



TEL AVIV UNIVERSITY

TAD
The AI and Data Science Center
Tel Aviv University

TAD

The Center for AI and Data Science

Biennial Report

2021-2023

Supported by the **Blavatnik Family Foundation**



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Letter from the Head of the Center

Tel Aviv University Center for Artificial Intelligence and Data Science (TAD) was officially inaugurated in March 2021. However, university activities in these fields can be dated to a much earlier time. For quite many years there is a strong research activity in the core areas of Artificial Intelligence (AI) and Data Science (DS) in the faculties of exact science and engineering producing groundbreaking contributions to the field. In addition, there are many diverse disciplines in the nine faculties of Tel Aviv University that have on-going research that can benefit from harnessing the methodologies of AI and DS to tackle the complex problems in their domain. In appreciation of this need, the center has been established with the following main goals: (a) Support core research in AI and DS; (b) Promote interdisciplinary collaborative research; (c) Promote education in AI and DS; (d) Provide an infrastructure of computational resources; and (e) Develop relations with industry and public organizations.

Initial funding for the center was provided by a national initiative led by Israel Council for Higher Education, MALAG/VATAT, together with university support. The center was awarded the largest grant among all universities in Israel, in the competitive program of this initiative. Subsequently, further donations and grants from industry and private donors have been obtained to support the center’s activities.

Since our inception, we have made significant strides in advancing knowledge and understanding in AI and DS in the university. We are now delighted to present some of the achievements made over the past two years in all the goals set for the center. These include support of both core and applied research, initiation of collaborations, the establishment of new educational programs, construction of an infrastructure for research, and contributions to society in the context of industry and public organizations. The center has established a strong presence on campus. It holds seminars and conferences and has established 13 communities in various fields to connect its members and to foster collaborations. As

a result, over 300 faculty members are now affiliated with the center. In addition, the center has formed a “Bridge” entity, to help researchers through consulting, mentoring, and connecting between research groups. This is only the beginning!

Looking ahead, we continue to formulate an ambitious road map for the future:

Research Excellence: We are committed to continue foster excellent research in the core areas as well as the disciplinary areas, with grants, student support and high quality challenges leading to continuing breakthroughs in these areas.

Impactful Applications: We aim to leverage our research to develop AI and DS solutions that have a tangible impact on society. From healthcare to sustainability, finance to education, we aspire to create tools and technologies that address pressing challenges and improve lives.

Education: Next year we will launch a prestigious graduate program that is designed to attract the best students, to come to TAU to study for a Ph.D. in AI. The undergraduate education activities will continue throughout the campus.

Knowledge Dissemination: We will actively share our findings and expertise with the scientific community, industry partners, policymakers, and the public.

This progress report highlights our achievements over the past two years. It will also provide updates on our initiatives, programs, and events, and showcase some of our noteworthy accomplishments.



Meir Feder

Prof. Meir Feder
Head, Center for AI
and Data Science (TAD)
Tel Aviv University

Overview of TAD

Mission



TAD Meet & Collaborate event, Museum of Natural History, TAU, 2022 | Photo: Ofer Amram

The Tel Aviv University Center for Artificial Intelligence and Data Science (TAD), which was inaugurated in March 2021, is an interdisciplinary center with a mission to advance innovative research and education in these fields. More than 300 faculty members, covering both core and application areas from across the campus (Exact Sciences, Engineering, Life Sciences, Medicine, Arts, Social Sciences, Law, Humanities, and Management) are affiliated with the center. The center strives to transform all research areas, and puts a special focus on data science (DS) and AI for the benefit of humanity.

Our main goals are:

- **Support core research in AI and DS**
- **Promote interdisciplinary collaborative research across the campus**

- **Provide an infrastructure of computational resources and access to unique datasets**
- **Develop relations with industry and public organizations**
- **Promote education in AI and DS**

In pursuit of these aims, the center funds research in AI and DS and supports PhD candidates through excellence scholarship programs. The center also hosts workshops, conferences, and meetings, and has established 13 communities in various fields. These are intended to connect and support its members and to foster collaborations inside the university and with other academic institutions, as well as with industry and government. A “Bridge” entity formed by the center is designed to help researchers through consulting, mentoring, and generating connections between research groups. The center is also involved in several TAU education programs.

Team

Academic Management

Prof. Meir Feder, Electrical Engineering, and Head of TAD | **Prof. Saharon Rosset**, Mathematical Sciences | **Prof. Amir Globerson**, Computer Science | **Prof. Irad Ben-Gal**, Industrial Engineering | **Prof. Niva Elkin Koren**, Law | **Prof. Galit Yovel**, Psychological Sciences | **Prof. Tal Pupko**, Shmunis School of Biomedicine and Cancer Research

Extended Academic Management

Prof. Yoav Benjamini, Mathematical Sciences | **Prof. Tova Milo**, Computer Science | **Prof. Lior Wolf**, Computer Science | **Prof. Isaac Ben Israel**, Political Science | **Prof. Hayit Greenspan**, Biomedical Engineering | **Prof. Oded Maimon**, Industrial Engineering | **Prof. Manuel Trajtenberg**, Economics | **Prof. Leo Corry**, History and Philosophy of Sciences

Research Staff

Dr. Moni Shahar, Scientific Manager | **Dr. Shiri Stempler**, Director of Scientific Programs and Collaborations | **Aya Vituri**, Senior Statistician, The Statistical Consulting Lab | **David Refaeli**, Statistician, The Statistical Consulting Lab | **Dr. Ruth Barshir**, Director of Medical Data (Joint with Safra Center for Bioinformatics) | **Dr. Vered Varod-Silber**, Principal consultant for Humanities and Social Sciences | **Stav Klein**, Head of Computational Text Analysis for Humanities

Administrative Staff

Hilla Einy, Administrative Manager | **Ori Manor**, Event Coordination and Social Media | **Miki Peled**, Website Editor



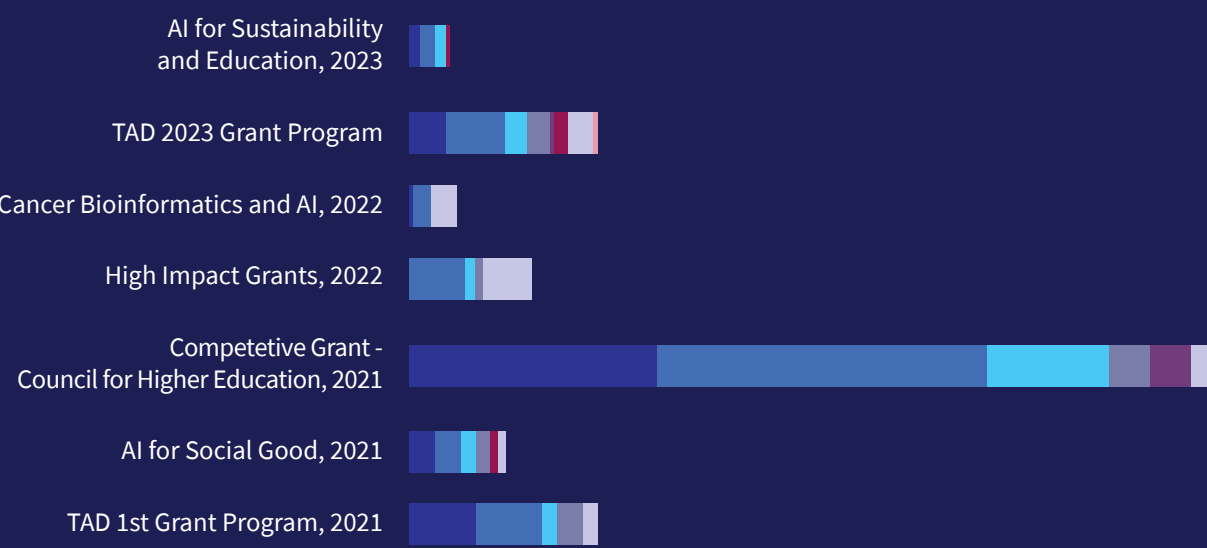
TAD First Meeting, TAU, 2021. Left to right: Dr. Shiri Stempler, Dr. Moni Shahar, Prof. Saharon Rosset, Prof. Amir Globerson, Prof. Meir Feder, Prof. Niva Elkin-Koren, Prof. Irad Ben-Gal, Hilla Einy | Photo: TAD

Research

TAD is proud to have funded **68** research projects during its first two years, thereby providing financial support of more than **31** million NIS to **124** faculty members. These projects involve both core and interdisciplinary AI and DS research into a range of fields at TAU from Health and Sustainability, Computer Science, and Engineering, to Economics, Ethics, and Arts. The center promotes innovative research and supports individual as well as collaborative grants, through multiple programs. Many of the grants awarded support new collaborations between faculty members.

