CONTENTS

The Galilee Research Center for Applied Mathematics

The Galilee Research Center for Applied Mathematics (GRCAM) was established by the Department of Mathematics at ORT Braude College in 2005. Its main aim is supporting the research activities of the Department's faculty members through scientific collaborations as well as the promotion of joint projects with the College's engineering departments and with industry. The Center has organized and hosted over 25 conferences and workshops since its establishment. We strongly believe that high quality research is crucial for maintaining excellence in teaching, in addition to its contribution to the reputation of ORT Braude College as an academic center.

The Center maintains ongoing cooperation with universities in Israel and abroad including, among others, the University of Rome Tor Vergata, the Royal Institute of Technology in Stockholm, the University of California, Berkeley, the University of South Florida, the Max Planck Institute Leipzig, the Fraunhofer Institute for Industrial Mathematics, the Technical University of Kaiserslautern, and the University of Innsbruck. The Center has supported visits of mathematicians from various universities, generating a lively and fruitful exchange of ideas. These activities have led to publications in high-ranking scientific journals.

The research fields we are engaged in include: complex analysis, dynamical systems, geometry and its applications, partial differential equations and applications to natural sciences, optimization, Lie algebra, group theory and mathematical education. The Center promotes the use of mathematical models in industry.

The president of the College recently approved the formal bylaws of the Center and its new management.

The Center Management:


Prof. Yaniv Almog


Prof. Mark Elin


Assoc. Prof. Aviv Gibali (Head, Mathematics Department)


Prof. Lavi Karp (Head, GRCAM)


Assoc. Prof. Haggai Katriel


Assoc. Prof. Arie Maharshak (President, ORT Braude College)


Assoc. Prof. Mareì Sammar (Head, Research Authority)


Dr. Eitan Yudilevich (Executive Director, BIRD Foundation)

COOPERATING UNIVERSITIES


Bar-Ilan University, Ramat Gan, Israel


Holon Institute of Technology, Israel


Tel Aviv University, Israel


The Hebrew University of Jerusalem, Israel


The Technion – Israel Institute of Technology, Haifa, Israel


University of Haifa, Israel


Australian National University, Canberra, Australia


Curtin University, Australia


University of Innsbruck, Innsbruck, Austria


Free University of Brussels, Belgium


College of Science, Civil Aviation University of China


Dalian University of Technology, China


Le Plessis-Robinson, France


Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany


Heinrich-Heine-Universität Düsseldorf, Germany


TU Bergakademie Freiberg, Germany


Fraunhofer Institute for Industrial Mathematics (ITWM), Germany


Institute of Mathematical Sciences, Chennai, India


Università di Roma “Tor Vergata”, Italy


Tohoku University, Japan


Ss. Cyril and Methodius University of Skopje, Republic of Macedonia


University of Warmia and Mazury, Olsztyn, Poland


Moscow State Technical University, Russia


University of Alicante, Alicante, Spain


Universidad Complutense Madrid, Spain


Universidad de Sevilla, Spain


Stony Brook University, New York, USA

RESEARCH ACTIVITY

RESEARCH GROUPS

ALGEBRA

Abed Abedelfatah, Mark N. Berman and Ofir Schnabel

The research group in algebra has two broad areas of interest. One area concerns classical questions in algebra. These include twisted group algebras as a tool for understanding algebraic concepts such as simply-graded algebras and units of (twisted) group rings, and the so-called isomorphism problems for (twisted) group rings. Further classical topics include the Hilbert function of graded algebra, Betti numbers of monomial ideals and face numbers of simplicial complexes. The second broad area of interest concentrates on Lie algebras, Lie superalgebras and the subgroup, growth of finitely generated groups. A unifying theme in all of our work is the application of methods from other branches of mathematics to develop algebraic theories. Especially prominent here are representation theory and combinatorial methods. Representation theory is of independent importance as a tool in many areas of mathematics and science. This focus connects us to the scientific community at large.

Keywords: Lie algebras, Lie superalgebras, representation theory, Hilbert functions, Betti numbers, regular sequences, simplicial complexes, graded ideals, graded algebras, twisted group rings, projective representations, groups of central type, finitely generated nilpotent groups, zeta functions of groups, pro-isomorphic zeta functions, algebraic groups, p-adic integration.

OPTIMIZATION, CONTROL THEORY AND DIFFERENTIAL GAMES

Aviv Gibali, Valery Y. Glizer and Vladimir Turetsky

Optimization theory focuses on finding a best element with respect to some criterion, from a set of alternatives. Many real-world problems are modelled as either single or multi-objective optimization ones and optimization theory, investigating the existing solutions, develops iterative methods for finding one or several equivalent solutions.

