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EDUCATION AND TRAINING

Dr. rer. nat. in Mathematics

University of Konstanz [10/2012 – 01/2016]

Address: Konstanz (Germany)

(Summa cum laude), GPA: 0.16 **out of 0.00**

MSc. in Mathematics

The University of Jordan [09/2009 – 08/2011]

Address: Amman (Jordan)

(Excellent), GPA: 4.00 **out of 4.00** (first rank among all the students of the university)

BSc. in Mathematics

Hebron University [01/2005 – 06/2008]

Address: Hebron (Autonomous Palestinian Territories)

(Excellent Honors), GPA: 95.51 **out of 100** (first rank among all the students of the university)

Secondary School (Tawjihi)

Beit – Ula Secondary School [09/2002 – 06/2004]

Address: Hebron (Autonomous Palestinian Territories)

Scientific branch, GPA: 95.7 **out of 100**

THESES

Ph.D.: Perturbation and Intervals of Totally Nonnegative Matrices and Related Properties of Sign Regular Matrices

[01/10/2012 – 21/01/2016]

University of Konstanz, Konstanz, Germany, 2016.

Supervisor: Prof. Dr. Jürgen Garloff.

M.Sc.: Geometrical Relations Between the Zeros and Critical Points of Polynomials

[01/10/2010 – 27/06/2011]

The University of Jordan, Amman, Jordan, 2011.

Supervisor: Prof. Dr. Fuad Kittaneh.

WORK EXPERIENCE

Assistant Professor

Palestine Polytechnic University [01/09/2016 – Current]

Address: Hebron (Autonomous Palestinian Territories)

Postdoctoral Fellow

University of Konstanz [01/02/2017 – 31/07/2018]

Address: Konstanz (Germany)

Postdoctoral Fellow Visitor

University of Regina [01/02/2017 – 31/01/2018]

Address: Regina (Canada)

Associated Fellow

Zukunftskolleg / University of Konstanz [01/05/2016 – 31/08/2016]

Address: Konstanz (Germany)

Instructor

Palestine Polytechnic University [04/09/2011 – 31/03/2012]

Address: Hebron (Autonomous Palestinian Territories)

Research and Teaching Assistant

Palestine Polytechnic University [01/09/2008 – 15/09/2009]

Address: Hebron (Autonomous Palestinian Territories)

HONOURS AND AWARDS

Founding Academy

Palestine Academy for Sciences and Technology (PALAST) [01/12/2019]

Co-founder of the Palestine Young Academy (PYA).

Best Research Group

Palestine Polytechnic University [01/11/2018]

Palestine Islamic Bank Prize for the best Research Group at 2018 (with Ms. Khawla Almuhtaseb and Mr. Ayed Abdel Ghani).

Prestigious Membership

Arab-German Young Academy of Sciences and Humanities (AGYA) [01/07/2018]

Membership of the Arab-German Young Academy of Sciences and Humanities (AGYA), July 2018 - Sep. 2023 (more than 400 applicants from Germany and the Arab countries, I have been selected together with 13 scientists)

PRIME Postdoctoral Fellowship

German Academic Exchange Service (DAAD) [15/07/2016]

Postdoctoral Researchers International Mobility Experience (P.R.I.M.E.) awarded by the German Academic Exchange Service (DAAD), Feb. 2017 - July 2018 (first Palestinian and the second Arab to be awarded the P.R.I.M.E.).

Postdoctoral Fellowship

Zukunftskolleg at the University of Konstanz [15/04/2016]

Bridge fellowship awarded by the Zukunftskolleg at the University of Konstanz, May 2016 - Jan. 2017.

PhD Scholarship

German Academic Exchange Service (DAAD) [20/03/2012]

Scholarship awarded by the German Academic Exchange Service (DAAD) to attain the Doctoral degree in mathematics at the University of Konstanz, Konstanz, Germany, April 2012 - March 2016.

MSc Scholarship

German Academic Exchange Service (DAAD) [15/02/2009]

Scholarship awarded by the German Academic Exchange Service (DAAD) to attain the M.Sc. degree in mathematics at The University of Jordan, Amman, Jordan, Sep. 2009 – Aug. 2011.

BSc Scholarship

Hebron University [15/01/2005]

Scholarship awarded by Hebron University for excellence students of the university, full funding of the B. Sc. studies, Jan. 2005 – June 2008.

First Position

The University of Jordan [01/07/2011]

First position among the graduates of the entire The University of Jordan, 2011.

First Position

Hebron University [15/07/2008]

First position among the graduates of the entire Hebron University, 2008.

One of the Best Graduates

Palestinian Ministry of Education and Higher Education [25/08/2008]

One of the best graduates of all Palestinian universities in 2008.