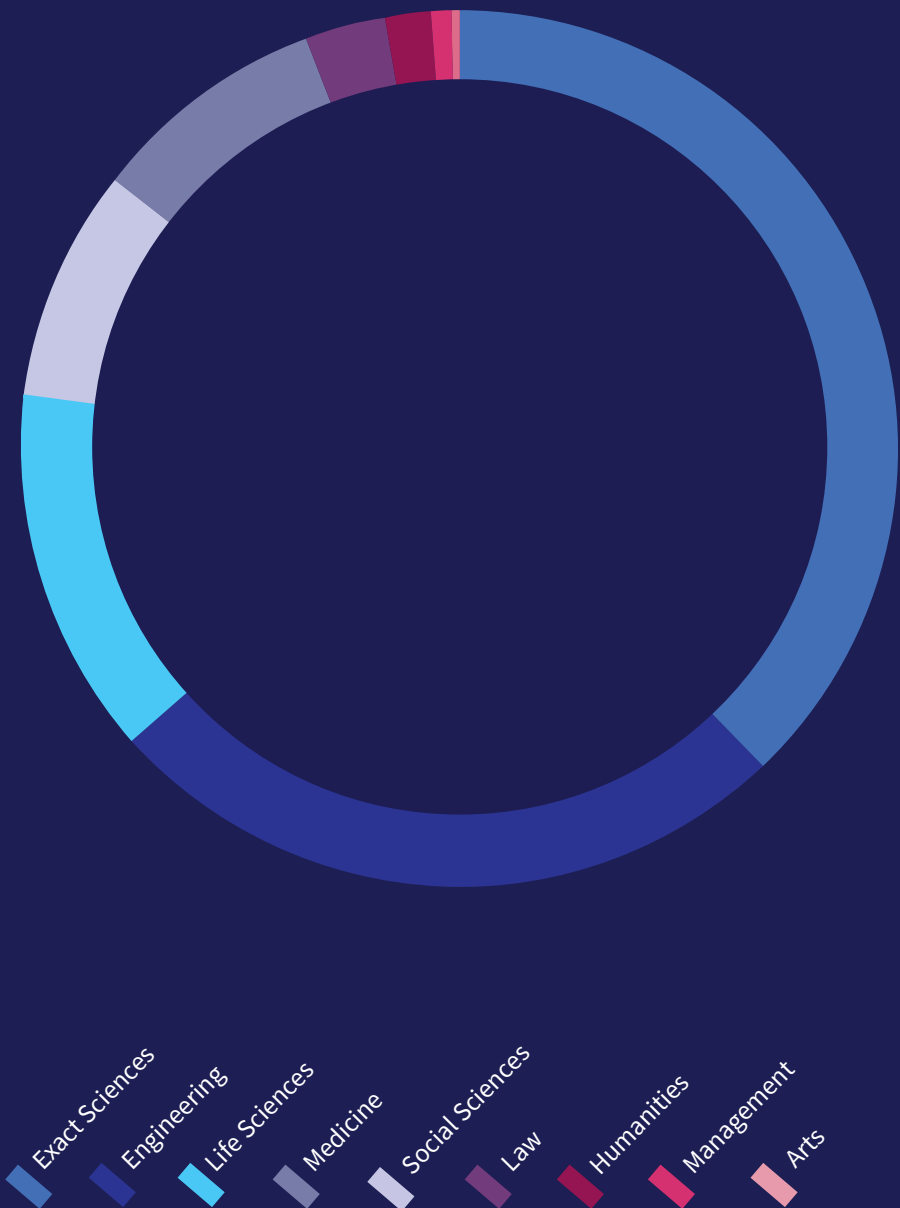
Grant Programs

TAD grants awarded in the different grant programs
with total funding of more than 31 million NIS in 2021-2023



Distribution of funding

Research grants and scholarships



TAD 1st Grant Program, 2021

The first call for proposals of TAD, funded with the support of the Council for Higher Education, was aimed at both core research in DS and interdisciplinary research, where DS is applied to research efforts on campus. **18** projects, providing a total of **3.075** million NIS to the different teams were selected for funding:

A machine learning-based framework for correcting batch effects in microbiome data
 Researchers: **Prof. Elhanan Bornstein** (Computer Science and Medicine)

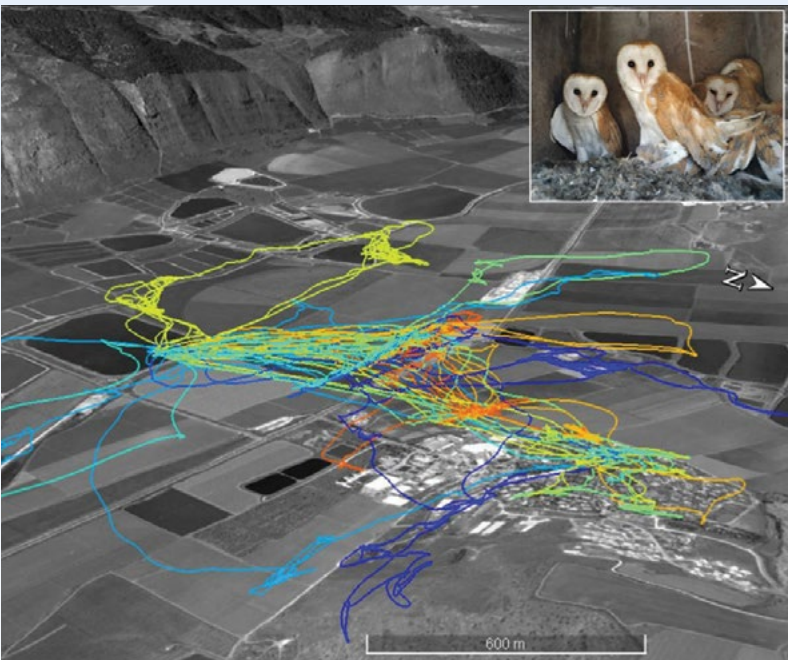
An integrated computational-experimental approach to characterize breast cancer heterogeneity with applications to prognosis and treatment
 Researchers: **Prof. Roded Sharan** (Computer Science), **Prof. Tamar Geiger** (Medicine)

Artificial Intelligence and machine learning models for assessing physiological response to physical activity
 Researchers: **Dr. Yftach Gepner** (Public Health), **Dr. Noam Ben-Eliezer** (Biomedical Engineering), **Prof. Hayit Greenspan** (Biomedical Engineering)

Causal effects of antibiotic use on resistance
 Researchers: **Dr. Daniel Nevo** (Mathematical Sciences), **Dr. Uri Obolski** (Public Health)

Diagnostic and prognostic scores for pancreatic cancer using big medical data high-dimensional modeling
 Researchers: **Prof. Daniel Yekutieli** (Mathematical Sciences), **Dr. Osnat Ashur-Fabian** (Medicine)

Dynamic risk prediction (DRP) model for post trauma psychopathology
 Researchers: **Prof. Talma Hendler** (Psychological Sciences), **Prof. Malka Gorfine** (Mathematical Sciences)



Applying data science approaches for processing high-resolution animal movement data and segmenting trajectories into behavioral modes
 Researchers: **Prof. Sivan Toledo** (Computer Science), **Dr. Orr Spiegel** (Zoology)

Community based monitoring of pests
 Researcher: **Prof. Ram Fishman** (Public Policy)





**From data to algorithms and back:
Making urban public transport adaptive**
Researchers: **Prof. Itzhak Benenson** (Geography),
Prof. Tal Raviv (Industrial Engineering)

**Teaching natural language
understanding models
to generalize better**
Researchers: **Dr. Omer Levy**
(Computer Science),
Prof. Jonathan Berant
(Computer Science)



**Echo-based 3D reconstruction
of natural environments**
Researchers: **Prof. Yossi Yovel**
(Zoology), **Prof. Anthony Weiss**
(Electrical Engineering)

**Harnessing the power of deep
learning to detect habitable
exoplanets**
Researchers: **Prof. Shay Zucker**
(Environment and Earth
Sciences), **Prof. Raja Giryes**
(Electrical Engineering)

**Improving control of
wastewater treatment by deep
learning analysis**
Researchers: **Prof. Hadas
Mamane** (Mechanical
Engineering), **Prof. Yuval Shavitt**
(Electrical Engineering)

**Inclusive decay-vertex
reconstruction with deep
learning methods**
Researchers: **Prof. Abner Soffer**
(Physics and Astronomy), **Prof.
Ran Gilad-Bachrach** (Biomedical
Engineering)

**Multiple testing for particle
picking in cryo-EM**
Researchers: **Prof. Tamir
Bendory** (Electrical Engineering),
Dr. Amichai Painsky (Industrial
Engineering)

**Reconstruction of
nonequilibrium dynamics from
coarse-grained time-series data
using graph neural network**
Researchers: **Dr. Gili Bisker**
(Biomedical Engineering),
Dr. Dan Raviv (Electrical
Engineering)

**The phylogenetic tree
reconstruction game:
developing reinforcement-
learning algorithms for fast
and accurate inference of
evolutionary trees**
Researchers: **Prof. Tal Pupko**
(Shmunis School of Biomedicine
and Cancer Research), **Prof.
Yishay Mansour** (Computer
Science), **Prof. Itay Mayrose**
(Plant Sciences)

**Towards autonomous
exploratory data analysis**
Researchers: **Prof. Tova Milo**
(Computer Science), **Prof. Daniel
Deutch** (Computer Science)

Competitive Grant – Council for Higher Education, 2021

In 2021, the TAD center won the highest grant in the competitive program for data science centers in Israel, provided by the Council for Higher Education. This amounted to **20 million** NIS for **4** years (including matching from TAU).