Control theory examines ways to manipulate input to a dynamical system to obtain desired behavior and output.

Differential game theory models and studies problems in the context of dynamical systems.

Assoc. Prof. Gibali's research focuses on mathematical theory and development of iterative algorithms for solving feasibility problems and their applications to industrial problems such as radiation therapy treatment planning and image processing.

Prof. Turetsky is engaged in studying pursuit–evasion games with perfect and imperfect information; robust control; generalized linear-quadratic games; optimal control; cheap control problems; differential games with hybrid dynamics; invariant sets for feedback strategies; inverse problems of signal restoration and differentiation.

Prof. Glizer's research focuses on control problems and differential games with singularly perturbed dynamics; cheap control problems; singular control problems; robust control problems; differential games with perfect and imperfect information; differential games with hybrid dynamics; singular differential games; multi-objective differential games; singularly perturbed ODEs, PDEs, functional-differential equations, difference equations; nonlinear stochastic differential and difference equations; nonlinear theory of generalized functions and its applications.

Keywords: Feasibility problems, control design, noncooperative and antagonistic games, single and multi-objective optimization, real-world problems.

DYNAMICAL SYSTEMS AND NONLINEAR ANALYSIS

Mark Elin, Fiana Jacobzon, Haggai Katriel, Marina Levenshtein and David Shoikhet

The interest of mathematicians in the general theory of dynamical systems dates back to the early 20th century. Our research focuses on fixed point theory, and operator and resolvent methods and their applications to autonomous and nonautonomous differential equations. A question of central interest is classifying certain families of holomorphic mappings in a Banach space with respect to conjugacy. We also study the asymptotic behavior of discrete and continuous time semigroups and semicocycles (in one-dimensional and multidimensional settings), and boundary rigidity problems for semigroups and their generators. We are also interested in the criteria for analytic extension of semigroups with respect to their parameter.

Keywords: Semigroups and semicocycles, infinitesimal generator, filtration of generators, nonlinear resolvent, analytic semigroups, asymptotic behavior.

GEOMETRIC FUNCTION THEORY / COMPLEX ANALYSIS

Mark Elin, Fiana Jacobzon, Marina Levenshtein, Emil Saucan and David Shoikhet

Geometric function theory, which focuses on the geometric properties of univalent mappings, has been an active field for over a century. Well-known results in this field include the Riemann mapping theorem, hyperbolic geometry, the Schwarz lemma, the Julia-Wolff-Caratheodory theorem and others.

Our research focuses on biholomorphic mappings on a unit ball, in one-dimensional and multidimensional complex spaces. We study the geometric structure of these mappings, including star-like and spiral-like mappings with respect to an interior point or a boundary point, hyperbolically convex mappings and so on. Geometric characteristics of images involve distortion and covering theorems and boundary behavior of different classes of mappings as well as interpolation and extremal problems.

Another field of study is quasiconformal and quasiregular mappings, which are both of theoretical interest as generalizations of conformal mappings, and of applied interest, as they arise naturally in the context of computer graphics and imaging, in particular in medical imaging.

Keywords: Starlike, spirallike functions, distortion theorems, boundary behavior, hyperbolic convexity, quasiconformal and quasiregular mappings, dilation, imaging.

GEOMETRY AND ITS APPLICATIONS

Emil Saucan

Geometry, the study of shape and space, is a central field of mathematics. Among its variety of subfields, one that has recently become very active is discrete differential geometry, both due to its intrinsic beauty, and because of its many applications in computer graphics, imaging, computer-aided design, complex networks and pattern recognition. In particular, we study discrete Ricci curvature and flows, and their applications to complex networks, imaging and deep learning, which work has proven to be very fruitful. The role of discrete Ricci curvature in medical imaging, mainly for anomaly detection in CT and MIR images, is another promising direction of study.

Keywords: Discrete Ricci curvature and flow, Forman curvature, Ollivier curvature, complex network understanding and long-time evolution, anomaly detection in medical images.

MATHEMATICAL EDUCATION

Buma Abramovitz, Miryam Berezina, Fiana Jacobzon and Ludmila Shvartsman

The main purpose of our research is to develop methods for teaching mathematics at the undergraduate level, aiming to improve students' understanding.

Keywords: Mathematical education, understanding, undergraduate level.

PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS TO NATURAL SCIENCES

Yaniv Almog, Tamar Gadrich, Lavi Karp, Haggai Katriel, Yakov Lutsky and Victor Ostrovski

Mathematical models are important tools in understanding the behavior of complex systems in all branches of science. We use mathematical analysis to study such models in order to shed light on the natural phenomena that they describe. Partial differential equations (PDEs) are central in modeling physical phenomena. Work on PDEs, motivated by fluid mechanics, wave motion, and electromagnetism, began in the eighteenth century. Since then, the range of applications of PDEs has expanded rapidly, and nowadays PDEs are applied in quantum mechanics, general relativity, and geometry as well as in other fields such as mathematical biology and financial mathematics. The group's research deals with several aspects of this vast field.

