absorbing Markov Chains with r Absorbing States", *Journal of Information and Optimization Sciences*, Vol. 16(1995), No. 2, pp. 277-280.

- 10) **M. Al-Towaiq** and B. Al-Eideh, "Quasi Stationary Distribution in Absorbing Markov Chains with r Absorbing States," *Journal of Information and Optimization Sciences*, Vol. 15, No. 2, pp. 89-95, 1994.
- 11) M. Smadi and **M. Al-Towaiq**, "A Note on Jackknife Estimators and Empirical Results for the First and Second Order Autoregressive Process," *Journal of Information and Optimization Sciences*, Vol. 13, No. 3, pp. 399-406, 1992.
- 12) **M. Al-Towaiq** and B. Al-Eideh, "An Application of the McNemar Test for the Existence of Absorbing Subchains in a Given Markov Chain," *Journal of Information and Optimization Sciences*, Vol. 12, No. 3, pp. 467-475, 1991.
- 13) M. Smadi and **M. Al-Towaiq**, "Empirical Comparison for Bays Estimator for the Parameter of AR(1) Process in Case of Short Series," *Journal of Information and Optimization Science*, Vol. 2, No. 2, pp. 229-233, 1991.
- 14) **M. AL-Towaiq**, "A Direct Method for the Solution of Large Systems of Linear Equations Using Incomplete LU-Factorization," *Mathematica Japonica*, Vol. 34, No. 5, 1989.
- 15) **M. AL-Towaiq**, "A Two-Term Iterative Solution Scheme for Linear Sparse Systems," *ISNA, METU*, pp. 123-140, 1987.

Conference Papers

- 16) **Al-Towaiq** and Huda Al-Aamri, " Parallel Implementation of Gauss-Huard Algorithm on a Cluster of Linux Workstations", Proceedings of the IADIS International Conference on Applied Computing 2004, Lisbon, Portugal, 23 to 26 March 2004, pp. I-543-550.
- 17) K. Day, **M. Al-Towaiq**, F. Masoud, A. B. Mnaouer, " Comparative Performance Evaluation of Client-Server Database Systems", ACIT'2003, International Arab Conference on Information Technology, 20-23 December 2003, Alexandria, Egypt, Vol. 1, pp. 254-261.

- 18) **M. Al-Towaiq** and Huda Al-Amri , " A Parallel Implementation of GESPP on a Cluster of Silicon Graphics Workstations", *Proceedings of the Ninth IEEE Inter. Conf. On Parallel and Distributed Systems*, pp. 226-230, 17-20 December 2002, Taiwan.
- 19) **A.B. Mnaouer**, K. Day, **M. Al-Towaiq** and F.A. Masoud: " Colored Petri Nets Based Modeling and Simulations of Replicated Database Systems", *Proceedings of the 2002 Inter. Conf. On Information and Knowledge Engg. (IKE'02)*, pp. 606-613, Las Vegas, USA, June 24-27, 2002.
- 20) K. Day, F.A. Masoud, A.B. Mnaouer and **M. Al-Towaiq**, " Centralized Versus Replecated Client-Server Database Systems", *Proceedings of the IASTED Inter. Conf. On Applied Informatics*, pp. 295-299, Feb. 18-21, 2002, Innsbruck, Austria.
- 21) **M. Al-Towaiq**, K. Day, A. Mnaouer, F. Masoud, " A New Parallel Algorithm for the Solution of Large Banded Shifted Systems", *Proceeding of the IASTED Inter. Conf. (ASM 2001)*, pp. 355-358, Sept. 4-7, Spain.
- 22) K. Day, A. B. Mnaouer, F. Masoud, and **M. Al-Towaiq** "A Fault-Tolerant Asynchronous Data Replication Protocol," *Proceedings of The 19th IASTED International Conference on Applied Informatics, AI'2001*, pp. 59-63, February 19-22, 2001, Innsbruck, Austria.

Books

- 23) **M. Al-Towaiq** and B. Al-Eideh, "Introduction to Finite Markov Chains", book in process.

Others

- 24) **M. Al-Towaiq**, "On a Two-Term Iterative Scheme Based on Incomplete Factorization of Large Sparse systems," Ph. D. Thesis, 1985, Advisor: Professor Reginald P. Tewarson.

Papers in process

- 25) **M. Al-Towaiq**, "Three-Species Dynamics in a Food Chain," in process.
- 26) **M. Al-Towaiq**, " Fast Parallel Solutions for BVP with Mixed Boundary Conditions".

REFEREEING ACTIVITIES

- (1) Refree for
 (a) Journal of Systems and Software, Elsevier Inc.