The competitive grant builds on the strengths of the TAD center, and seeks to expand the impact of DS & AI across campus and outside the university. The proposal includes **5** collaborative projects involving **28** faculty members:



TAD Deep Learning Theory Retreat, 2023

The Center for Theory of Deep Learning

Much of the recent success of AI relies on deep learning techniques. However, these remain poorly understood from a theoretical perspective. In this project, led by Prof. Amir Globerson, we take advantage of an exceptionally strong and diverse group of TAU researchers with expertise in the field to tackle challenging questions and their practical implications. A key aspect of this project involves forming new cross-disciplinary collaborations that will be able to uncover original aspects of the core questions in this area. To this end, we held a successful two-day retreat for the faculty members in the group and their graduate students at the Elma Hotel in Zikhron Yaakov in February 2023.

Researchers: From Computer Science: Prof. Amir Globerson, Dr. Tomer Koren, Prof. Yishay Mansour, Dr. Nadav Cohen, Prof. Lior Wolf. From Electrical Engineering: Prof. Raja Giryes, Prof. Meir Feder, Dr. Roi Livni. From Mathematical Sciences: Prof. Saharon Rosset.

Deep Neural Networks for Scientific Discovery

AI has the potential to revolutionize scientific research. Indeed, collaborations between data-scientists and researchers across the TAU campus have already resulted in unique AI-driven discoveries. The aim of this project was to devise a comprehensive methodology for using deep-learning within all aspects of scientific and engineering research (e.g., simulations, inverse models, and interpretability). The resulting methods will be applied to research at TAU.

Researchers: From Computer Science: Prof. Lior Wolf. From Electrical Engineering: Prof. Meir Feder, Prof. Raja Giryes. From Physics and Astronomy: Prof. Haim Suchowski. From Neurobiology, Biochemistry & Biophysics: Prof. Pablo Blinder, Prof. Nir Ben Tal. From Zoology: Prof. Yossi Yovel. From Shmunis School of Biomedicine and Cancer Research: Prof. Miguel Weil.

Data Access with Privacy, Security, and Accountability: Towards Virtual Research Rooms

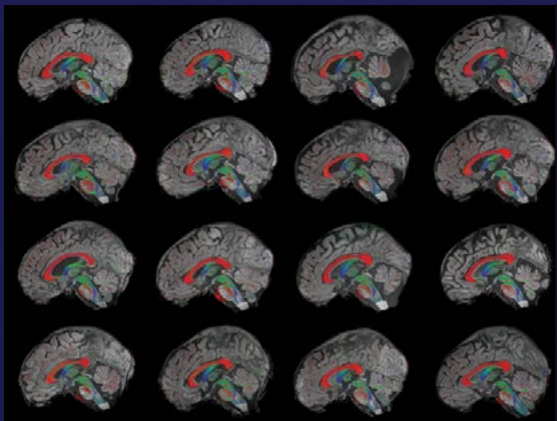
Information about people is key to making informed decisions and driving research in medical and social sciences. But how can such data be used without sacrificing privacy? Here we form a unique collaboration of core researchers and researchers from social sciences and law, together with the **Israel Central Bureau of Statistics (ICBS)**. The research team will develop new theoretically grounded methods and algorithms designed to provide private, secure, and accountable data access. These will be deployed in virtual research rooms that will be used by researchers at TAU and other Israeli research institutions.

Researchers: Prof. Eran Toch (Industrial Engineering), Prof. Ran Gilad-Bachrach (Bio-Medical Engineering), Prof. Michal Feldman (Computer Science), Prof. Yishay Mansour (Computer Science), Prof. Michael Birnhack (Law), Dr. Analia Schlosser (Economics).

The TAU Brain-MRI Bank Project

Understanding the human brain is one of the greatest challenges in modern science. A key empirical tool in the arsenal is neuroimaging and specifically MRI. The data generated by imaging studies are complex and their analysis requires the application of advanced DS methods, as well as the development of new options. In this project, we propose the creation and utilization of a neuroimaging database at TAU, which will be unique in terms of size (over 10000 subjects) and the multi-modality of the collected data. We will also form a collaboration of core DS researchers and neuroscience collaborators with the objective of designing new methodologies to drive scientific discovery.

Researchers: Prof. Yaniv Assaf (Neurobiology, Biochemistry & Biophysics), Prof. Saharon Rosset (Mathematical Sciences), Prof. Galit Yovel (Psychological Sciences), Prof. Hayit Greenspan (Biomedical Engineering), Prof. Ruth Heller (Mathematical Sciences), Prof. Tom Schonberg (Neurobiology, Biochemistry & Biophysics), Dr. Ido Tavor (Medicine).



Brain scans of 16 subjects out of our growing database of 1500 subjects. Image depicts mid sagittal slice demonstrating corpus callosum variability across subjects (in red).

The TAU EMR Research Hub Project

Modern healthcare is strongly driven by data, and Israel is a powerhouse in terms of quality and coverage of electronic medical records. Here, we form a collaboration of core DS researchers, computational biologists and healthcare professionals towards joint research on these topics. The group will curate existing and new datasets and will develop novel techniques with the aim of using them to make scientific discoveries and improve healthcare.

Researchers: Prof. Ron Shamir (Computer Science), Prof. Uri Nevo (Biomedical Engineering), Prof. Ran Gilad-Bachrach (Biomedical Engineering), Prof. Malka Gorfine (Mathematical Sciences), Prof. Rani Elkon (Medicine).

AI for Social Good, 2021

(Joint program - TAD & Google)

Google and TAU have launched a joint program to promote AI-related multidisciplinary research designed to address global social, economic, and environmental challenges. The program aims to support the combination of DS and AI in a variety of projects, within the framework of the TAD Center. **10** projects by researchers affiliated with TAD, all addressing the theme “AI for Social Good,” have been selected to receive funding by both Google and TAD. Each project received **200K** NIS for two years.

AI based model for automatic coding of pre-linguistic behaviors in infants
Researcher: **Prof. Liat Kishon-Rabin** (Health Professions)

Balancing fair use and copyright in the presence of big and synthetic data
Researcher: **Dr. Roi Livni** (Electrical Engineering)

Developing high-resolution climate mapping and insect-detection models to reduce risks to food production under climate change
Researcher: **Dr. Ofir Levy** (Zoology)

Early warning for invasive Mediterranean fishes
Researchers: **Prof. Jonathan Belmaker** (Zoology), **Prof. Raja Giryes** (Electrical Engineering)

General falsification tests for instrumental variables
Researchers: **Dr. Oren Danieli** (Economics), **Dr. Daniel Nevo** (Mathematical Sciences), **Dr. Dan Zeltzer** (Economics)

How recommendation systems lead to polarization
Researchers: **Prof. Sigal Alon** (Sociology and Anthropology), **Prof. Dafna Gelbgiser** (Labor Studies), **Prof. Ran Gilad-Bachrach** (Bio-medical engineering)

Prediction of Rain intensity classes from near-real-time geosynchronous Satellites and precipitation imagery Time-series (PROSPECT)
Researcher: **Dr. Michal Segal-Rozenhaimer** (Exact Sciences)

Real time augmented reality registration of stretchable structures for needle navigation through the gluteus muscles
Researchers: **Dr. Dan Raviv**, (Electrical Engineering), **Shai Tejman-Yarden, M.D.**, (Edmond and Lily Safra Children's Hospital, Chaim Sheba Medical Center & Sackler Faculty of Medicine)

Understanding and executing instructions in natural language
Researchers: **Dr. Omer Levy** (Computer Science)



