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Irad Yavneh

June, 2023

Born in Israel, April 23, 1958

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ACADEMIC DEGREES

Ph.D., Applied Mathematics, April 1991

Department of Applied Mathematics and Computer Science

The Weizmann Institute of Science, Rehovot, Israel

B.Sc., Aeronautical Engineering (Summa Cum Laude), August 1984

Technion, Israel Institute of Technology, Haifa, Israel

ACADEMIC APPOINTMENTS

March 2006 – Present: Professor

Department of Computer Science, Technion

January 2000 – February 2006: Associate Professor

Department of Computer Science, Technion

September 1993 – December 1999: Senior Lecturer

Department of Computer Science, Technion

VISITING APPOINTMENTS

Spring 2013:

Department of Computer Science and Applied Mathematics, Weizmann Institute of Science.

Summer 2009:

Department of Computer Science, University of British Columbia, Vancouver, Canada.

Summer 2007:

Department of Computer Science, University of Erlangen, Germany. *Invited Compact Course on Multigrid Techniques.*

Summer 2006:

The Lawrence Livermore National Laboratory, Livermore, CA.

Summer 2005:

Department of Computer Science, University of Erlangen, Germany. *Invited Compact Course on Multigrid Techniques.*

Summers 2003, 2005:

Center for Electronic Imaging Systems, University of Rochester, NY.

Summer 2002:

Department of Computer Science, University of Erlangen, Germany. *Invited lecture series on Multilevel Methods for Image Analysis.*

Summer 2001:

The Lawrence Livermore National Laboratory, Livermore, CA.

September 1999 – June 2000:

Institute of Geophysics and Planetary Physics, UCLA, USA

Summers 1994, 96, 98, 99:

National Center for Atmospheric Research, Boulder, Colorado, USA

PREVIOUS RESEARCH APPOINTMENTS

August 1991 – August 1993: Postdoctoral Fellow

Oceanography and Geophysical Turbulence Program, National Center for Atmospheric Research, Boulder, Colorado, USA

November 1989 – November 1990: Graduate Research Assistant

Center for Nonlinear Studies, Los Alamos National Laboratory

RESEARCH INTERESTS

Primary

Multigrid computational methods and Scientific Computing

Other

Geophysical fluid dynamics; Image processing and analysis; Computational physics.

TEACHING EXPERIENCE

October 1993 – Present: Faculty

Department of Computer Science, Technion

Numerical Analysis I and II, Introduction to Computers (Fortran, C, Matlab), Computer Science Seminars and “Advanced Topics”, Multigrid Computational Methods, Numerical Algorithms.

May 1985 – September 1985:

Technion preparatory school

Physics

PUBLIC PROFESSIONAL ACTIVITIES

October 2010 – September 2013

Section Editor: “Computational Methods in Science and Engineering”, SIAM Journal on Scientific Computing

January 2010 – Present

Editorial board member, Numerical Linear algebra with Applications

January 1999 – September 2010, October 2013 – 2019

Associate Editor, SIAM Journal on Scientific Computing

2014

Co-Editor-in-Chief of special section on Big Data and Planet Earth, SIAM Journal on Scientific Computing

April 2009, 2011, 2013, 2015

Program co-chair, 14th, 15th, 16th, and 17th Copper Mountain Conferences on Multigrid Methods, Colorado.

April 1997, 1999, 2001, 2003, 2005, 2007, 2017, 2019, 2021, 2023

Program committee member of the 8th, 9th, 10th, 11th, 12th, 13th, 18th, 19th, 20th and 21st Copper Mountain Conferences on Multigrid Methods, Colorado. Duties included:

1. Guest Editor-in-Chief for the journal: Numerical Linear Algebra with Applications (2005).
2. Editor for special issues in the journal: Electronic Transactions on Numerical Analysis (ETNA), and Numerical Linear Algebra with Applications (NLA).

April 2006, 2008, 2010, 2012, 2014, 2016, 2018, 2020, 2022

Program committee member of the 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th and 17th Copper Mountain Conferences on Iterative Methods.

1. Guest Editor-in-Charge for the special sections dedicated to the 2018 and 2020 conferences in: SIAM Journal on Scientific Computing.

September 2010

Scientific Committee of the European Multigrid Conference EMG2010.

2006-Present

Advisory board member, Bavarian Graduate School of Computational Engineering

ACADEMIC ADMINISTRATIVE POSITIONS

July 2020 – Present

Director of the Samuel Neaman Institute for National Policy Research

October 2013 – December 2017

Dean of Computer Science, Technion.

February 2010 – February 2013

Vice Dean for Undergraduate Studies, Computer Science, Technion

MEMBERSHIP IN SCIENTIFIC SOCIETIES

SIAM

PRIZES AND FELLOWSHIPS

Yanai Prize for a substantial and unique contribution to the advancement of academic education of undergraduate students (2011).

Muriel and David Jacknow award for excellence in teaching (2007).

Rei and Miriam Klein research prize for research on “Multigrid Solvers for Turbulent Transonic Flows” (2001).

Wolf-foundation prize for Ph.D. Thesis (1991).