Einstein equations describe the evolution of matter and energy in a curved spacetime. We are interested in Euler-Einstein systems—that is, the Einstein field equations coupled with the relativistic Euler equations of compressible fluid. The nonrelativistic versions of these are the Euler-Poisson equations. Nonlinear hyperbolic PDEs are the main tool to investigate those systems.

Free boundary problems are concerned with solutions of differential equations whose boundary is unknown in advance. We are interested in the free boundary problems that arise from potential theory and Hele-Shaw flows.

The study of hydrodynamic stability explores the transition of steady flows into weak turbulence. As has been observed in numerous experiments, when the steady flow loses its stability, the flow becomes time-dependent and vortex motion appears. Our focus is on linear stability analysis of incompressible laminar flows. While it is commonly agreed that the transition to turbulence results from nonlinear effects, the properties of the linearized Navier-Stokes operator play a significant role in the nonlinear stability analysis.

Mathematical biology involves the study of dynamical systems relevant to biological phenomena, at different levels: from the subcellular level (biochemical kinetics, gene regulation) through the level of the organism (physiological processes, inter-host dynamics of infections, cancer), up to the level of populations (ecology, epidemiology, population genetics and evolution). We are investigating, both theoretically and mathematically, dynamic models, the formulation of new models, and the fitting of mathematical models to experimental, clinical and epidemiological data, using modern statistical methods.

Keywords: Mathematical modeling, partial differential equations, Euler-Einstein systems, free boundary problems, mathematical biology, ecology, epidemiology, hydrodynamic stability.

Selected PUBLICATIONS

REFEREED PAPERS

A. Abedelfatan, Some results on the subadditivity condition of syzygies, Collectanea Mathematica. 2020. https://doi.org/10.1007/s13348-020-00312-3

Y. Almog, L.V. Berlyand, D. Golovaty and I. Shafrir, Existence of superconducting solutions for a reduced Ginzburg-Landau model in the presence of strong electric currents, SIAM Journal on Mathematical Analysis, 51, 873–912, 2019. https://doi.org/10.1137/17M1112285

Y. Almog, and B. Helffer, The spectrum of a Schrödinger operator in a wire-like domain with a purely imaginary degenerate potential in the semiclassical limit, Mémoires de la SMF, 166, 94 pages, 2020. https://doi.org/10.24033/msmf.474

L.K. Hart and **Y. Almog**, The maximal current carried by a normal/superconducting interface in the absence of magnetic field, European Journal of Applied Mathematics, 31, 544–552, 2020. https://doi.org/10.1017/s0956792519000196

N. Yuviler-Gavish, D. Faran and **M. N. Berman**, The effect of complexity on training for exploration of non-intuitive rules in theory of mind, Journal of Cognitive Enhancement, 2019. https://doi.org/10.1007/s41465-019-00158-z

M. Elin and **F. Jacobzon**, Coefficient body for nonlinear resolvents, Annales Universitatis Mariae Curie-Sklodowska, 2, 41–53, 2020**.** https://doi.org/10.17951/a.2019.73.2.45-57

M. Elin, F. Jacobzon and **G. Katriel**, Linearization of holomorphic semicocycles in Banach spaces, Rivista di Mathematica della Universita di Parma, 10, 145–164, 2019.
https://doi.org/10.1007/s00028-019-00509-5

M. Elin, F. Jacobzon and G. Katriel, Continuous and holomorphic semicocycles in Banach spaces, Journal of Evaluation Equations, 19, 1199–1221, 2019. https://doi.org/10.1007/s00028-019-00509-5

M. Elin, F. Jacobzon and **G. Katriel**, Non-commutative holomorphic semicocycles, Michigan Mathematical Journal, 68(3), 505–526, 2019. https://doi.org/10.1307/mmj/1557302432

M. Elin, **D. Shoikhet**, and T. Sugawa, Geometric properties of the nonlinear resolvent of holomorphic generators, Journal of Mathematical Analysis and Applications, 483**,** No. 123614, 2020.
https://doi.org/10.1016/j.jmaa.2019.123614

M. Elin and **D. Shoikhet**, A sharpened form of the inverse function theorem, Annales Universitatis Mariae Curie–Sklodowska, 73, 59–67, 2020. https://doi.org/10.17951/a.2019.73.2.59-67

M. Elin, **D. Shoikhet** and N. Tuneski, Radii problems for starlike functions and semigroup generators, Computational Methods and Function Theory, 20, 297–318, 2020.
https://doi.org/10.1007/s40315-020-00311-2