- (b)AMSE, Series A, Advances in Modeling and Analysis, France.
- (c)Dirasat, University of Jordan.
- (d)Damascus J. for Basic Sciences and Agricultural Engineering/ University of Damascus.
- (e)Abhath al-Yarmouk J., Yarmouk University.
- (f) Mu'tah J. for Research and Studies/ Natural and Applied Sciences Series, Mu'tah University.

(2) Referee for several national conferences and two international conference.

FUNDED RESEARCH GRANTS

- 1- SQU/DOPSAR/R/SCI/00/12. " High-Performance Computing on a Cluster of Workstations Interconnected by a High-Speed Switched Network". (Grant total RO 10,800 =US\$27,835). Principle investigator: Drs. K. Day, **M. Al-Towaiq**, F. Masoud, and A. Ben Mnaouer.
- 2- SQU/IG/SCI/COMP/02/01. " Parallel Implementation of Gauss-Jordan and Gauss-Huard Algorithms in a Cluster Computing Environment ".(Grant total RO 1,416=US\$3,670). Principle investigator: **M. Al-Towaiq**, and Huda Al-Aamri.

TEACHING EXPERIENCE

Undergraduate Teaching

Computer Science Courses:

Computational Methods I & II, Finite Automata and Formal Languages, Problem Solving and Computer Programming Using VB, Programming in Fortran 77 and 90/95 (SQU⁴ and JUST), Operations Research (JUST), Foundation of Computer Science (JUST), Personal Computers and Software Packages (SQU), Discrete Mathematics (JUST), Linear Programming and Game Theory (Al al-Bayt and JUST), Operations Research (JUST), Theory of Computations (JUST), Introduction to Computer Science (JUST), Also, I can teach Data Structures, Algorithm Analysis, Compiler and Parallel Processing and Computing.

Mathematics and Statistics Courses:

Calculus I, II, and III, Ordinary Differential Equations, linear Algebra (YU³, JUST, AlBayan, and Al al-Bayt), Partial Differential Equations (YU),

³ Yarmouk University

⁴ Sultan Qaboos University

Numerical Analysis (JUST, YU, AlBayan and Al al-Bayt), Applied Algebra (JUST), Engineering Mathematics, Boundary Value Problems (SUNY), Statistics I (JUST and AlBayan), and Probability and Statistics (JUST), Linear Programming (JUST and AL al-Bayt).

Graduate Teaching

Advanced Numerical Analysis (JUST & YU), Least Squares Solution (YU).
Biostatistics and Mathematics for Pharmacists (JUST).

Curriculum Development

I was actively involved in developing the following study programs. I also played a major role in developing several courses for these programs.

B.Sc. Program in Computer Science at SQU.

B.Sc. Program in Mathematics at YU and Al al-Bayt University.

B.Sc. Program in Mathematical Sciences/Operation Research and Programming Analysis at JUST.

M.Sc. Program in Mathematics and Applied Mathematics at YU and Al al-Bayt University.

Theses Supervision/Examination

- 1) Zakwan Al-Arnout, " Attack Path Accompaniment for Tracing Flooding Denial of Service Attacks in IP-Based Network", al-Albayt University, Department of Computer Science, MSc. Thesis, external examiner, Feb. 2004.
- 2) Emad Jaradat, "Line Integrals Over Implicitly Defined Curves", JUST, Dept of Math. and Stat., MSc. thesis, examiner, 2003.
- 3) Mohammad Al-Qudah, "Jacobi-Weighted Orthogonal Polynomials on Triangular and Simplex Domains", JUST, Dept of Math and Stat, MSc. thesis, examiner, 2003.
- 4) Mufeed Al-Mushrafi, "Design and Analysis of Recursive Binary Sequences for the Use of Stream Cipher Crypto-System", SQU, Dept. of Information Engineering, M.Sc. thesis, external examiner, 2001.
- 5) Said A. Al-Hadhrami, " Moving Extremes Ranked Set Sampling (MERSS)", SQU, Dept. of Mathematics and Statistics, M. Sc. thesis, external examiner, 2001.
- 6) Essam F. Al-Daoud, "New Algorithm for the Solution of Linear Sparse Systems," Al al-Bayt University, M.Sc. thesis, supervisor, 1997
- 7) Ali W. Al-Attaiwi, "Some Applications of Genetic Algorithms," Al al-Bayt University, M.Sc. thesis, Cooperator supervisor and examiner, 1997.