Wolfson Postdoctoral Fellowship from The Israeli Academy of Sciences (1991)

GRADUATE STUDENTS

Completed Theses

1. 1997: Eugene Reyzer, M. Sc. (joint supervision with Marius Ungarish.)
2. 1998: Noa Porrat, M. Sc. (joint with Moshe Israeli.)
3. 1998: Elena Olvovsky, M. Sc.
4. 2002: Avi Kenigsberg, M. Sc. (joint with Ron Kimmel.)
5. 2004: Zvika Gutterman, M. Sc. (joint with Yossi Gil.)
6. 2005: Shadi Sabba, M. Sc. (joint with Chaim Gotsman.)
7. 2005: Gregory Dardyk, M. Sc.
8. 2007: Iliia Antsiferov, M. Sc. (Tel Aviv University, joint with Yossi Rosenwaks)
9. 2007: Iddit Shalem, M. Sc.
10. 2007: Yair Koren, Ph. D.
11. 2010: Michal Holtzman Gazit, Ph. D.
12. 2012: Eliyahu Osherovich, Ph. D. (joint with Michael Zibulevsky)
13. 2013: Ran Zemach, M. Sc.
14. 2013: Roman Zeyde, M. Sc.
15. 2014: Eran Treister, Ph. D.
16. 2015: Javier Turek, Ph. D. (joint with Michael Elad)
17. 2015: Ron Goldman, M. Sc. (joint with Marius Ungarish)
18. 2016: Yoni Levi, Ph. D. (joint with Lihi Zelnik-Manor)
19. 2017: Yanir Damti, M. Sc. (joint with Shlomo Moran)
20. 2021: Tao Hong, Ph. D. (joint with Michael Zibulevsky)
21. 2021: Or Avnat, M. Sc.
22. 2022: Dmitry Kuznichov, M. Sc. (joint with Ron Kimmel)
23. 2022: Gal Shalom, M. Sc. *Summa Cum Laude* (joint with Eran Treister of Ben Gurion University)

POSTDOCTORAL FELLOW

1. Gil Kohav, January 1996 – December 1997.

EXTERNAL RESEARCH GRANTS

1. Agency: United States–Israel Binational Science Foundation (BSF).
Title: Improving the Computational Methods for Modeling the Oceanic General Circulation.
Period: Three years, beginning September, 1995.
Amount: \$16000 (first year), \$19,500 (second year), \$19,500 (third year).
Other Principal Investigators: James C. McWilliams (UCLA).
2. Agency: The Ministry of Science and the Arts.
Title: A Parallel Approach to Continuum and Discrete Modeling of Solids and Liquids.
Period: December, 1995 – December, 1997
Amount: 95000 Sh. (first year, split among the three PI's), 104000 Sh. (second year).
Other Principal Investigators: Simon Brandon (Chemical Engineering, Technion), Joan Adler (Physics, Technion).
3. Agency: The Ministry of Science and the Arts.
Title: Parallelization (Algorithm and Software) of an Existing Industrial Serial Navier-Stokes Solver.
Period: Two years, starting January, 1998
Amount: 30000 Sh. (total grant is 75000 Sh.) per year.
Other Principal Investigator: Amir Averbuch (Tel Aviv University). In collaboration with the Israeli Aircraft Industry.
4. Agency: The Ministry of Science and the Arts.
Title: Parallel Computation of Vibration of Large Structural Systems by the Dynamics Systems Method
Period: Two years, starting January, 1998
Amount: 50000 Sh. total grant per year.
Other Principal Investigator: Moshe Eisenberger (Civil Engineering).
5. Agency: Israeli Science Foundation
Title: Robust Nonlinear Multigrid Methods
Period: Four years, starting October, 2002
Amount: approximately \$33,000 per year.
No other principal investigator.
6. Agency: Applied Materials
Title: Multiscale Methods for Image Completion
Period: One year, starting November, 2005
Amount: \$8,000
No other principal investigator.
7. Agency: Israeli Science Foundation
Title: Exact Interpolation Scheme Multigrid with Application to Eigenproblems

- Period: Three years, starting October, 2008
Amount: approximately 120,000 Sh. per year.
No other principal investigator.
8. Agency: Israeli Science Foundation
Title: Adaptive Distance Functions for Phylogenetic Tree Reconstruction
Period: Four years, starting October, 2011
Amount: approximately 160,000 Sh. per year.
Other Principal Investigator: Shlomo Moran
 9. Company: Intel
Title: Sparse Matrix Preconditioning for Accelerating Machine Learning
Period: May 2012 - March 2015
Amount: \$50,000 total, split evenly between the two PI's
Other Principal Investigator: Raanan Fattal, The Hebrew University
 10. Agency: Israeli Science Foundation
Title: Learning to Efficiently Solve Partial Differential Equations with Multigrid
Period: Four years, starting October, 2019
Amount: approximately 240,000 Sh. per year.
Other Principal Investigators: Ronen Basri and Meirav Galun, Weizmann Institute of Science

COLLABORATION WITH INDUSTRY IN MAGNET/MAGNETON FRAMEWORK

11. WFCM (MAGNET)
Title: Geometric Image Processing Towards Enhancing Process Tool Overall Equipment Efficiency (with Applied Materials, Israel)
Period: Three years, starting September, 2001
Principal investigator: Ron Kimmel
12. MAGNETON
Title: Image Analysis for Smart Fill Overlay Metrology (with KLA-Tencor)
Period: 16 months, starting September, 2004.
Amount: 510,000 Sh.
No other principal investigator.
13. IMG4 (MAGNET)
Title: Automatic Detection and Classification of Targets in Microscopic Images (mainly with Applied Spectral Imaging (ASI))
Amount: 335,00 Sh. for the first year, starting September, 2005, 700,000 Sh. for the second year, 700,000 Sh. for the third year, 180,000 Sh. for the fourth year, 220,000 Sh. for the fifth year.
Other principal investigator: Ehud Rivlin.
14. MAGNETON
Title: Clutter Free Transcoastal Apical Imaging of Difficult to Image Patients (with GE

Medical)
Period: Two years starting May, 2013
Amount: Approximately 660,000 Sh. per year
Other principal investigator: Michael Elad.