A. Gibali, M. D. Brooke and Y. Censor, Dynamic string-averaging CQ-methods for the split feasibility problem with percentage volume constraints arising in radiation therapy treatment planning, International Transactions in Operational Research, arXiv:1911.12041, 2020.
https://doi.org/10.1111/itor.12929

S. Singh, **A. Gibali** and X. Qin, Cooperation in traffic network problems via evolutionary split variational inequalities, Journal of Industrial and Management Optimization, 2020.
https://doi.org/10.3934/jimo.2020170

Y. I. Suleiman, P. Kumam, H. ur Rehan and **A. Gibali**, A self-adaptive extragradient CQ-method for a class of bilevel split equilibrium problems with application to Nash Cournot oligopolistic electricity market models, Computational and Applied Mathematics, 39(4), 1–20, 2020. https://doi.org/10.1007/s40314-020-01338-w

A. Gibali, S. Sabach and S. Voldman, Non-convex split feasibility problems: Models, algorithms and theory, Open Journal of Mathematical Optimization, 1(1), 15p., 2020. https://doi.org/10.5802/ojmo.1

A. Gibali and Y. Shehu, A Symmetric FBF method for solving monotone inclusions, Symmetry, 2020.
https://doi.org/10.3390/sym12091456

A. Gibali, D. V. Thong and N. T. Vinh, Three new iterative methods for solving inclusion problems and related problems, Computational and Applied Mathematics, 39, 187, 2020.
https://doi.org/10.1007/s40314-020-01215-6

Y. Tang and **A. Gibali**, Several inertial methods for solving split convex feasibilities and related problems, accepted for publication in Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas, 2020. https://doi.org/10.1007/s13398-020-00857-9

A. Gibali and M. Haltmeier, Superiorized regularization of inverse problems, Journal of Applied and Numerical Optimization, 2(1), 63–70, 2020. https://doi.org/10.23952/jano.2.2020.1.04

E. Bonacker and **A. Gibali**, K.-H. Küfer, Nesterov perturbations and projection methods applied to IMRT, Journal of Nonlinear and Variational Analysis, 4**,** 63–86, 2020. https://doi.org/10.23952/jnva.4.2020.1.06

Y. Shehu, **A. Gibali**, and S. Sagratella Inertial projection-type methods for solving quasi-variational inequalities in real Hilbert spaces, Journal of Optimization Theory and Applications, 184, 877–892, 2020. https://doi.org/10.1007/s10957-019-01616-6

F. J. Aragón Artacho, Y. Censor and **A. Gibali**, The Cyclic Douglas-Rachford algorithm with r-sets-Douglas-Rachford Operators, Optimization Methods and Software, 34, 875–889, 2019. https://doi.org/10.1080/10556788.2018.1504049

E. N. Antoniou, A. Araújo, M. D. Bustamante and **A. Gibali**, Physically feasible decomposition of Engino® toy models: A graph theoretic approach, European Journal of Applied Mathematics 30**,** 278–297, 2019. https://doi.org/10.1017/s0956792518000086

G. Katriel, Optimality of constant arrival rate for a linear system with a bottleneck entrance. Systems & Control Letters, 138, 104649, 2020. https://doi.org/10.1016/j.sysconle.2020.104649

T. Gadrich and **G. Katriel**, Estimating the rate of defects under imperfect sampling inspection – A new approach. Probability in the Engineering and Informational Sciences, arXiv:1707.00114v3, 2019. https://doi.org/10.1017/s0269964819000391

G. Katriel, The dynamics of two-stage contagion, Chaos, Solitons and Fractals: X 2, 100010, 2019. https://doi.org/10.1016/j.csfx.2019.100010

M. Ben-Artzi & **G. Katriel**, Spline functions, the biharmonic operator and approximate eigenvalues. Numerische Mathematik, 141, 839–879, 2019. https://doi.org/10.1007/s00211-018-01018-2

G. Katriel, A quantitative discounted central limit theorem using the Fourier metric. Statistics & Probability Letters, 145, 321–326, 2019. https://doi.org/10.1016/j.spl.2018.10.013

U. Brauer and **L. Karp**, Continuity of the flow map for symmetric hyperbolic systems and its application to the Euler-Poisson system. Journal d'Analyse Mathematique, 141, 113–163, 2020. https://doi.org/10.1007/s11854-020-0125-4

U. Brauer and **L. Karp**, The non-isentropic relativistic Euler system written in a symmetric hyperbolic form, to appear in Anomalies in Partial Differential Equations, Springer INdAM Series, Chapter 3. https://doi.org/10.1007/978-3-030-61346-4_3