Opening the Dead Sea scrolls to the world
Researchers: **Prof. Nachum Dershowitz** (Computer Science), **Prof. Jonathan Ben-Dov** (Biblical Studies)

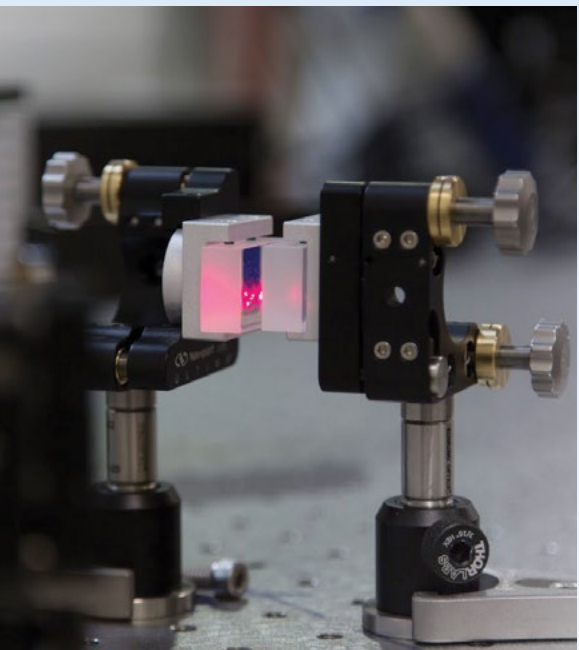
Examples of recent color images on the left and an old IR image on the right. The two arrows indicate matches. (All images are courtesy of Leon Levy Dead Sea Scrolls Digital Library, Israel Antiques Authority; color photographer Shai Halevi, infrared by Najib Anton Albina.)

High Impact Grants

The primary mission of TAD is to foster groundbreaking research that involves AI and DS. To achieve this aim, TAD announced a funding opportunity for high impact research projects. Proposals were reviewed for groundbreaking and ambitious research leading to a game-changing impact in any scientific field that can benefit from a major contribution from AI/DS. **2** projects were selected to receive full funding of **\$300,000** for **3** years and two projects were selected to receive seed grants.

Full Grant Awardees

Machine and Deep Learning for Smart Electromagnetism and Photonics



Ultrashort light pulses propagation through chirp mirrors, optical elements that keep the pulses temporally compressed (Photo: Taken at the FemtoNano lab, TAU). Both teams collaborate to develop inverse design methods for the design of such elements.

Researchers: **Prof. Haim Suchowski** (Physics and Astronomy) & **Dr. Nadav Cohen** (Computer Science)

AI has emerged as a powerful approach and has already led to significant breakthroughs in many scientific and technological fields in the past decade.

Deep Learning, inspired by the layered and hierarchical deep architecture of the human brain, has emerged as an efficient means to design photonic structures.

Our current proposal stems from the complementary expertise of the two groups and from the realization that the strength of deep learning can be further leveraged to address inverse design challenges in physics and, in particular, in electromagnetism sub-wavelength inverse design spanning the large spectrum of electromagnetic and photonics applications. More specifically, we plan to use recently introduced DL methods and our recent achievements to address challenging inverse design tasks in electromagnetism, such as sensing with nano-photonics, novel 5G and Wifi antennas, as well as integrated photonics for quantum information and LIDARs.

The demand for and supply of biased news:
evidence from article-level slant

Researchers: **Dr. Ro'ee Levy** (Economics), with collaborators: **Dr. Luca Braghieri** (University of Munich), **Dr. Sarah Eichmeyer** (University of Munich), **Prof. Markus Mobius** (Microsoft Research), **Dr. Jacob Steinhardt** (UC Berkeley).



The news market has changed rapidly in recent decades. The current availability of online news and particularly social media, means that news is now consumed from a variety of sources, instead of as a bundle from one or two outlets. Therefore, in order to analyze the slant (political leaning) of an individuals' news consumption, it is necessary to measure the slant of specific articles rather than merely that of the outlets as previously assessed. In the project, we will leverage advances in machine learning in order to overcome the classical technical challenges and measure the article-level slant for articles appearing in all major US news outlets. This will allow us to revisit classic questions in media economics and examine whether echo chambers exist online. We will also examine whether individuals tend to prefer to consume news articles matching their ideology even within specific outlets, and analyze how individuals engage with articles based on their slant in social media.

High Impact - Seed Grant Awardees

Targeting aging-related diseases by integrating
machine learning, biophysical and cellular tools

At the heart of modern drug discovery lies the ability to modulate a defined cellular pathway in order to achieve the desired therapeutic effect. Protein-protein interactions (PPIs) are the main machineries regulating such pathways, and as such are promising therapeutic targets. Unfortunately, the generic physico-chemical characteristics of PPIs greatly complicates the identification of small molecule drugs capable of disrupting the interactions and PPIs are thus often considered undruggable. A promising path towards the discovery of PPI modulators is to design binding peptides.

Here, we propose to develop and integrate three specific and complementary AI-based approaches towards the discovery of new peptides that bind

a prescribed region of a target protein: (i) Mining and reverse-engineering of binding peptides extracted from native protein substrates using sequence generative models. (ii) Fast screening of complementary binding motifs of the targeted region via geometric deep learning. (iii) De novo complex structure prediction of protein-peptides complexes using the state-of-the-art AlphaFold-multimer model. These tools will identify high affinity peptides that can then be validated experimentally, thus providing a unique discovery engine for PPI interface modulators.

Researchers: **Prof. Haim Wolfson** (Computer Science), **Dr. Maayan Gal** (Dental Medicine), **Dr. Daniel Bar** (Dental Medicine)

Plants secret communication:
deciphering plant acoustic signals using machine learning

Plants are known to use visual, olfactory, and tactile signals to communicate with pollinators, seed dispersers, herbivores, and other plants. However, the sensory modality of acoustic communication remains almost unexplored in plants, despite its potential adaptive value. Plant vibrations have been recorded for decades, but always by connecting the recording device directly to the plant, thus not revealing the extent to which these vibrations travel through air and may be detected at a distance from the plant.

We have now shown, for the first time, that stressed plants of different species emit ultrasonic sound-signals that can be detected from up to several meters away. We also demonstrated that these sounds, which are

composed of short ultrasonic clicks, can be classified by machine learning algorithms, as related to the condition of the plant (e.g., whether it is a dry, cut, or unstressed). The goal of our proposal is to extend these findings to decipher this hitherto secretive potential plant communication system. This will be accomplished by using machine learning, utilizing existing tools that have proved effective in interpretation of acoustic communication in other systems, as well as novel tools that we will develop here.

We aim to obtain a comprehensive understanding of the different sounds of plants, to reveal the information they carry, and describe their functionality in communication with plants and animals.

Researchers: **Prof. Lilach Hadany** (Plant Sciences), **Prof. Yossi Yovel** (Zoology), **Prof. Amir Globerson** (Computer Science)

Publication: Itzhak Khait et al., [Sounds emitted by plants under stress are airborne and informative](#), Cell (2023).



Cancer Bioinformatics and Artificial Intelligence Grants, 2022

A joint program of TAD with the Cancer Biology Research Center (CBRC), Edmond J. Safra Center for Bioinformatics (EJSCB), and the Djerassi Oncology Center. We held a kickoff event in the university to introduce and bring together clinicians from all the hospitals affiliated with the university and faculty members in the fields of AI and Bioinformatics. Members of the Health and Biomedicine community of TAD participated in the event. **6** grants representing a total amount of **900K** NIS were awarded to support new collaborative projects involving clinicians and basic research scientists in the fields of AI and Bioinformatics and Cancer at TAU. A fraction of the total budget was provided by Teva Pharmaceutical Industries Ltd. ("Teva"):



A personalized approach for childhood cancer: Whole-genome Cell-free DNA methylation for molecular monitoring

Researchers: **Prof. Shai Izraeli** (Schneider Children's Medical Center), **Prof. Yuval Ebenstein** (Chemistry)

AI-based analysis of tumor organoids and in-vivo xenograft models as a novel approach to improve cancer treatment: kidney cancer as a proof of concept

Researchers: **Dr. Oren Pleniceanu** (Sheba Medical Center), **Prof. Lior Wolf** (Computer Science)

Deep learning based deconvolution of gene expression data of human glioblastomas for improving future immunotherapy

Researchers: **Dr. Ilan Volovitz** (Tel Aviv Sourasky Medical Center), **Prof. Roded Sharan** (Computer Science)

Developing radiological biomarkers for brain metastases response to radiotherapy treatment, using deep learning analysis of MRI and radiation plans

Researchers: **Orit Furman** (Tel Aviv Sourasky Medical Center), **Leor Zach** (Tel Aviv Sourasky Medical Center), **Raja Giryes** (Electrical Engineering)