LANGUAGE SKILLS

Mother tongue(s): **Arabic**

Other language(s):

English

LISTENING C1 READING C1 WRITING C1

SPOKEN PRODUCTION C1 SPOKEN INTERACTION C1

German

LISTENING B1 READING B1 WRITING B1

SPOKEN PRODUCTION B1 SPOKEN INTERACTION A2

JOB-RELATED SKILLS

Programs

Microsoft Office, LaTeX.

RESEARCH INTERESTS

Research interests

Matrix theory, linear and multilinear algebra, graph theory, combinatorics, and fractional calculus..

PUBLICATIONS

Bounds and majorization relations for the critical points of polynomials

[2012]

<https://www.sciencedirect.com/science/article/pii/S0024379511007221>

Linear Algebra Appl., 436, 2494 – 2503, 2012 (with F. Kittaneh).

Intervals of totally nonnegative matrices

[2013]

<https://www.sciencedirect.com/science/article/pii/S0024379513006411>

Linear Algebra Appl., 439, 3796 – 3806, 2013 (with J. Garloff).

Invariance of total nonnegativity of a tridiagonal matrix under element-wise perturbation

[2014]

<http://oam.ele-math.com/08-06/Invariance-of-total-nonnegativity-of-a-tridiagonal-matrix-under-element-wise-perturbation>

Oper. Matrices, 8 (1), 129 – 137, 2014 (with J. Garloff).

Improved tests and characterizations of totally nonnegative matrices

[2014]

<https://journals.uwyo.edu/index.php/ela/article/view/1399>

Electron. J. Linear Algebra, 27, 588 – 610, 2014 (with J. Garloff).

Invariance of total positivity of a matrix under entry-wise perturbation and completion problems

[2016]

https://books.google.ps/books?hl=en&lr=&id=hmq1CwAAQBAJ&oi=fnd&pg=PA115&dq=info:pPcGhhcNFmwj:scholar.google.com&ots=EPrEGvGCUQ&sig=2siQpsqZqiebCfZp4hnr3pagM9k&redir_esc=y#v=onepage&q&f=false

in: *A Panorama of Mathematics: Pure and Applied, Contemporary Mathematics*, vol. 658, Amer. Math. Soc., Providence, RI, pp. 115-126, 2016 (with J. Garloff).

Total nonnegativity of matrices related to polynomial roots and poles of rational functions

[2016]

<https://www.sciencedirect.com/science/article/pii/S0022247X15008161>

J. Math. Anal. Appl., 434, 780 – 797, 2016 (with J. Garloff and J. Titi).

Intervals of special sign regular matrices

[2016]

<https://www.tandfonline.com/doi/abs/10.1080/03081087.2015.1090388?journalCode=glma20>

Linear and Multilinear Algebra, 64, 1424-1444, 2016 (with J. Garloff).

A survey of classes of matrices possessing the interval property and related properties

[2016]

<https://interval.louisiana.edu/reliable-computing-journal/volume-22/reliable-computing-22-pp-001-014.pdf>

Reliable Computing, 22, 1 – 10, 2016 (with J. Garloff and J. Titi).

Total nonnegativity of the extended Perron complement

[2016]

<https://www.sciencedirect.com/science/article/pii/S0024379516302646>

Linear Algebra Appl., 508, 214 – 224, 2016 (with J. Garloff).

Invariance of total nonnegativity of a matrix under entry-wise perturbation and subdirect sum of totally nonnegative matrices

[2017]

<https://www.sciencedirect.com/science/article/pii/S0024379516305171>

Linear Algebra Appl., 514, 222 - 233, 2017 (with J. Garloff).

Further applications of the Cauchon Algorithm to rank determination and bidiagonal factorization

[2018]

<https://www.sciencedirect.com/science/article/abs/pii/S0024379518300491>

Linear Algebra Appl., 545, 240 - 255, 2018 (with K. Al Muhtaseb, A. Abdel Ghani, S. Fallat, and J.)

Ovoids of generalized quadrangles of order $(q, q^2 - q)$ and Delsarte cliques in related strongly regular graphs

[2018]

<https://onlinelibrary.wiley.com/doi/abs/10.1002/jcd.21598>

J. Comb. Designs 26 (5), 249 - 263, 2018 (with .R Bergen, F. Ihringer, S. Jaques, K. Meagher, A. Purdy, and B. Yang).

Total nonnegativity of finite Hurwitz matrices and root location of polynomials

[2018]

<https://www.sciencedirect.com/science/article/abs/pii/S0022247X18305663>

J. Math. Anal. Appl., 434 (1), 780-797, 2018 (with J. Garloff and M. Tyaglov).

The maximum multiplicity of the largest k -th eigenvalue in a matrix whose graph is acyclic or unicyclic

[2019]

<https://www.sciencedirect.com/science/article/abs/pii/S0012365X19302262>

Discrete Mathematics, 342 (10), 2924 - 2950, 2019 (with S. Fallat).