U. Brauer and **L. Karp**, Local existence of solutions to the EulerPoisson system, including densities without compact support, to appear in Proceedings of the 12th ISAAC Congress in Aveiro, Portugal, Birkhäuser "Research Perspectives"' Series. https://doi.org/10.1016/j.jde.2017.09.024

E. Saucan, R. P. Sreejith, R. P. Vivek-Ananth, J. Jost, and A. Samal, Discrete Ricci curvatures for directed networks. Chaos, Solitons & Fractals, 118, 347–360, 2019. https://doi.org/10.1016/j.chaos.2018.11.031

H. Kannan, **E. Saucan**, I. Roy and A. Samal, Persistent homology of unweighted networks via discrete Morse Theory. Scientific Reports, 9:13817, 18 pages, 2019. https://doi.org/10.1038/s41598-019-50202-3

E. Saucan, Metric curvatures and their applications 2: Metric Ricci curvature and flow. Mathematics, Computation and Geometry of Data, 1(1), 59–97, 2020. https://doi.org/10.4310/mcgd.2021.v1.n1.a3

E. Saucan, A. Samal and J. Jost, A simple differential geometry for complex networks. Network Science, First View, 1–28, 2020. https://doi.org/10.1017/nws.2020.42

A Samal, H. K. Pharasi, S. J. Ramaia, **E. Saucan**, J. Jost and A. Chakraborti, Network geometry and market instability. Royal Society Open Science, 25 pages, 2020. https://doi.org/10.1098/rsos.201734

Y. Ginosar and **O. Schnabel**, Groups of central type, maximal connected gradings and intrinsic fundamental groups of complex semisimple algebras. Transactions of the American Mathematical Society, 371, no. 9, 6125–6168, 2019. https://doi.org/10.1090/tran/7457

L. Margolis and **O. Schnabel**, The Herzog-Schonheim Conjecture for small groups and harmonic subgroups. Contributions to Algebra and Geometry, 60(3), 399–418, 2019. https://doi.org/10.1007/s13366-018-0419-1

O. Schnabel and J. Simpson, A new approach to the Fraenkel Conjecture for low n values. Integers 19, paper no. A43, 10 pages 2019.

A. Gordienko and **O. Schnabel**, Categories and weak equivalences of graded algebras, with A. Gordienko. Algebra Colloquium, 26(4), 643–664, 2019. https://doi.org/10.1142/s1005386719000476

L. Margolis and **O. Schnabel**, The twisted group ring isomorphism problem over fields. Israel Journal of Mathematics, 238, 209–242, 2020. https://doi.org/10.1007/s11856-021-2125-1

D. Alpay, V. Bolotnikov and **D. Shoikhet**, Pseudo-contractions, rigidity, fixed points and related questions. Analysis and Mathematical Physics, 10(1), Paper No. 7, 26 pages, 2020. https://doi.org/10.1007/s13324-019-00346-2

V. Turetsky, D. M. Steinberg and E. Bashkansky, Item response function in antagonistic situations. Applied Stochastic Models in Business and Industry, (published online 5/05/20, 1–15, 2020. https://doi.org/10.1002/asmb.2539

V. Turetsky, M. Weiss and T. Shima, Minimum effort pursuit guidance with delayed engagement decision. Journal of Guidance, Control and Dynamics, 42(12), 2664–2670, 2019. https://doi.org/10.2514/1.g004393

J. Bhargav, **V. Turetsky** and T. Shima, Robust path tracking by a Dubins ground vehicle. IEEE Transactions on Control Systems Technology, 27(6), 2614–2621, 2019. https://doi.org/10.1109/tcst.2018.2870571

V. Turetsky and V. Y. Glizer, Open-loop solution of a defender-attacker-target game: Penalty function approach. Journal of Control and Decision, 6(3), 166–190, 2019. https://doi.org/10.1080/23307706.2018.1453311

V. Turetsky and V. Y. Glizer, Optimal decision in a statistical process control with cubic loss. Journal of Industrial and Management Optimization. https://doi.org/10.3934/jimo.2021096

BOOKS AND CHAPTERS IN BOOKS

M. Elin, S. Reich and **D. Shoikhet**, Numerical Range of Holomorphic Mappings and Applications. Birkhäuser/Springer, 2019. https://doi.org/10.1007/978-3-030-05020-7

A. Gibali, G.T. Herman and C. Schnörr, Guest Editors, Superiorization versus Constrained Optimization: Analysis and Applications. Special Issue of Journal of Applied and Numerical Optimization (JANO), 2020. http://jano.biemdas.com/archives/category/volume-2-issue-1