Improving early breast cancer detection in diverse ethnic groups in Israel

Researchers: **Prof. Rinat Yerushalmi** (Rabin Medical Center), **Prof. Ran Elkon** (Medicine)

Sensitive detection of diffuse large B cell Lymphoma by neural network assisted circulating microRNA classification

Researchers: **Prof. Irit Avivi** (Tel Aviv Sourasky Medical Center), **Dr. Yohai Bar Sinai** (Physics and Astronomy)

TAD Call for Proposals in AI and Data Science, 2023

The TAD 2023 grants, amounting to a total of **3.2** million NIS were awarded to a broad range of projects in the fields of AI and DS. The center awarded **15** regular grants and **6** seed grants to support new and innovative ideas. These grants represent the diversity of research areas in which AI & DS can play a major role. The grants support **40** faculty members from **8** different faculties:

AI-based methodologies for phylogeny: model selection and tuning dataset-specific search Parameters
Researchers: **Prof. Tal Pupko** (Shmunis School of Biomedicine and Cancer Research), **Prof. Yishay Mansour** (Computer Science), **Prof. Itay Mayrose** (Plant Sciences)

Dating the Dead Sea scrolls using computational linguistics tools
Researchers: **Dr. Eshbal Ratzon** (Jewish Philosophy), **Prof. Nachum Dershowitz** (Computer Science)

Elucidating human language processing with large language Models
Researchers: **Prof. Aya Meltzer**

Asscher (Linguistics), Prof. Jonathan Berant (Computer Science)

Estimating real-world step length from inertial measurement units using advanced machine learning techniques
Researchers: **Dr. Neta Rabin** (Industrial Engineering), **Prof. Jeffrey Hausdorff** (Health Professions)

Generalized regression discontinuity design with multiple time periods and comparison groups for causal inference: theory and practice
Researchers: **Dr. Daniel Nevo** (Mathematical Sciences), **Dr. Itay Saporta-Eksten** (Economics), **Dr. Analia Schlosser** (Economics)

Generative models for the design and analysis of quantum devices
Researchers: **Dr. Amit Bermano** (Computer Science), **Dr. Yoav Lahini** (Physics and Astronomy)

Human-systems integration in AI-supported fake news detection
Researcher: **Prof. Joachim Mayer** (Industrial Engineering)

Learning the dynamics of chaos and turbulence
Researchers: **Prof. Yaron Oz** (Physics and Astronomy), **Prof. Lior Wolf** (Computer Science)



Developing an acoustic monitoring tool for coral reef health
Researchers: **Prof. Jonathan Belmaker** (Zoology), **Prof. Yossi Yovel** (Zoology), **Dr. Yoav Ram** (Zoology)



Paleography powered by learning:
Analyzing cuneiforms with neural networks
Researchers: **Dr. Hadar Elor** (Electrical Engineering), **Prof. Yoram Cohen** (Archaeology)

Machine learning of collective variables for accelerating molecular dynamics simulations
Researchers: **Dr. Barak Hirshberg** (Chemistry), **Dr. Yohai Bar Sinai** (Physics and Astronomy)

Magnetic sweet AI: metabolic brain cancer imaging using deep MRI of a sugar-based contrast agent
Researchers: **Dr. Or Perlman** (Biomedical Engineering), **Prof. Gil Navon** (Chemistry)

Mathematical foundations of xAI and their applications to personalized medicine and public health
Researchers: **Dr. Uri Obolski** (Public Health), **Prof. Ran Gilad Bachrach** (Biomedical Engineering)

Using machine learning to understand the impacts of climatic variability on human Behavior
Researcher: **Prof. Ram Fishman** (Public Policy)

Under the hood of the American supreme court: Identifying authorship in unsigned opinions
Researchers: **Prof. Ronen Avraham** (Law), **Prof. Tamar Kricheli-Katz** (Law), **Prof. Roded Sharan** (Computer Science)



Seed Grant Awardees

Developing and implementing an algorithmic toolset for data-driven music-analytical research
Researcher: **Dr. Uri Binyamin Rom** (Music)

Geometry-oriented dependence measures
Researcher: **Dr. Anatoly Khina** (Electrical Engineering)

Identifying and characterizing new biomarkers for alcohol addiction using artificial intelligence
Researcher: **Prof. Segev Barak** (Psychological Sciences)

Large scale acoustic based navigation – a machine learning approach
Researchers: **Prof. Yossi Yovel** (Zoology), **Prof. Raja Giryes** (Electrical Engineering)

Midlife predictors of exceptional survival in a cohort of 10,000 Israeli male employees
Researchers: **Prof. Yariv Gerber** (Public Health), **Prof. Yael Benyamini** (Social Work)

Using inverse reinforcement learning to understand what is being learned in motor learning
Researcher: **Prof. Jason Friedman** (Health Professions)

AI for Sustainability and Education, 2023

(Joint with Google)

As part of their ongoing collaboration, Google and TAU launched a new 3-year program for the promotion of AI and DS research, which focuses mainly on AI research for Sustainability and for Education.



Left to Right (standing): Dr. Arnon HersHKovitz, Education; Prof. Tal Pupko, Life Sciences; Prof. Noa Shenkar, Life Sciences; Prof. Yossi Matias, VP Research, Google and Head of Google Center in Israel; Prof. Meir Feder, Head of TAD; Prof. Hadas Mamane, Engineering; (sitting): Ronit Levavi-Morad, Director, Program Management at Google Research; Ofir Inbar, PhD candidate at the Porter School of the Environment; Prof. Vered Blass, Porter School of the Environment; Dr. Deborah Cohen, Senior Scientist at Google Research; and Dr. Shiri Stempler, TAD | Photo : Ofra Ron Mazor

Artificial Intelligence for the impact of floods on users' water quality
Researchers: **Prof. Vered Blass** (Porter School for Environmental and Earth Sciences), **Prof. Hadas Mamane** (Mechanical Engineering)

Deep Learning based technology for managing the secondary treatment process in wastewater treatment plants
Researcher: **Prof. Dror Avisar** (Porter School for Environmental and Earth Sciences)

Harnessing AI for development of novel approaches to control the spread of invasive species by marine vessels
Researchers: **Prof. Noa Shenkar** (Zoology), **Prof. Tal Pupko** (Shmunis School of Biomedicine and Cancer Research)

Harnessing creativity through representation modelling of Students' problem-solving processes
Researchers: **Dr. Arnon HersHKovitz** (Education), **Dr. Noam Koenigstein** (Industrial Engineering)

Scholarship Programs

PhD Excellence Fellowships, 2021

The center awarded four excellence PhD scholarships (starting October 2021). Each scholarship is planned for **3** years. One of the scholarships was given to a student in core DS research and three scholarships were awarded to students in applied DS fields:

Ben Kantor Social Sciences (advisor: Dr. Inbal Ben Ami Bartal)

Keren Halabi Plant Sciences (advisor: Prof. Itay Mayrose)

Noam Razin Computer Science (advisor: Dr. Nadav Cohen)

Yotam Liel Management (advisor: Dr. Lior Zalmanson)



Left to right: Keren Halabi, Prof. Ariel Porat, Prof. Meir Feder, Yotam Liel, Noam Razin | Photo: Ofer Amram



Left to right: Ronit Levavi-Morad, Avery Deveto, Rasha Jaber, Ameen Ali, Prof. Yossi Matias, Prof. Meir Feder | Photo: Ofra Ron Mazor

Graduate Program Scholarships, 2023

Joint with google

Ameen Ali

PhD candidate, Computer Science (advisor: Prof. Lior Wolf)
Research Title: Using explainability in order to provide feedback to deep neural networks in a way that would promote fairness

Avery Deveto

PhD candidate, Zoology (advisors: Prof. Yoni Belmaker, Prof. Roi Holtzman)
Research Title: AI for prediction of invasive species

Rasha Jaber

Master's student, Education (advisor: Dr. Arnon HersHKovitz)
Research Title: Analyzing student behavior while engaging in interactive mathematics sorting tasks

Bridge Unit

The "Bridge" unit offers expert guidance and consultation services to researchers and graduate students who wish to advance their work in the domains of DS and AI. Our team specializes in identifying and facilitating useful collaborations with esteemed faculty members at TAU, and in achieving seamless integration into ongoing research initiatives. In addition, we provide comprehensive consultation services in the fields of DS and AI, and offer co-advising support to first-grade project and master's students. Importantly, the "Bridge" unit plays an instrumental role in providing first-grade DS workshops, which are of invaluable support to students in their early stages of academic exploration. Through our services, we strive to foster a culture of collaboration, innovation, and excellence in the realms of DS and AI research.