PUBLICATIONS

Thesis (Ph.D.)

“Multilevel Techniques for Incompressible Flows”, Department of Applied Mathematics and Computer Science, The Weizmann Institute of Science, Rehovot, Israel (1991), Professor Achi Brandt Supervisor.

Journals

1. Brandt, A., and Yavneh, I., “Inadequacy of First-Order Upstream Difference Schemes for some Recirculating Flows”, *J. Comput. Phys.* **93** (1), 128-141 (1991).
2. Brandt, A., and Yavneh, I., “On Multigrid Solution of High-Reynolds Incompressible Entering Flows”, *J. Comput. Phys.* **101** (1), 151-164 (1992).
3. Brandt, A., and Yavneh, I., “Accelerated Multigrid Convergence and High-Reynolds Recirculating Flows”, *SIAM J. Sci. Comput.* **14** (3), 607-626 (1993).
4. Yavneh, I., “A Method for Devising Efficient Multigrid Smoothers for Complicated PDE Systems”, *SIAM J. Sci. Comput.* **14** (6), 1437-1463 (1993).
5. Tziperman, E., Yavneh, I., and Ta’asan, S., “Multilevel Turbulence Simulations”, *Europhysics Let.* **24** (4), 239-244 (1993).
6. Rosenwaks, Y., Nozik, A. J., and Yavneh, I., “The Effect of Electric Fields on Time-Resolved Photoluminescence Spectra in Semiconductors”, *J. Appl. Phys.* **75** (8) 4255-4257 (1994).
7. McWilliams, J. C., Weiss, J. B., and Yavneh, I., “Anisotropy and Coherent Vortex Structures in Planetary Turbulence”, *Science*, **264** (5157) 410-413 (1994).
8. Rosenwaks, Y., Thacker, B. R., Ahrenkiel, R. K., Nozik, A. J., and Yavneh, I., “Photogenerated Carrier Dynamics Under the Influence of Electric Fields in III-V Semiconductors”, *Phys. Rev. B: Condensed matter*, **50** (3) 1746-1754 (1994).
9. Yavneh, I., and McWilliams, J. C., “Breakdown of the Slow Manifold in the Shallow-Water Equations”, *Geo. and Astr. Fluid Dyn.* **75** 131-161 (1994).
10. Yavneh, I., “Multigrid Smoothing Factors of Red-Black Gauss-Seidel Applied to a Class of Elliptic Operators”, *SIAM J. Numer. Anal.*, **32**, 1126-1138 (1995).
11. Yavneh, I., and McWilliams, J. C., “Robust Multigrid Solution of the Shallow-Water Balance Equations”, *J. Comput. Phys.* **119**, 1-25 (1995).
12. Yavneh, I., “On Red-Black SOR Smoothing in Multigrid”, *SIAM J. Sci. Comput.*, **17** (1), 180-192 (1996).
13. Yavneh, I., and McWilliams, J. C., “Multigrid Solution of Stably Stratified Flows: The Quasigeostrophic Equations”, *J. Sci. Comput.* **11** (1), 47-69 (1996).
14. Yavneh, I., “Analysis of a Fourth-Order Compact Scheme for Convection-Diffusion”, *J. Comput. Phys.* **133**, 361-364 (1997).