S. Le Ménec and **V. Turetsky**, Computation of robust capture zones using interval based viability techniques in presence of state uncertainties. In: Advances in Dynamic Games (David M. Ramsey and Jérôme Renault, Eds.), Annals of the International Society of Dynamic Games, Vol. 17, Ch. 4, Birkhauser Basel, 75–100, 2020. https://doi.org/10.1007/978-3-030-56534-3_4

V.Y. Glizer and V. Turetsky, Optimal time-sampling in a statistical process control with a polynomial expected loss. In Informatics in Control, Automation and Robotics, 15th International Conference ICINCO 2018, Porto, Portugal, July 29–31, 2018, Revised Selected Papers (O. Gusikhin and K. Madani, Eds.), Lecture Notes in Electrical Engineering, Vol. 613, Ch. 2, Springer Nature Switzerland AG, 26–50, 2020. https://doi.org/10.1007/978-3-030-31993-9_2

REFEREED CONFERENCE PROCEEDINGS

E. Saucan and M. Weber, Forman's Ricci curvature – From networks to hypernetworks. Proceedings of Complex Networks 2018, Studies in Computational Intelligence (SCI), Springer, 707–717, 2019. https://doi.org/10.1007/978-3-030-05411-3_56

E. Saucan, A. Samal and J. Jost, A simple differential geometry for networks and its applications. Proceedings of Complex Networks 2019, Studies in Computational Intelligence (SCI), Springer, 943–954, 2020. https://doi.org/10.1007/978-3-030-36687-2_78

J. Zhang, L. Zhang and **E. Saucan**, Ant colony shape matching algorithm based on the Gromov Wasserstein distance. Proceedings of ICDH 2020, 7 pages, 2020.

V. Turetsky, M. Weiss, and T. Shima, Combined linear quadratic/bounded control differential game with delayed pursuit decision. III International Seminar "Control Theory and Theory of Generalized Solutions of Hamilton-Jacobi Equations", Ekaterinburg, Russia, 91–95, October 2020. https://doi.org/10.1109/taes.2021.3083574

V. Turetsky, M. Weiss, and T. Shima, Pursuit-evasion game with delayed pursuit decision. Proceedings of the 60th Israel Annual Conference on Aerospace Sciences, Tel Aviv – Haifa, Israel, 157–178, March 2020.

V. Turetsky and V. Y. Glizer, Defender-attacker-target game: First-order defender and attacker dynamics. Proceedings of International Conference on Integrated Modeling and Analysis in Applied Control and Automation, Lisbon, Portugal (Bruzzone, Daufen-Tanguy and Junco Eds.), 65–72, 2019.

V. Turetsky, Linear-quadratic differential game control: Two ways to ensure solvability. Proceedings of the 22nd Nordic Process Control Workshop, Kongens Lyngby, Denmark, 49–54, August 2019.

V.Y. Glizer and **V. Turetsky,** Robust optimization of statistical process control. Proceedings of the 27th Mediterranean Conference on Control and Automation, Akko, Israel, 112 –117, July 2019. https://doi.org/10.1109/MED.2019.8798539

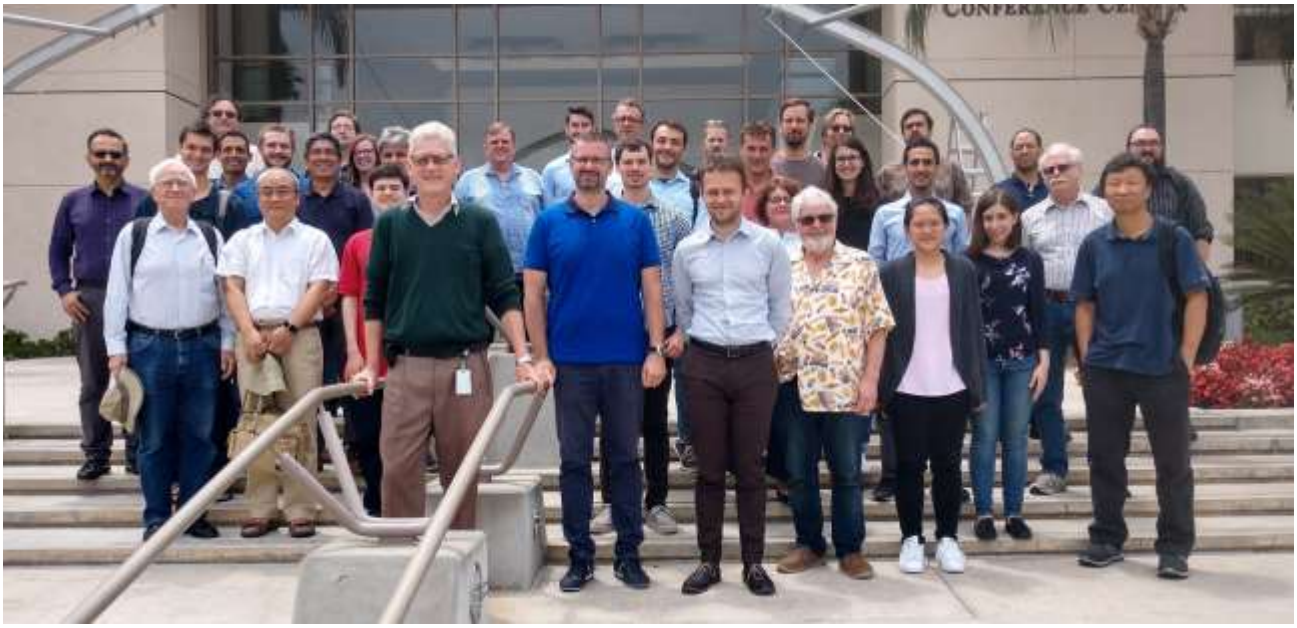
V. Turetsky, M. Weiss, and T. Shima, Minimum control effort guidance with delayed pursuit decision. Proceedings of the 27th Mediterranean Conference on Control and Automation, Akko, Israel, 589–594, July 2019. https://doi.org/10.1109/med.2019.8798499