The "Bridge" is composed of two units: (a) the Statistical Lab and (b) the Computational Text Analysis (CTextA) team.

A The Statistical Lab provides robust support for DS projects, primarily focusing on generating tabular data through advanced statistical, machine learning, and deep learning techniques. The majority of projects within the lab are affiliated with TAU. Since its affiliation with TAD in October 2021, the lab has contributed to over 40 research initiatives and has collaborated

with researchers from various schools, including those of the Health Professions, Psychology, Brain Sciences, and Management. Our team also partners with hospitals, medical centers, and industry experts to ensure the highest standards of data analysis. Furthermore, the lab frequently assists in experiment planning and provides input for medical protocols. Our overarching objective is to establish long-term relationships with research labs, for whom the Statistical Lab can provide the foremost solution for sophisticated data analysis. Working with the lab can be either as a paid service or as a part of research collaboration.

A selected list of publications:

- Berestizshevsky, et al. (2021). Optimization of resource-constrained policies for COVID-19 testing and quarantining. *Journal of Communications and Networks*, 23(5), 326-339.
- Helft, et. al. (2023). Quantitative MRI biomarkers of pathology in a Poly I:C rat lactational model of schizophrenia and depression. *ISMRS*.
- Izakson, et al. (2023). Similar functional networks predict performance in both perceptual and value-based decision tasks. *Cerebral Cortex*, 33(6), 2669-2681.

- Kolomansky, et al. (2021). Patients diagnosed with myelodysplastic syndromes display lower bone mass: Assessment using bone marrow biopsies manually and with Artificial Intelligence. *Blood*, 138, 3694.
- Resheff, et al. (2023). Proving unfairness of decision-making systems without model access. *Expert Systems with Applications*, 213, 118987.

B The Computational Text-Analysis (CTextA) team promotes and supports research in the field of computational text analysis for the faculties of Law, Humanities, Social Sciences, Management, and Arts. Its mission is to provide researchers in these faculties with research tools and literacy in computational analysis of texts, to promote interdisciplinary collaborations, and to provide infrastructure (i.e., software, databases, storage, and access). Since its establishment in January 2023, the team has launched fruitful collaborations with 18 faculty members and graduate students. While some of these collaborations are still in their early stages, others have already produced promising results, with roughly 10 projects currently in progress and several others having already been successfully completed. In addition, a series of hands-on workshops on computational tools for text analysis was organized.

Conferences and Workshops

- **October 2022**
Machine learning for data researchers workshop. by Dr. Moni Shahar.
- **February 2023**
Digital Assyriology International Conference – Joint organization of the Archaeological Departments in TAU and in Ariel University.
- **February 2023**
Corpus analysis with Antconc - a free software for concordance and text analysis. by Dr. Vered Silber-Varod.
- **March 2023**
Historical data Hackathon on 16th century texts.
- **April 2023**
NeTxt tool for text analysis and Visone for semantic network analysis. by Prof. Elad Segev.

Research Communities

TAD center has established **13 communities** in various research fields of DS and AI with the objective of sharing knowledge and promoting research collaborations. This work is led by Dr. Shiri Stempler, Director of Research Programs and Collaborations at TAD, together with faculty members from the various fields. More than 300 faculty members and their graduate students at TAU participate in TAD communities and their activities.



We thank the faculty members who helped in planning and organizing the activities in the different communities, in collaboration with Dr. Stempler:

From Engineering: Prof. Ran Gilad Bachrach, Prof. Raja Giryes, Dr. Goren Gordon, Prof. Eran Toch

From Exact Sciences: Dr. Barak Hirshberg, Dr. Yohai Bar-Sinai, Prof. Amir Globerson, Dr. Vered Blass, Dr. Amit Bermano, Dr. Daniel Nevo, Prof. Itzhak Benenson

From Life Sciences: Prof. Oded Rechavi, and Prof. Yossi Yovel

From Medicine: Dr. Uri Obolski

From Law: Prof. Niva Elkin Koren and Prof. Assaf Hamdani

From Management: Prof. Tomer Geva, Dr. Inbal Yahav, Prof. Lior Zalmanson

From Humanities: Dr. Arnon HersHKovitz, Prof. Jonathan Ben-Dov, Dr. Amir Teicher, Dr. Liora Sarfati

From Social Sciences: Dr. Isaac Sasson, and Dr. Dan Zeltzer

Fundamentals of AI and DS

Three gatherings of the community with poster presentations by students

Deep Learning Theory Retreat at Elma Hotel, Zikhron Yaakov

AI on Chip Conference (in collaboration with the Technion)

AI in the Physical Sciences

Workshop & Seminar by Prof. Michele Ceriotti, EPFL, on Atomic-scale modeling in the age of machine learning;

Three seminars by researchers from Physics, Chemistry, Computer Science and Mathematical Sciences

Environment

Workshop: Remote Sensing Data Science in Ecology - connecting government and researchers from academic institutions in Israel

Two Joint seminars with Google including tutorials on Earth engine and Dynamic World.

Gathering of the TAU Environmental community

Urban Planning & Smart Cities

Big Data, AI and Urban Future - A Monthly Lecture Series in collaboration with TAU City Center. Four speakers:

John Östh, Oslo Metropolitan University; Alex Hagen Zanker, University of Surrey; Toshihiro Osaragi, Tokyo Institute of Technology; Itzhak Benenson, Tel Aviv University;

Natural Language Processing

Gathering of the TAU NLP community

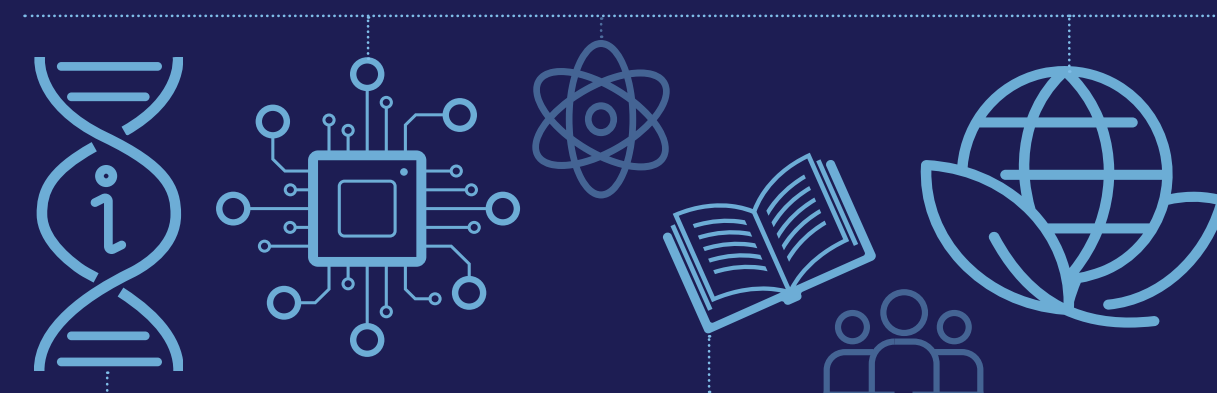
Israeli Seminar on Computational Linguistics (ISCOL) 2022 – Co-organized with Google

Vision

Seminar on visual computing, supported by TAD

AI & Education

Two seminars including a talk by Prof. Zach Pardos, School of Education, UC Berkeley



Health & Biomedicine

Three gatherings and seminars of the community

#ScienceFlashMob – two day conference at Tel Aviv beach for the Israeli Biomed community, promoting new collaborations. Organized by Oded Rechavi, Bjorn Schumacher, Shiri Stempler and Roni Rak, and supported by TAD and the Israel Young Academy

Kickoff event for a new collaborative grant program in Cancer Bioinformatics and AI – connecting clinicians from hospitals affiliated with TAU and members of TAD's Health and Biomed community (with EJSBC, CBRC and Djerassi Oncology Center)