15. Yavneh, I., Shchepetkin, A., McWilliams, J. C., and Graves, L. P., "Multigrid Solution of Stably Stratified Flows: The Balance Equations and their Turbulent Dynamics", *J. Comput. Phys.* **136** (2), 245-262 (1997).
16. Yavneh, I., Venner, C. H., and Brandt, A., "Fast Multigrid Solution of the Advection Problem with Closed Characteristics", *SIAM J. Sci. Comput.* **19** (1), 111-125 (1998).
17. Yavneh, I., and Olvovsky, E., "Multigrid Smoothing for Symmetric Nine-Point Stencils", *Appl. Math. Comput.* **92**, 229-246 (1998).
18. Yavneh, I., "Coarse-Grid Correction for Nonelliptic and Singular Perturbation Problems", *SIAM J. Sci. Comput.* **19** (5) 1682-1699 (1998).
19. McWilliams, J. C., and Yavneh, I., "Fluctuation Growth and Instability Associated with a Singularity of the Balance Equations", *Phys. Fluids* **10** (10) 2587-2596 (1998).
20. Meir, A. J., and Yavneh, I., "An Elliptic Problem with Integral Constraints, With Application to Large-Scale Geophysical Flow", *Computational Geosciences* **2**, 337-346 (1998).
21. McWilliams, J. C., Yavneh, I., Cullen, M. J. P., Gent, P. R., "The Breakdown of Large-scale Flows in Rotating, Stratified Fluids", *Phys. Fluids* **10** (12), 3178-3184 (1998).
22. McWilliams, J. C., Weiss, J. B., and Yavneh, I., "The Vortices of Homogeneous Geostrophic Turbulence", *J. Fluid Mech.* **401**, 1-26 (1999).
23. Brandt, A., Israeli, M., Yavneh, I., and Siegel, A., "Multigrid Solution of an Elliptic Boundary-Value Problem with Integral Constraints", *SIAM J. Sci. Comput.* **21** (4), 1357-1369 (2000).
24. Averbuch, A., Epstein, B., Ioffe, L., and Yavneh, I., "Efficient Parallelization of a Three-Dimensional Navier-Stokes Solver on MIMD Multiprocessors", *J. of Supercomputing* **17**, 123-142 (2000).
25. Averbuch, A., Israeli, M., Ravve, I., and Yavneh, I., "Computation for Electromigration in Interconnects of Microelectronic Devices", *J. Comput. Phys.* **167**, 316-371 (2001).
26. Epstein, B., Averbuch, A., and Yavneh, I., "An Accurate ENO Driven Multigrid Method Applied to 3D Turbulent Transonic Flows", *J. Comput. Phys.* **168** (2), 316-338 (2001).
27. Molemaker, M. J., McWilliams, J. C., and Yavneh, I., "Instability and Equilibration of Centrifugally-Stable Stratified Taylor-Couette Flow", *Phys. Rev. Lett.* **86** (23), 5270-5273 (2001).
28. Siegel, A., Weiss, J. B., Toomre, J., McWilliams, J. C., Berloff, P., and Yavneh, I., "Eddies and Vortices in Ocean Basin Dynamics," *Geo. Res. Lett.* **28** (16), 3183-3186 (2001).
29. Yavneh, I., McWilliams, J. C., and Molemaker, M. J., "Non-Axisymmetric Instability of Centrifugally-Stable Stratified Taylor-Couette Flow", *J. Fluid Mech.* **448**, 1-21 (2001).

30. Gil, Y., Gutterman, Z., Onn, S., and Yavneh, I., “Automated Transformations for PDE Systems with Application to Multigrid Solvers”, *SIAM J. Sci. Comput.* **24** (3), 886-904 (2003).
31. Kimmel, R., and Yavneh, I., “An Algebraic Multigrid Approach to Image Analysis”, *SIAM J. Sci. Comput.* **24** (4), 1218-1231 (2003).
32. Vanneste, J., and Yavneh, I., “Exponentially Small Inertia-Gravity Waves and the Breakdown of Quasi-Geostrophic Balance”, *J. Atmos. Sci.* **61** (2), 211-223 (2004).
33. Dardyk, G., and Yavneh, I., “A Multigrid Approach to Two-Dimensional Phase Unwrapping”, *Numer. Lin. Alg. Appl.* **11** 241-259 (2004).
34. McWilliams, J. C., Molemaker, M. J., and Yavneh, I., “Ageostrophic, Anticyclonic Instability of a Geostrophic, Barotropic Boundary Current”, *Phys. Fluids* **16** (10) 3720-3725 (2004).
35. Roichman, Y., Levine, D., and Yavneh, I., “Propagation of Interacting Force Chains in the Continuum Limit”, *Phys. Rev. E* **70**, 061301 (2004).
36. Molemaker, M. J., McWilliams, J. C., and Yavneh, I., “Baroclinic Instability and Loss of Balance”, *J. Phys. Ocean.* **35** (9) 1505-1517 (2005)
37. Koren, Y., Yavneh, I., and Spira, A., “A Multigrid Approach to the 1D Quantization Problem”, *IEEE Trans. Information Theory* **51** (8) 2993-2998 (2005).
38. Koren, Y. and Yavneh, I., “Adaptive Multiscale Redistribution for Vector Quantization”, *SIAM J. Sci. Comput.* **27** (5) 1573-1593 (2006).
39. Yavneh, I., and Dardyk, G., “A Multilevel Nonlinear Method”, *SIAM J. Sci. Comput.* **28** (1) 24-46 (2006).
40. Bronstein, M. M., Bronstein, A. M., Kimmel, R., and Yavneh, I., “Multigrid Multi-dimensional Scaling”, *Numer. Lin. Alg. Appl.* **13** (2-3) 149-171 (2006).
41. Bar-Yehuda, R., and Yavneh, I., “A Factor-Two Approximation Algorithm for Two-Dimensional Phase-Unwrapping”, *J. Graph Algor. Appl.* **10** (2) 123-139 (2006).
42. Vanneste, J., and Yavneh, I., “Unbalanced instabilities of rapidly rotating stratified shear flows”, *J. Fluid. Mech.* **584** 373-396 (2007).
43. Shalem, I., and Yavneh, I., “A multilevel graph algorithm for two dimensional phase unwrapping”, *Computation and Visualization in Science.* **11** (2) 89-100 (2008).
44. Holtzmann-Gazit, M., and Yavneh, I., “A Scale-Consistent Approach to Image Completion”, *Int. J. Multiscale Comput. Eng.* **6** (6) 617-628 (2008).
45. Di Castro, D., Meir, R., and Yavneh, I., “Delays and Oscillations in Networks of Spiking Neurons - a Two Time Scale Analysis”, *Neural Computation* **21** (4) 1100-1124 (2009).
46. Gronau, I., Moran, S., and Yavneh, I., “Towards Optimal Distance Functions for Stochastic Substitution Models”, *J. Theor. Biol.* **260** 294-307 (2009).
47. Elad, M., and Yavneh, I., “A Plurality of Sparse Representations is Better than the Sparsest One Alone”, *IEEE Trans. Information Theory* **55** (10) 4701-4714 (2009).
48. Wienands, R., and Yavneh, I., “Collocation Coarse Approximation in Multigrid”, *SIAM J. Sci. Comput.* **31** (5) 3643-3660 (2009).