Achievable multiplicity partitions in the inverse eigenvalue problem of a graph

<https://www.degruyter.com/document/doi/10.1515/spma-2019-0022/html>

Special Matrices, 7, 276 - 290, 2019 (with S. Fallat, K. Meagher, S. Nasserar, S. Plosker, and B. Yang).

Relaxing the nonsingularity assumption for intervals of totally nonnegative matrices

[2020]

<https://journals.uwyo.edu/index.php/ela/article/view/5015>

Electron. J. Linear Algebra, 36, 106 - 123, 2020 (with K. Al Muhtaseb, A. Abdel Ghani, and J. Garloff).

Weakly Hadamard diagonalizable graphs

[2021]

<https://www.sciencedirect.com/science/article/abs/pii/S0024379520304663>

Linear Algebra Appl., 610, 86 - 119, 2021 (with K. Almuhtaseb, S. Fallat, K. Meagher, S. Nasserar, M. Shirazi, and A. Razafimahatratra).

Characterization, perturbation, and interval property of certain sign regular matrices

[2021]

<https://www.sciencedirect.com/science/article/abs/pii/S0024379520305607>

Linear Algebra Appl., 612, 146 - 161, 2021 (with J. Garloff).

Further matrix classes possessing the interval property

[2021]

https://kops.uni-konstanz.de/bitstream/handle/123456789/54059/Garloff_2-yi893nr1o5d30.pdf?sequence=3&isAllowed=y

Accepted in Reliable Computing (with D. AlSaafin and M. Adm).

Bounding the range of a sum of multivariate rational functions

Submitted (with J. Titi, J. Garloff, and A. Elgayar).

On some numerical aspects of the Cauchon algorithm

to be submitted soon (with J. Garloff and F. Rasheed).

Results and questions on the maximum nullity of a graph with a fixed inertia

To be submitted soon (with S. Fallat).

SIGNIFICANT CONTRIBUTIONS

Significant Contributions

In the second paper of the list of my publications, a conjecture which was posed by Prof. Jürgen Garloff in 1982 is settled. In this paper we combine an array of recent tools from distinct areas and we successfully bridge these facts to resolve this open problem. In the fourth paper, some results from second paper are used to give an efficient determinantal criterion for totally nonnegative matrices and some characterizations of their subclasses. In the seventh paper, analogous results for other classes of matrices are proved and a new conjecture is posed. In the sixth paper, these results are applied to the theory of Hurwitz (stable) polynomials and theory of rational functions to give simple proofs for some known results e.g., Markov's Theorem, and sufficient conditions for a given family of 'interval' rational functions and interval polynomials to be R -functions of negative type and Hurwitz, respectively. In the eleventh paper, a novel method for the determination of the rank of a matrix is proposed and an efficient method for calculating the bidiagonal factorization of an important class of matrices is given. In the thirteenth paper, an extension of the well-known Routh-Hurwitz Theorem is introduced. In the fourteenth and fifteenth papers, the inverse inertia problem for interesting families of graphs is solved and two challenging conjectures are proposed whose solution will advance the theory of the inverse eigenvalue problem of graphs.

TALKS IN CONFERENCES

Relations between the zeros and critical points of polynomials

[16/07/2012 – 18/07/2012]

Third Palestinian Conference on Modern Trends in Mathematics and Physics, Hebron, Palestine.

Intervals of sign regular matrices

[09/06/2015 – 11/06/2015]

8th Small Workshop on Interval Methods (SWIM 2015), Prague, Czech Republic.

Total nonnegativity of matrices related to polynomial roots and poles of rational functions

[07/09/2015 – 11/09/2015]

MATTRIAD 2015, Coimbra, Portugal.

Application of the Cauchon Algorithm to sign regular matrices

[11/07/2016 – 15/07/2016]

20th Conference of the International Linear Algebra Society (ILAS 2016), Leuven, Belgium.

Zeros and poles localization of polynomials and rational functions and total nonnegativity of structured matrices

[18/07/2016 – 22/07/2016]

7th European Congress of Mathematics (7ECM), Berlin, Germany.

Zeros and poles localization of polynomials and rational functions and total nonnegativity of structured matrices

[31/07/2016 – 02/08/2016]

Fifth Palestinian Conference on Modern Trends in Mathematics and Physics (PCMTMP-V), Jenin, Palestine (**Invited speaker**).

Optimal determinantal criteria for and intervals of totally nonnegative matrices

[02/06/2017 – 05/06/2017]

The Prairie Discrete Mathematics Workshop (PDMW), Living Skies Conference Centre Lumsden, Saskatchewan (near Regina), Canada, (**Invited speaker**).

Efficient determinantal tests for sign regular matrices

[05/06/2017 – 08/06/2017]

14th Annual PIMS Young Researchers Conference, University of Saskatchewan, Saskatoon, Saskatchewan, Canada.