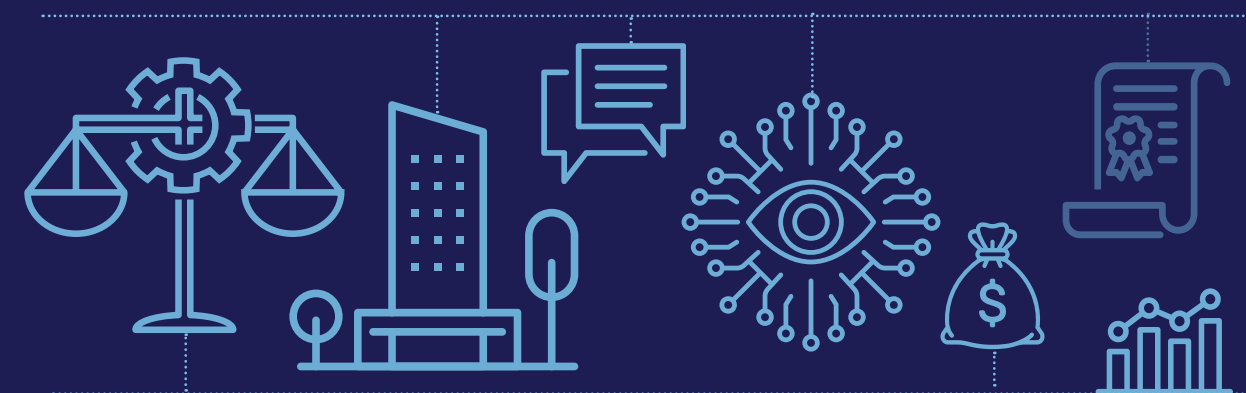
A new collaborative grant program with Shaare Zedek Medical Center and EJSBC will be announced in July 2023

Digital Humanities

Six monthly seminars with speakers from various fields: arts, history, literature, Jewish studies, archeology, communication and more

AI & Society

Community Gathering



AI, Ethics and Law

Eight seminars bringing together researchers from Law, Computer Science and Engineering (Seminars in 2022-2023 were organized in collaboration with The Chief Justice Shamgar Center for Digital Law and Innovation)

Training for Responsible AI workshop – co-organized by IDSI, TAD Community on AI, Ethics & Law, Responsible AI, Law, Ethics & Society, and The Chief Justice Shamgar Center for Digital Law and Innovation

International Research Workshop, co-organized by TAD & University of Hamburg on Methodologies for interdisciplinary research in computer science and law

Personalized Law: Different Rules for Different People. Book Launch by President of TAU, Prof. Ariel Porat and Prof. Omri Ben Shahr (organized with the Buchmann Faculty of Law).

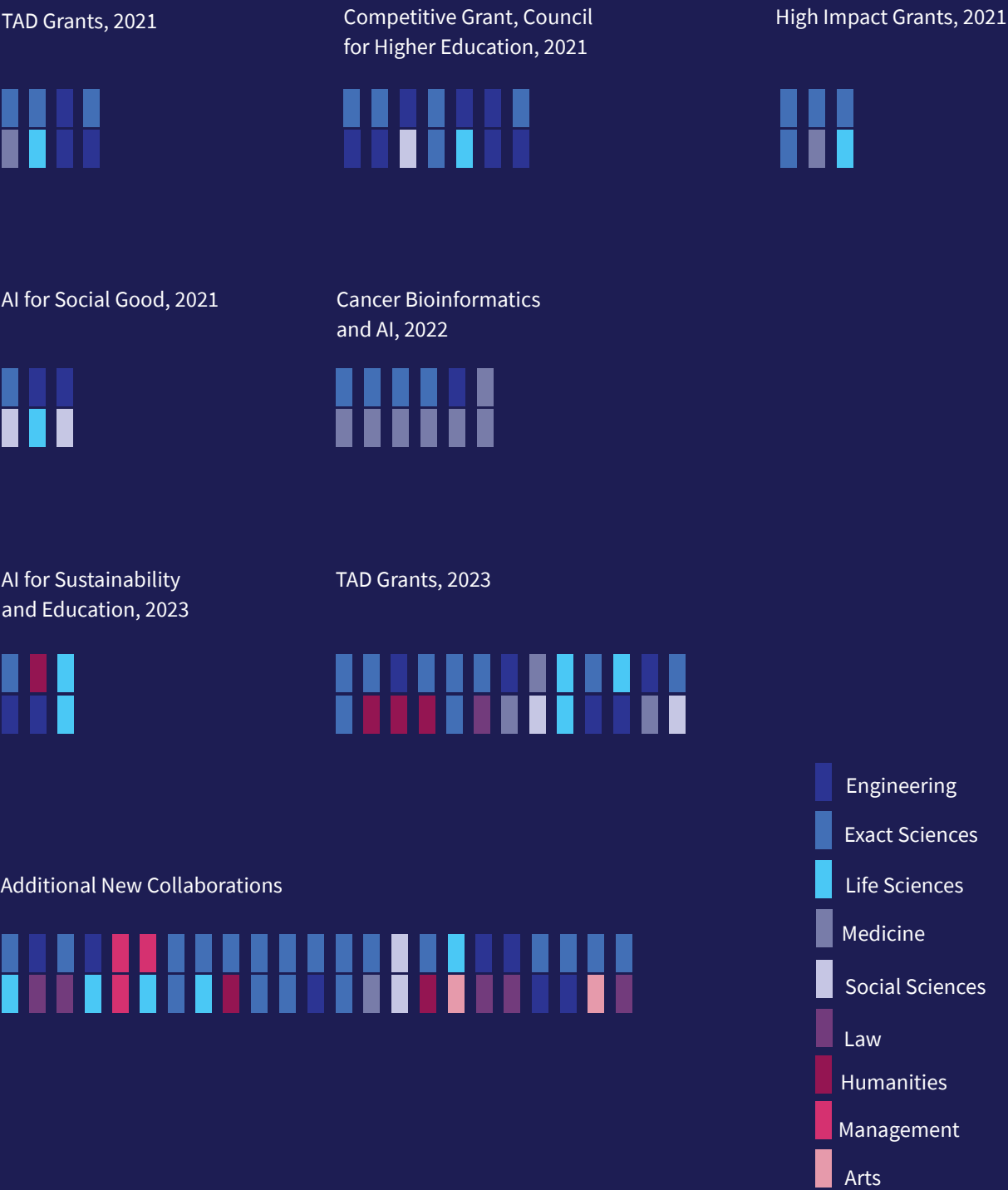
AI & Business:

Four seminars exploring different aspects of management and AI

Causal Inference

First meeting is planned in June 2023, with a special keynote by Prof. Fabrizia Mealli, University of Florence.

The various activities of the center have led to a large number of new collaborations (> 60). Many of them have received funding from TAD through various grant programs (see illustration below):



Education

Undergraduate programs

The relevance of AI and DS to all areas of science is unquestionable. Nevertheless, most undergraduate programs outside the exact sciences and engineering do not offer AI and DS courses. To address this gap, TAD offers two clusters of AI and DS courses that are integrated with existing undergraduate programs in Social Sciences, Life Sciences, Law, Humanities, and Arts. These courses provide students with training in advanced computational tools to tackle research questions in their respective fields, enabling innovative approaches beyond traditional methodologies. Participation in these courses also facilitates communication with scientists who work in the core areas of AI and DS, bridging interdisciplinary gaps. Such interdisciplinary training is much needed and beneficial for both academia and industry.



Students in TAD's undergraduate program | Photo: TAD

Minor ("Hativa") in DS and AI (32 credits)

The program comprises 8 courses, including background courses in math, statistics, and programming, followed by more advanced courses in data science, machine learning, deep learning and AI, and ethics. Students are required to have a prior background in high school math (4-5 points) and will undertake a research project that applies DS and AI to a research question in their area of study. This minor is currently offered to students in Psychology, Economics, Political Science, Law, Neuroscience and Life Sciences and can be expanded to other programs. The program will provide the students with computational understanding and tools (such as text, image, and big data analysis), which are highly relevant in academia and industry.

Cluster ("Hekbetz") in DS and AI (16 credits)

This program is designed for students with no background in mathematics and has been developed to provide a basic understanding of the terminology

and tools of DS and AI in a simplified way that does not depend on mathematical and statistical knowledge. It includes four courses: statistics, programming, and two courses in data science. The students will conduct a research project that applies the DS/AI tools taught in the courses, to their area of study. Initially offered this year to one Humanities program, it will expand next year to students in Social Sciences (Social Work, Sociology, Political Science) and Law.

Graduate program

In the academic year of 2023/24, TAD plans to offer outstanding students with a strong background in exact sciences, a new direct PhD program in collaboration with existing graduate programs on campus. The program includes three advanced machine learning courses offered by TAD that students will take as part of existing graduate programs in Computer Sciences, Statistics, Engineering, Life Sciences, and Neuroscience. Thus, students in the courses offered by TAD will come from different disciplines and will be exposed to interdisciplinary research in AI and DS. Initially, the students will be accepted to their "home" school and subsequently selected by a TAD committee. TAD will supplement the scholarships that the students receive from their schools to 200%.