49. Treister, E., and Yavneh, I., “Square & Stretch Multigrid for Stochastic Matrix Eigenproblems”, *Numer. Lin. Alg. Appl.* **17** (2-3) 229-251 (2010).
50. Knoll, Y., and Yavneh, I., “Scale covariant physics: a ‘quantum deformation’ of classical electrodynamics”, *Journal of Physics A: Mathematical and Theoretical* **43** (2010) 055401 (22 pp).
51. Wasserman, M., Mor-Yossef, Y., Yavneh, I., and Greenberg, J. B., “A Robust Implicit Multigrid Method for RANS Equations with Two-Equation Turbulence Models”, *J. Comput. Phys.* **229** 58205842 (2010)
52. Protter, M., Yavneh, I., and Elad, M., “Closed-Form MMSE Estimation for Signal Denoising Under Sparse Representation Modeling Over a Unitary Dictionary”, *IEEE Trans. Signal Proc.* **58** (7) 3471-3484 (2010)
53. Gronau, I., Moran, S., and Yavneh, I., “Adaptive Distance Measures for Resolving K2P Quartets: Metric Separation versus Stochastic Noise”, *J. Comput. Biology.* **17** (11) 1391-1400 (2010)
54. Rodrigo, C., Gaspar, F. J., Oosterlee, C. W., and Yavneh, I., “Accuracy Measures and Fourier Analysis for the Full Multigrid Algorithm”, *SIAM J. Sci. Comput.* **32** (5) 3108-3129 (2010)
55. Turek, J. S., Yavneh, I., Protter, M., and Elad, M., “On MMSE and MAP Denoising Under Sparse Representation Modelling Over a Unitary Dictionary”, *IEEE Trans. Signal Proc.* **59** (8) 3526-3535 (2011)
56. Osherovich, E., Zibulevsky, M., and Yavneh, I., “Approximate Fourier Phase Information in the Phase Retrieval Problem: What it Gives and How to Use it”, *J. Opt. Soc. Am. A* **28** (10) 2124-2131 (2011)
57. de Sterck, H., Miller, K., Treister, E., and Yavneh, I., “Fast multilevel methods for Markov chains”, *Numer. Lin. Alg. Appl.* doi: 10.1002/nla.800 (2011)
58. Treister, E., and Yavneh, I., “On-the-Fly Adaptive Smoothed Aggregation Multigrid Applied to Markov Chains”, *SIAM J. Sci. Comput.* **33** (5) 2927-2949 (2011)
59. Bolten, M., Thiess, A., Yavneh, I., and Zeller, R., “Preconditioning Systems Arising from the KKR Green Function Method Using Block-Circulant Matrices”, *Linear Algebra and its Applications* **436** (2) 436-446 (2012)
60. Szameit, A., Shechtman, Y., Osherovich, E., Bullkich, E., Sidorenko, P., Dana, H., Steiner, S., Kley, E. B., Gazit, S., Cohen-Hyams, T., Shoham, S., Zibulevsky, M., Yavneh, I., Eldar, Y. C., Cohen, O., Segev, M., “Sparsity-Based Single-Shot Subwavelength Coherent Diffractive Imaging”, *Nature Materials* **11**, 455-459 (2012)
61. Yavneh, I., and Weinzierl, M., “Nonsymmetric Black Box Multigrid with Coarsening by Three”, *Numer. Lin. Alg. Appl.* **19** (2) 194-209 (2012)
62. Doerr, D., Gronau, I., Moran, S., and Yavneh, I., “Stochastic Errors Vs. Modeling Errors in Distance Based Phylogenetic Reconstructions”, *Algorithms for Molecular Biology* 7:22 doi:10.1186/1748-7188-7-22 (2012)
63. Treister, E., and Yavneh, I., “A Multilevel Iterated-Shrinkage Approach to ℓ_1 Penalized Least-Squares Minimization”, *IEEE Trans. Signal Proc.* **60** (12) 6319-6329

DOI: 10.1109/TSP.2012.2218807 (2012)