CONFERENCES, WORKSHOPS & SEMINARS

Aviv Gibali

- Organizing committee: The 149 European study group with industry, March 4–8, Innsbruck, Austria. https://esgi-innsbruck.uibk.ac.at/

- Plenary speaker at The 5th Annual Loma Linda workshop, Loma Linda University, Loma Linda, CA, USA, July, 2019. http://ionimaging.org/llu2019-overview/



- Organizer and speaker at The Felix Klein Autumn Workshop, jointly with The High Performance Center Simulation and Software Based Innovation, Fraunhofer ITWM, 16/9/20–18/9/20.
  https://www.leistungszentrum-simulation-software.de/en/news events/Fairs_conferences_and_events/2020/2020_09_14-18_FKTW_Continuous_Optimization.html

- Initiator and organizer jointly with The Fraunhofer Institute for Industrial Mathematics ITWM: Expert Sessions “Projection Methods”. A weekly online seminar series 23/6/20–26/8/20.
  https://www.leistungszentrum-simulation-software.de/en/news-events/Fairs_conferences_and_events/2020/2020_06_Expert_Sessions_Projection_Methods_inFeasibility_Superiorization_and_Optimization.html

Mark Elin

- The Ninth Congress of Romanian Mathematicians, Galaţi, Romania.
- The 27th International Conference on Finite and Infinite Dimensional Complex Analysis and Applications, Krasnoyarsk, Russia.
- The Second Joint IMU – INdAM Conference in Analysis, Naples, Italy.

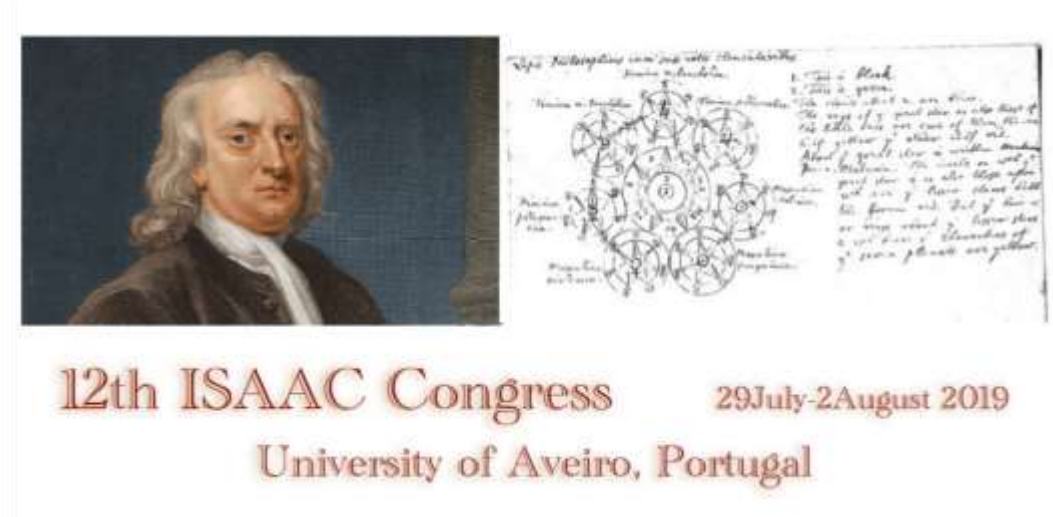
- International Conference of Mathematics and Computer Science “Congressio-Mathematica”, Olsztyn, Poland.