- 8) Zeyad A. Al-Zohour, "Kronecker Products and Some Applications," Al al-Bayt University, M.Sc. thesis, examiner, 1997.
- 9) Amer H. Omar, "Generalization of Fractional Calculus Solutions to a Class of Linear Ordinary Integro-Differential Equations," Al al-Bayt University, M.Sc. thesis, examiner, 1997.
- 10) Ibrahim M. Al-Ayyoub, "On the Learning Algorithms of Artificial Neural Networks and Singular Value Decomposition of Matrices," Al al-Bayt University, M.Sc. thesis, examiner, 1997.
- 11) Kamel M. Al-Khaled, "On the Lagrange Interpolation of Entire Functions," Yarmouk University, M.Sc. thesis, examiner, 1988.
- 12) Abedallah M. Rababah, "On Hermite-Fejer Interpolation for Functions of Bounded Variation Based on the Zeros of Certain Jacobi Polynomials," Yarmouk University, M.Sc. thesis, examiner, 1988.

Final-Year Project Supervision

- 1) Solution of System of Linear Equations using Gaussian Elimination with Scaled Partial Pivoting in Parallel Computer.
- 2) Solution of System of Linear Equations using Gauss-Seidel Method in Parallel Computer.
- 3) Implementation of Genetic Algorithms for the solution of the Lecture Room Assignment Problem.

SELECTED SERVICES

Committees

Department level: Coordinator of the Appointment Committee, Staff Affairs Committee and Student Affairs committees (SQU, 99/00, 00/01, 2001/02).

Student / Staff Liaison Committee (SQU, 99/2000, 2001/02)

Served in and coordinated most committees in JUST, YU, and Al al-Bayt.

College level: Appointment Committee (SQU, 00/01 and 2001/02)

Technical Training Committee (SQU, 00/01)
 Adhoc Committee for Technician Training (SQU,
 99/2000)

Curriculum committee (JUST and YU)
 Coordinator of the library committee (JUST)
 Coordinator of the scientific research committee (JUST)
 Scientific research committee (JUST)
 Several different ad hoc committees (JUST)
 Exam and disciplinary committee (JUST)

University level: Library committee (JUST)
 Committee for developing research and graduate study
 (JUST)

Scientific Research Council (JUST)
 Scientific Research and Graduate Study Council (Al al-
 Bayt University)
 Graduate Study Council (JUST)

Other major services

Planning committee for the establishment of the Department of
 Mathematical Sciences, JUST.

Actively involved and chaired the department of Applied Mathematical
 Science in JUST for

more than 7 years. Also, I served as an acting head of the Computer Science
 Department in

SQU for several times (6 –8/11/00, 18-21/11/00, 17/6-14/7/00, 22-
 31/7/00, 6-13/1/01, and
 18-23/2/01).

Served in the organizing committee of the Jordanian Conference in
 Mathematical Sciences for
 the years 1992, 1996, and 1998.

OTHER ACTIVITIES

- 1) Member of IEEE Computer Society.
- 2) Member of ACM Group
- 3) Member of IASTED Society
- 4) Member of Jordan Mathematical Sciences Association (8 years, stopped).
- 5) Member of Jordanian Alumni Society Graduates of U.S. Universities and
 Institutes.
- 6) Member of Jordan Computer Society (two years, stopped).
- 7) Member of Japanese Association of Mathematical Sciences (3 years,
 stopped)

SELECTED PROFESSIONAL AND SCIENTIFIC MEETINGS

- 1) Conference on Applied Mathematics, 3 - 6 January 1987, Cairo, Egypt. Contributed a Paper Entitled " A Direct Method for the Solution of Large Systems of Linear Equations Using an Incomplete LU-Factorization".
- 2) International Symposium on Numerical Analysis, 1-4 September 1987, METU, Ankara, Turkey. Contributed a Paper Entitled "A Two-Term Iterative Solution Scheme for Linear Sparse Systems".
- 3) Round Table meeting " Education for all by the year 2000 ", 20-23 Dec. 1992, Amman, Jordan.
- 4) Workshop on "Active Learning Mathematics", March 3-6/1996, United Arab Emirates Univ., Al-Ain, UAE.
- 5) Member of the primary committee of the first Jordanian Conference in Mathematical Sciences, Jordan 2 - 4 /1992.
- 6) The third Jordanian Conference in Mathematical Sciences, Jordan 2-4/1996.
- 7) Member of the primary committee of the 4th. Jordanian conference in Mathematical Sciences, Jordan, 24 - 26 / 8 / 1998.

COMPUTER RELATED EXPERIENCE

Adept in Mathematical programming: Working knowledge of numerical algorithms, PVM, DRIVE, MATLAB, MATHEMATICA, LINPACK, SPSS and the ISML subroutines. Also, I have good experience in Computer Literacy: Word, Access, PowerPoint, Excel, and the World Wide Web.