64. Schnitzer, O., Zeyde, R., Yavneh, I., and Yariv, E., “Weakly Nonlinear Electrophoresis of a Highly Charged Colloidal Particle”, *Physics of Fluids* **25** (5) Article Number: 052004 DOI: 10.1063/1.4804672 (2013)
65. Goldman, R., Ungarish, M., and Yavneh, I., “Gravity Currents with Double Stratification: a Numerical and Analytical Investigation”, *Environ. Fluid Mech.* **14** (2) 471-499 (2014)
66. Turek, J.S., Yavneh, I., and Elad M., “On MAP and MMSE estimators for the co-sparse analysis model”, *Digital Signal Processing* **28** 57-74 (2014)
67. Levi Y. and Yavneh I., “Speed Limit Quasi Splines and their Application to Interpolation with Bounded First Order Derivative”, *Numer. Lin. Alg. Appl.* **22** (3) 433-452 (2015)
68. Treister E. and Yavneh I., “Non-Galerkin Multigrid Based on Sparsified Smoothed Aggregation”, *SIAM J. Sci. Comput.* **37** (1), A30-A54 (2015)
69. Turek, J.S., Elad, M., and Yavneh, I., “Clutter Mitigation in Echocardiography using Sparse Signal Separation”, *Int. J. Biomed. Imag.* Article Number: 958963, 18 pages (2015)
70. Galun, M., Basri, R., and Yavneh, I., “Review of Methods Inspired by Algebraic-Multigrid for Data and Image Analysis Applications”, *Numer. Math. Theor. Meth. Appl.* **8** (2), 283-312 (2015)
71. Treister, M., Turek, J., and Yavneh, I., “A Multilevel Framework for Sparse Optimization with Application to Inverse Covariance Estimation and Logistic Regression”, *SIAM J. Sci. Comput.* **38** (5), S566-S592 (2016)
72. Damti, Y., Gronau, I., Moran, S., and Yavneh, I., “Comparing Evolutionary Distances via Adaptive Distance Functions”, *J. Theor. Biol.* **440** (7), 88-99 (2018)
73. Hong, T., Yavneh, I., and Zibulevsky, M., “Solving RED with Weighted Proximal Methods”, *IEEE Signal Processing Letters* **27** 501-505 (2020)
74. Hong, T., and Yavneh, I., “On Adapting Nesterov’s Scheme to Accelerate Iterative Methods for Linear Problems”, *Numer. Lin. Alg. Appl.* **29** (2), e2417 (2022)
75. Avnat, O., and Yavneh, I., “On the Recursive Structure of Multigrid Cycles”, *SIAM J. Sci. Comput.* <https://doi.org/10.1137/21M1433502> S103-S126 (2022)

Other publications

1. Baillie, C. F., McWilliams, J. C., Weiss, J. B., and Yavneh, I., “Grand Challenge 3d Quasi-Geostrophic Multi-Grid code on the Cray T3D,” *PSC News*, Pittsburgh Supercomputing Center, July-August (1995), 3-4.
2. Yavneh, I., “Why Multigrid Methods are so Efficient”, *Computing in Science and Engineering* **8** (6) 12-22 (2006).
3. Moran, S. and Yavneh, I., “Adjustable Coins”, *Recreational Mathematics Magazine*, DOI: <https://doi.org/10.2478/rmm-2021-0009>, 27-39 (2021)

ACTIVE PARTICIPATION IN INTERNATIONAL CONFERENCES

Invited

1. “Efficient Multigrid Solution of the Shallow Water Balance Equations”, in the NCAR Workshop on Balance Models, Boulder, Colorado, July 1992.
2. “Critical Strain Values in Stratified Rotating Balanced Flows”, in The Workshop on Stratified Rotating Flows, Boulder Colorado, July 1996.
3. “Multi-level Algorithms for some Image Processing Problems”, in *Advances in Numerical Algorithms*, Graz, Austria, September 2003.
4. “Multiscale Algorithms for Image Analysis and Processing”, EMG2005: The European Multigrid Conference, Scheveningen, The Netherlands, September, 2005.
5. “Automated Transformations for PDE systems”, 4th International Conference on Symbolic and Numerical Scientific Computing (SNSC 08), Linz, Austria, July, 2008.
6. “Automatic Coarse-Grid Correction”, EMG2008: The European Multigrid Conference, Bad Herrenalb, Germany, October, 2008.
7. “Nonlinear Multigrid Revisited”, IMA Workshop: Numerical Solutions of Partial Differential Equations: Fast Solution Techniques, Minnesota, 2010.
8. “Coarse to Fine and Back Again”, 36th Woudchoten Conference, Zeist, The Netherlands, 2011.
9. In Workshop: “Lectures on Numerical Mathematics and Applications”, Zaragoza, Spain, 2013.
10. “A Multilevel Iterated-Shrinkage Approach to l_1 Penalized Least-Squares”, Workshop on Novel Numerical Methods, Institute of Advanced Studies, Technical University of Munich, 2013.
11. “Multilevel Algorithms for l_1 Minimization”, In Workshop: “Lectures on Numerical Mathematics and Applications”, Wuerzburg, Germany, August, 2014.
12. “Introduction to Multigrid Methods—Fundamental Concepts, Basic Algorithms, Local Mode Analysis”, Thematic School on Multigrid Methods, Frejus, France, November, 2014.

Contributed

1. “Improved Coarse-Grid Correction for High-Reynolds Flows”, in The 5th Copper Mountain Conference on Multigrid Methods, Colorado, April 1991. (Proceedings paper noted in list below).
2. “A Method for Devising Efficient Multigrid Smoothers for Complicated PDE Systems”, in The Copper Mountain Conference on Iterative Methods, Colorado, April 1992.
3. “Efficient Multigrid Solution of the Shallow Water Balance Equations”, in The Copper Mountain Conference on Iterative Methods, Colorado, April 1992.
4. “Multigrid Solution to Geophysical Flows with Stable Stratification”, in The 6th Copper Mountain Conference on Multigrid Methods, Colorado, April 1993.
5. “Smoothing Factors of Red-Black Gauss-Seidel Relaxation”, in The 6th Copper Mountain Conference on Multigrid Methods, Colorado, April 1993 (Informal session).