Lavi Karp

- Organizer: Seminar on Non-linear Partial Differential Equations and General Relativity (October 2020, postponed because of Covid-19), Batsheva de Rothschild Fund Grant of $40,000. With Matinia Ben-Artzi, Amos Ori and Gilbert Weinstein
- INdAM Workshop, Anomalies in Partial Differential Equations, IndAM (Istituto Nazionale di Alta Matematica Francesco Severi) Sapienza Universita di Roma, Italy (September 2019)

Fiana Jacobzon

- The 12th ISAAC Congress, University of Aveiro, Portugal, 29.7.2019–2.8.2019



Emil Saucan

- Invited speaker, SIAM MDS20 Minisymposium “Networks and Geometry”, June 30, 2020, Cincinnati, USA.
- Invited speaker, SIAM IS20 Minisymposium “Geometric Models, Deep Learning and Scientific Computing for Imaging, Graphics and Visions”, July 15–16, 2020, Toronto, Canada.
- Complex Networks 2019, December 10–12, 2019, Lisbon, Portugal.
- Invited speaker, Geometric and learning-based models for 2D/3D Imaging and Applications Minisymposium, ICIAM 2019, July 15–19, 2019, Valencia, Spain.

Ofir Schnabel

- Invited speaker, Groups, Rings and Associated Structures 2019, Spa, Brussels

Vladimir Turetsky

- The 22nd Nordic Process Control Workshop, August 2019, Kongens Lyngby, Denmark
- The 27th Mediterranean Conference on Control and Automation, July 2019, Akko, Israel
- The 61th British Applied Mathematics Colloquium, April 2019, Bath, UK
- The 3rd International Seminar “Control Theory and Theory of Generalized Solutions of Hamilton-Jacobin Equations”, October 2020, Ekaterinburg, Russia (online)
- The 60th Israel Annual Conference on Aerospace Sciences, March 2020, Tel Aviv – Haifa, Israel
- International Conference on Integrated Modeling and Analysis in Applied Control and Automation, September 2019, Lisbon, Portugal

SELECTED DEPARTMENT SEMINARS HELD IN 2019–2020

15.01.2019 – Prof. Dalia Fishelov, Afeka Tel Aviv Academic College of Engineering, Israel – An embedded Cartesian scheme for the Navier-Stokes Equations.

22.01.2019 – Dr. Ori Yudilevich, Catholic University of Leuven, Belgium – Classification problems of infinite type (in differential geometry).

05.02.2019 – Dr. Yakov Vaisbourd, Tel Aviv University, Israel – Globally solving the trust region subproblem using simple first-order methods.

26.03.2019 – Dr. Dmitry Batenkov, MIT, USA – Stability of some super-resolution problems.

07.05.2019 –Dr. Tali Pinsky, Technion, Israel – On the Lorenz flow and the modular surface.

18.06.2019 – Prof. Tatiana Savin, Ohio University, USA – Application of reflections to a class of uniform non-Laplacian growth.

25.06.2019 – Dr. Idan Eisner, ORT Braude College, Israel – Cluster algebras on SL_n.

10.07.2019 – Prof. Matthias Keller, Potsdam University, Germany – Improving Hardy's inequality.

17.12.2019 – Dr. Ayala Dente, ORT Braude College, Israel – How much does X cause Y?

31.12.2019 – Dr. Avner Segal, Bar-Ilan University, Israel – Zeta-functions and L-functions.

07.01.2020 – Dr. Anna Zigelman, Technion, Israel – Force calculation between spherical particles fully or partially submerged in a liquid.

16.01.2020 – Dr. Ilan Barnea, University of Haifa, Israel – The abelianization of inverse limits of groups.

21.01.2020 – Dr. Eyal Subag, Pennsylvania State University, USA – The algebraic symmetry of the hydrogen atom.

23.06.2020 – Dr. Adi Glucksam, University of Toronto, Canada – Stationary random entire functions and related questions.

03.11.2020 – Dr. Raffaella Mulas, Alan Turing Institute, London, UK – Spectral theory of hypergraphs.

17.11.2020 – Dr. Omer Bobrowski, Viterbi Faculty of Electrical Engineering, Technion, Israel – Topological Phase Transitions in Random Geometric Complexes.

24.11.2020 – Dr. Saray Shai, Wesleyan University, USA – Percolation-based network algorithms for destroying/protecting odular networks.

22.12.2020 – Prof. Indrava Roy, The Institute for Mathematical Sciences, Chennai, India – Coarse geometry and the Baum-Connes conjecture.

29.12.2020 – Prof. Anthea Monod, Imperial College, London, UK – Statistics for phylogenetic trees with tropical geometry.