A novel method for determining the rank of a matrix

[07/07/2017 – 09/07/2017]

Special Western Canada Linear Algebra meeting, Banff International Research Station for Mathematical Innovation and Discovery, Banff, Alberta, Canada (**Invited speaker**).

Recent applications of the Cauchon algorithm to totally nonnegative matrices

[24/07/2017 – 28/07/2017]

Meeting of International Linear Algebra Society: Connections (ILAS 2017), Iowa State University, Iowa, USA.

On the eigenvalues of acyclic matrices

[10/01/2018 – 13/01/2018]

Joint Mathematics Meeting (JMM 2018), San Diego, CA, USA.

Root location of polynomials whose finite Hurwitz matrix is totally nonnegative

[05/08/2018 – 08/08/2018]

Sixth Palestinian Conference on Modern Trends in Mathematics and Physics, Tulkarem, Palestine, (**Invited speaker**).

On the zero forcing game and maximum nullity of matrices whose graph is acyclic or unicyclic with q negative eigenvalues

[27/08/2018 – 30/08/2018]

Birzeit 2018 Conference Applied Mathematics and Random Structures, Ramallah, Palestine, (**Invited speaker**).

Math Online Teaching, Learning and Assessment: Challenges and Solutions

[25/02/2021 – 25/02/2021]

Math Unit Virtual First Symposium, Dhofar University, Oman, (**invited Panel Member**)

SUPERVISING MSC THESES AND BSC GRADUATION PROJECTS

Zero Forcing and Maximum Nullity of Graphs

[01/09/2019 – 15/06/2020]

Hadil Izzat, MSc Thesis, June 2020.

On Some Numerical Aspects of The Cauchon Algorithm

[01/09/2020 – 15/08/2021]

Fatema Rasheed, MSc Thesis, August 2021.

On The Nonsingular Sign Regular Matrices With Signature $(-1, -1, \dots, -1, +1)$

[01/09/2021 – Current]

Imad Hassouneh, MSc Thesis, -

Totally Nonnegative Matrices

[15/01/2019 – 15/05/2019]

Imad Hassouneh and Heba Jubeh, BSc graduation project, May 2019.

Spectral Graph Theory

[15/09/2018 – 10/01/2020]

Alaa Jamal, Montaser Abughalioun, and Younes Abuirmaila, BSc graduation project, January 2020.

MEMBERSHIP IN ACADEMIC ORGANISATIONS

Arab-German Young Academy of Sciences and Humanities (AGYA)

[01/07/2018 – 30/09/2023]

Palestine Young Academy (founding member)

[01/12/2020 – 30/11/2024]

International Linear Algebra Society (ILAS)

[01/07/2014 – Current]

ORGANIZING WORKSHOPS

Training Workshop: A Journey Towards Active Methods in Higher Education

[05/07/2019 – 08/07/2019]

Dierba, Tunisia, **(Co-organizer)**

Summer School: AGYA Summer School in Numerical Simulations, Palestine Polytechnic University and Bethlehem University

[18/08/2019 – 28/08/2019]

Hebron, Palestine, **(Head of the organizing committee)**.

Training Workshop: How to Integrate Interdisciplinary Courses in Arab and German Universities

[29/08/2019 – 01/09/2019]

Amman, Jordan **(Head of the organizing committee)**.

Training Workshop: Empowering Open Source Manufacturing Laboratories in Palestine

[03/12/2019 – 05/12/2019]

Hebron, Palestine **(Coordinator of the project in Palestine)**.

Training Workshop: Innovation in Teaching and Learning in Higher Education During COVID-19 Restrictions

[01/10/2020 – 31/12/2020]

Hebron, Palestine **(Head of the organizing committee)**

The Practical Training on Academic and Professional Skills for Entry into the Labour Market

[19/09/2021 – 07/10/2021]

Hebron, Gaza, Cairo **(Co-organizer)**

JOURNAL REVIEWS

Linear Algebra and its Applications Journal

Linear and Multilinear Algebra Journal

Discrete Mathematics Journal

Special Matrices Journal

Applications and Applied Mathematics: An International Journal (AAM)

Mathematical Reviews

Special Matrices

RECOMMENDATIONS

Name: Prof. Dr. Shaun M. Fallat,

Email: shaun.fallat@uregina.ca

Professor of Mathematics at the University of Regina, Regina, Canada.

Name: Prof. Dr. Jürgen Garloff,

Email: juergen.garloff@htwg-konstanz.de

Professor of Mathematics at the University of Konstanz and Institute for Applied Research, University of Applied Sciences/ HTWG, Konstanz, Germany.

Name: Prof. Dr. Fuad A. Kittaneh

Email: fkitt@ju.edu.jo

Professor of Mathematics at The University of Jordan, Amman, Jordan.