6. “SOR in Multigrid Revisited”, in The Colorado Conference on Iterative Methods, Colorado, April 1994.
7. “On Coarse-Grid Correction of Very Smooth Components”, in The 7th Copper Mountain Conference on Multigrid Methods, Colorado, April 1995.
8. “On multigrid solution of high-Reynolds flows”, in The 36th Israel Annual Conference on Aerospace Sciences, February, 1996.
9. “Fast Multigrid Solution of the Advection Problem with Closed Characteristics”, in the Colorado Conference on Iterative Methods, Colorado, April 1996.
10. “Coarse-Grid Correction for Nonelliptic and Singular Perturbation Problems”, in The Workshop on Multiscale Phenomena, Modelling and Computation, Eilat, March, 1997.
11. “Stranger Than Fiction: On Smoothing Symmetric Nine-point Operators”, in The 8th Copper Mountain Conference on Multigrid Methods, Colorado, April 1997. (Joint work with M. Sc. student Elena Olvovsky).
12. “Multigrid for the Integrally Constrained”, in the Colorado Conference on Iterative Methods, Colorado, April 1998.
13. “Computational Modeling and Singular Limits of the Balance Equations”, in the SIAM Annual Meeting, Toronto, July 1998.
14. “Towards Automatic Differential Preconditioning and Variable Transformations for PDE Systems”, in the 9th Copper Mountain Conference on Multigrid Methods, Colorado, April 1999. (Joint work with M. Sc. student Zvika Gutterman).
15. “Instabilities of rotating stratified flows associated with solvability conditions of the balance equations”, European Geophysical Society XXVI General Assembly, Nice, March 2001.
16. “An Algebraic Multigrid Approach for Shape from Photometric Stereo”, in the 10th Copper Mountain Conference on Multigrid Methods, Colorado, April 2001. (Joint work with Ron Kimmel).
17. “A Multilevel Nonlinear Method”, in the 11th Copper Mountain Conference on Multigrid Methods, Colorado, April 2003. (Joint work with Gregory Dardyk).
18. “Multilevel Two-Dimensional Phase Unwrapping”, in the 12th Copper Mountain Conference on Multigrid Methods, Colorado, April 2005. (Joint work with Iddit Shalem).
19. “Multiscale Algorithms for Vector Quantization”, Copper Mountain Conference on Iterative Methods, April 2006. (Joint work with Yair Koren).
20. “Scale Consistent Image Completion”, ECCOMAS 2006. (Joint work with Michal Gazit.)
21. “ACA—Automatic Coarse-Grid Approximation”, in the 13th Copper Mountain Conference on Multigrid Methods, Colorado, April 2007. (Joint work with Roman Wienands).
22. “Cyclic-Reduction Multigrid Revisited”, in the 15th Copper Mountain Conference on Multigrid Methods, Colorado, March 2009. (Joint work with Chen Greif).

23. “A Multilevel Approach to Sparse Representation of Signals”, European Multigrid Conference (EMG), Ischia, Italy, 2010. (Joint work with Eran Treister).
24. “Algebraic Collocation Coarse Approximation (ACCA) Multigrid”, 12th Copper Mountain Conference on Iterative Methods, April 2012. (Joint work with Eran Treister and Ran Zemach).
25. “A Multilevel Approach for l-1 Regularized Convex Optimization with Application to Covariance Selection”, European Multigrid Conference (EMG), Leuven, Belgium, September 2014. (Joint work with Eran Treister).
26. “Learning Prolongation for Diffusion Problems with Random Coefficients”, 19th Copper Mountain Conference on Multigrid Methods, March 2019. (Joint work with Daniel Greenfeld, Meirav Galun, Ronen Basri and Ron Kimmel).

REFEREED PAPERS IN CONFERENCE PROCEEDINGS

Appeared

1. Brandt A., and Yavneh, I., “Improved Coarse-Grid Correction for High-Reynolds Flows”, *Proceedings of the 5th Copper Mountain Conference on Multigrid Methods*, 1991 (unrefereed; preliminary version of published paper number 3 above).
2. Bates, J. R., McCormick, S. F., Ruge, J., Sholl, D. S., and Yavneh, I., “A Semi-Lagrangian Approach to the Shallow-Water Equations”, *Proceedings of the 6th Copper Mountain Conference on Multigrid Methods*, NASA Conference Publication 3224, 593-604 (1993).
3. Baillie, C. F., McWilliams, J. C., Weiss, J. B., and Yavneh, I., “Implementation and Performance of a Grand Challenge 3d Quasi-Geostrophic Multi-Grid code on the Cray T3D and IBM SP2,” *Proceedings of Supercomputing 95.*, San Diego, CA (ACM Press, New York, 1995).
4. Yavneh, I., “On multigrid solution of high-Reynolds flows”, Proceedings of The 36th Israel Annual Conference on Aerospace Sciences, Tel Aviv, February, 1996.
5. Baillie, C. F., McWilliams, J. C., Weiss, J. B., and Yavneh, I., “Portable, Efficient, Parallelization of a 3d Quasi-Geostrophic Multi-Grid code”, *Proc. Thirty-Sixth Semi-Annual Cray User Group Meeting*, pp 273-278 (Fairbanks, Alaska, 1995)
6. Epstein, B., Yavneh, I., and Averbuch, A., “An Accurate ENO Driven Multigrid Method Applied to 3-D Turbulent Transonic Flows”, in the Proceedings of the 14th AIAA Computational Fluid Dynamics Conference.
7. McWilliams, J. C., Molemaker, J. M., and Yavneh, I., “From Stirring to Mixing of Momentum: Cascades from Balanced flows to Dissipation in the Oceanic Interior”, in Proc. 12th ‘Aha Huliko‘a Hawaiian Winter Workshop, Honolulu, Hawaii, 2001.
8. Dardyk, G., and Yavneh, I., “A Multigrid Approach to Two-Dimensional Phase Unwrapping”, 11th Copper Mountain Conference on Multigrid Methods, April, 2003. (Dardyk won the student paper competition for this paper).
9. Koren, Y., and Yavneh, I., “Adaptive Multiscale Redistribution for Vector Quantization”, 8th Copper Mountain Conference on Iterative Methods, April, 2004. (Koren won the student paper competition for this paper).