REFERENCES

- 1) Professor Mohammed Hailat, Dean of College of Arts and Science, JUST, Jordan. Email: hailat@just.edu.jo
- 2) Professor Anton McLachlan, Dean of College of Science, Sultan Qaboos University, Oman. Email: antonmcl@squ.edu.om
- 3) Professor Abdul-Majid K.Nusayr, Dept. of Applied Mathematical Sciences, JUST, P.O.Box 3030, Irbid, Jordan. Email: nusayr@just.edu.jo
- 4) Professor R. P. Tewarson, SUNY at Stony Brook, AMS Dept., Stony Brook, NY, 11974, USA. Email: tewarson@optonline.net
- 5) Dr. K. Day, Department of Computer Science, SQU, Oman. e-mail: kday@squ.edu.om

PERSONAL DATA

Date of Birth: Feb. 10, 1950

Place of Birth: Ramtha, Jordan

Nationality: Jordanian

Marital Status: Married

Number of Children: Five

Current address: Jordan University of Science and Technology
Faculty of Computer Science and Information Technology,
Department of Computer Science, Chairman
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Permanent address: P.O.Box 133, Ramtha, Jordan.

Statement of Research

Mohammad Hasan Al-Towaiq

towaiq@just.edu.jo

I work in the area of Applied mathematics, focusing on the solution of large sparse systems, implementation of parallel algorithms on a cluster computer, and on the Quasi-Stationary Distributions of Markov Chains. I have published papers in international journals and conferences, including a number of single authored papers.

Parallel Computing research is an increasingly important subject, which plays a central role in large scale scientific computing. My contribution deals specifically with the implementation and applications of computer algorithms in order for effective mathematical software in linear systems of equations in general and sparse matrix technology to be used as tools in science and engineering. Currently, I improved and implement some parallel algorithms for the solution of large linear systems on a cluster of silicon graphics workstations, analytical performance evaluation of database systems using colored petri nets, and comparative performance evaluation of client-server database systems. The results we obtained are published in international journals and conferences proceedings. Also, I am involved in two research groups, UNDP project in Distributed Modeling of Pipe Network and a proposal to HCST on Solid Waste Landfill in Jordan.

Quasi-stationary distribution of absorbing Markov chains appears as models for process in Medicine, Biology, and other fields. Our contribution deals with more than one absorbing state and we study the different types of quasi-stationary distributions conditional on an eventual absorption into a specified state. Such a case encounters for instance in some biological research where the absorbing states correspond to the extinction of certain characteristics. Currently, we investigate the limiting distributions and the Central Limit Theorem for absorbing Markov chains with absorbing subchains. Also, we are working in a research book in Finite Markov Chains.

For more than three years I adapted a model in Three-Species Dynamics Food Chain. Interesting preliminary results are already achieved. Future experimental work is needed to support this model.

My plan is to continue working on the area of modeling and the implementation of parallel algorithms for the solution of large linear systems and the Differential Equations.

Statement of Teaching

Mohammad Hasan Al-Towaiq

towaiq@just.edu.jo

I started my teaching experience at the Jordanian high schools from 1971 to 1978. After I got my Ph. D. (1985) I am involving in teaching, research, and curriculum development in five universities (Yarmouk, JUST, Al al-Byat, Al Bayan, and SQU).

Curriculum Development:

At JUST I was involved in a field study at Jordan in order to establish the undergraduate program in Mathematical Sciences. I played a central role in this study by direct contact with educational experts in Europe, USA, Arab States, and locally in Jordan. Several course syllabi in Applied Mathematics, Operation Research, and Computer Applications were prepared as a part of this project.

At YU I was involved in developing the graduate program in applied mathematics. Several course syllabi were prepared.

At Al al-Byat University I was involved in developing the undergraduate and graduate programs in Mathematics. Several course syllabi were prepared. Also I was the Vice President of the Scientific Research and Graduate Study Council and I made numerous contributions to this academic body.

At SQU I was involved in updating the undergraduate program in Computer Science. Several course syllabi were prepared.

Laboratories

On the time we established the Dept. of Applied Mathematics I established and organized two labs. The two labs are equipped with several simulation packages useful for teaching various courses in programming analysis and related Math. courses. Also, I was involved in establishing a parallel and distributed lab setup at both SQU and JUST.

Teaching Philosophy

Teaching is an enjoyable career for me, especially teaching Mathematics. Mathematics is a beautiful subject and a good tool to acquire the process of

learning, thinking, computing, and communicating. As an applied mathematician, I always try to make the subject interesting. I ask questions, assigning group work to make students communicate with each other, I ask students to solve problems on the blackboard, and encourage them to ask questions.

In recent years I made great strides toward modernization of courses taught using E-Learning (WebCT), computer technology and available software. We established computer labs for teaching, and we use books using Matlab and Mathematica. I assign weekly homework and projects where the students need to use MatLab, Drive, or computer programming. I always keep in mind that technology is just a tool and not a substitute for the process of deriving answers.