10. Saba, S., Yavneh, I., Gotsman, C., and Sheffer, A., “Practical Spherical Embedding of Manifold Triangle Meshes”, *Shape Modeling International (SMI)*, 2005.
11. Bronstein, A. M., Bronstein, M. M., Kimmel, R., and Yavneh, I., “A Multigrid Approach for Multi-Dimensional Scaling”, in the 12th Copper Mountain Conference on Multigrid Methods, 2005. (The Bronsteins won the student paper competition for this paper).
12. Shalem, I., and Yavneh, I., “Multilevel Two-Dimensional Phase Unwrapping”, participated in the student-paper competition of the 12th Copper Mountain Conference on Multigrid Methods.
13. Magid, E., Keren, D., Rivlin, E., and Yavneh, I., “Spline-Based Robot Navigation”, 2006 IEEE/RSJ International Conference on Intelligent Robots and Systems.
14. Holtzman-Gazit, M., and Yavneh, I., “Scale Consistent Image Completion”, *International Symposium on Visual Computing*, November, 2006.
15. Protter, M., Yavneh, I., and Elad, M., “Closed-Form MMSE Estimator for Denoising Signals Under Sparse Representation Modeling”, *IEEE 25th Convention of Electrical and Electronics Engineers*, Eilat (2008).
16. Treister, E., and Yavneh, I., “Square & Stretch Multigrid for Stochastic Matrix Eigenproblems”, Copper Mountain Conference on Multigrid Methods, 2009 (Student paper winner).
17. Osherovich, E., Zibulevsky, M., Yavneh, I., “Fast Reconstruction Method for Diffraction Imaging”, Proc. 5th International Symposium on Advances in Visual Computing: Part II, LNCS pp. 1063-1072 (2009).
18. Holtzman-Gazit, M., and Yavneh, I., “Robust Multi-Scale Multi-Modal Image Registration”, Proc. SPIE 7697, 769713 (2010); doi:10.1117/12.848681.
19. Holtzman-Gazit, M., Zelnik-Manor, L., and Yavneh, I., “Salient Edges: A Multi Scale Approach”, ECCV 2010 Workshop on Vision for Cognitive Tasks.
20. Treister, E., and Yavneh, I., “On Multiplicative and Additive Multigrid Schemes for Sparse Eigenproblems”, Copper Mountain Conference on Iterative Methods, 2010.
21. Treister, E., and Yavneh, I., “A Multilevel Approach to L_1 Penalized Least-Squares Minimization”, Copper Mountain Conference on Multigrid Methods, 2011 (Student paper winner).
22. Dörr, D., Gronau, I., Moran, S., and Yavneh, I., “Stochastic Errors vs. Modeling Errors in Distance Based Phylogenetic Reconstructions”, (WABI 2011) Lecture Notes in Computer Science, Volume 6833, Algorithms in Bioinformatics, Pages 49-60, 2011.
23. Turek, J., Sulam, J., Elad, M., and Yavneh, I., “Fusion of Ultrasound Harmonic Imaging with Clutter Removal using Sparse Signal Separation”, ICASSP 793-797 (2015)
24. Meir, O., Galun, M., Yagev, S., Basri, R., and Yavneh, I., “A Multiscale Variable-Grouping Framework for MRF Energy Minimization”, ICCV-15 (2015)

25. Greenfeld, D., Galun, M., Basri, R., Yavneh, I., and Kimmel, R., “Learning to Optimize Multigrid PDE Solvers”, International Conference on Machine Learning (ICML), 2415-2423 (2019)
26. Luz, I., Galun, M., Maron, H., Basri, R., and Yavneh, I., “Learning Algebraic Multigrid using Graph Neural Networks”, International Conference on Machine Learning (ICML), 6489-6499 (2020)

CONFERENCE ORGANIZING COMMITTEE

1. 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th and 21st Copper Mountain Conferences on Multigrid Methods, Colorado, April 1997, 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013, 2015, 2017, 2019, 2021, 2023.
2. 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th and 17th Colorado Conferences on Iterative Methods, April 2006, 2008, 2010, 2012, 2014, 2016, 2018, 2020, 2022.
3. SIAM Conference on Computational Science and Engineering (CSE 15), March 2015.