Events

Events are an integral part of TAD's work and mission to bring together the AI and DS community and to promote discussions and research collaborations. TAD hosted conferences, seminars and meetings during 2021- 2023:

5.2021

First TAD Community Meeting

7.2021

TAD-Google 1st Joint Seminar - AI for Social Good initiative

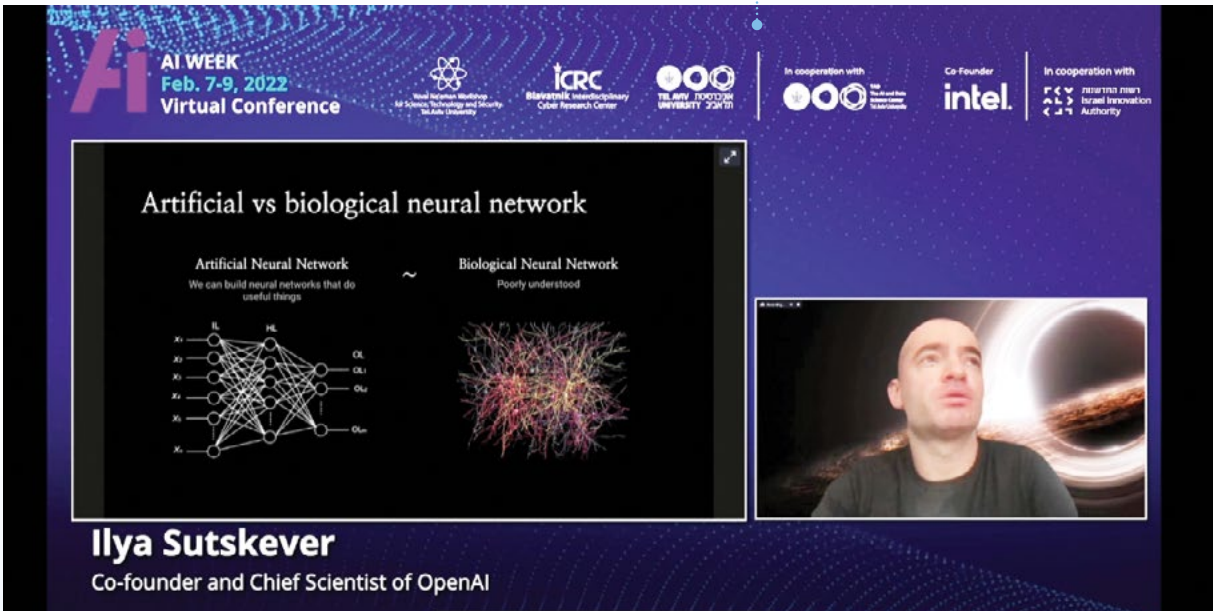
11.2021

Personalized Law: Different Rules for Different People – Book Launch, by Prof. Ariel Porat and Prof. Omri Ben Shazar



2.2022

AI Week 2022 - The 3-day virtual conference included a special joint session of TAD and Google on AI in Health. The event gathered 5000 participants from industry and academia from 75 countries. (Co-organized with the Blavatnik Interdisciplinary Cyber Research Center (ICRC))



10.2021

Meet & Collaborate Event



1.2022

Meet & Collaborate Event II - The AI and DS toolbox

4.2022

Kickoff event for a new collaborative grant program for clinicians and basic research scientists in Cancer Bioinformatics and AI (joint with CBRC, EJSCB, Djerassi Center)



9.2022

- Israeli Seminar on Computational Linguistics (ISCOL) 2022 (Co-organized with Google)
- ColabAI Workshops for faculty members - promoting new interdisciplinary and innovative collaborations at TAU, by Dr. Shiri Stempler



6.2022

- #ScienceFlashMob – Biomed Community
- Year-End Event on Responsible AI, including a panel discussion with the participation of the Ministry of Law and keynote by Cynthia Rudin
- Data Science Bootcamp
- Workshop: Remote Sensing Data Science in Ecology



2.2023

- AI Week 2023 (Co-organized with ICRC)
- Deep Learning Theory Retreat – Elma Hotel, Zikhron Yaacov



3.2023

TAD 2nd Annual Conference

5.2023

TAU-Google Research Collaboration Event on AI For Sustainability & For Education

6.2023

Year-End Event on AI Disruption: Risks and Opportunities



Infrastructure

Modern AI and DS is computationally intensive. One of the center's missions is to provide the computational resources needed for contemporary research. This is a valuable service that is provided by the center and its affiliated researchers. In addition to computation, there is a need for storage and data handling to support the huge amount of data needed for modern research.

The TAD center has purchased six GPU servers, each with eight GPUs. The machines are integrated in university clusters, where the low-end machines are part of the main university cluster, and the mid-end and high-end machines are part of the CS clusters. In addition, the center has also purchased one CPU server and 100 T

of storage for the use of researchers in the biomedical sciences. This hardware is currently being used by a few dozen researchers and extends the available computational power of TAU.

In collaboration with Google, the TAD center also provides resources in Google cloud.

TAD is a participant in the large national Israeli super computer project. This project is a joint collaboration between the Israel Innovation Authority, the IDF represented by Mafaat, and the Israeli universities. TAD took part in the committee that proposed a solution. The project is now moving to the implementation stage, in which TAD will serve as a bridge to researchers who wish to test the suggested platform.

Collaborations

Collaboration with Governmental Institutions

Israel Central Bureau of Statistics (ICBS)

As part of the projects included in the competitive grant from the Council of Higher Education, the center works with the ICBS to manage privacy and ensure accountability in virtual research rooms.

TAD and the Faculty of Social Sciences jointly fund the effort of opening a virtual ICBS research room at TAU. The research room is compliant with the high standards of security and privacy that ICBS requires. The room can provide access to data without the need to physically come to the ICBS offices, and thereby promotes TAU research that requires this data.

Hospitals and HMOs

Collaboration Program with Clinicians

In 2022, TAD center together with three additional centers: CBRC, EJSCB, and the Djerassi Oncology Center, organized a joint meeting for PIs, students, and clinicians from all the hospitals affiliated with TAU, with the aim of initiating collaborations. This meeting was a kickoff event for a joint program grant addressing research in cancer bioinformatics and AI that the centers initiated in collaboration with Teva. Six new collaborations with clinicians from the following hospitals: Schneider Children's Medical Center, Sheba Medical Center, Tel Aviv Sourasky Medical Center, and Rabin Medical Center, received funding.

Romach Project with Clalit

The Romach project is an initiative in which selected research proposals submitted by Clalit clinicians are executed in collaboration with PIs at TAU and additional Israeli universities. This project was formed as a collaboration between Clalit innovation division and the Biomedical Engineering department at TAU and is led by Prof. Ran Gilad Bachrach. The project has expanded, and 16 studies, of which half are conducted by Tel Aviv University researchers, have been initiated under this umbrella in this year alone. The "Bridge" unit of TAD has mentored three students' projects as part of this collaboration.

Collaboration with Industry

TAD aims to serve as a hub of collaboration, enabling scholars and students to work collaboratively on practical DS and AI challenges, while exposing the industry to pioneering research methods and to the next generation of analytics tools. Accordingly, TAD's efforts are focused on large-scale collaborative research projects with a unique synergy among groups of academic researchers, developers, industry-domain experts, practitioners and decision makers.

Google

In 2021, Google and TAD launched a collaborative program called “**AI for Social Good**”. The aim of this program is to promote AI-related multidisciplinary research into global social, economic, and environmental challenges. Ten TAD researcher directed projects designed to harness the power of AI for social good and for science were selected to receive funding. As part of the initiative, we also organized joint seminars (led by Dr. Debby Cohen, Google, and Dr. Shiri Stempler, TAD) in which researchers presented ongoing projects or research questions, in order to encourage discussion and collaboration between academia and industry.



In 2023, Google and TAD launched a new 3-year program for the promotion of AI and DS research, with financial support of \$1M from Google. The new program is focused mainly on **AI research for Sustainability and for Education**. This program includes a call for research proposals in the above fields and a call for applications to support graduate students in AI who belong to underrepresented groups in academia.

Left to Right: Prof. Ariel Porat, Prof. Tova Milo, Dr. Shiri Stempler, Prof. Yossi Matias, VP, Research, Google and Head of Google Center in Israel, and Prof. Meir Feder | Photo: Ofra Ron Mazor

Intel

TAD will start a collaboration with Intel Corporation with the aim to develop courses in AI in the next academic year.

Additional Collaborative Projects supported by TAD



"Resonance 4145" by the artist Ronen Shaharabani and the scientist: Prof. Yossi Yovel | Photo: Elad Sarig

TAU Genia Schreiber Art Gallery

Exhibition: In the Mind's Eye - January 2023, Curator: Dr. Tamar Mayer

The TAD center assisted in brainstorming and by brokering a connection with TAD researchers whose fields of activity are related to the theme of the exhibition. These researchers met with the artists who were selected to take part at the artist incubator (by Mifal Hapais) for a series of meetings, and some even collaborated with the artists to create installations that combine scientific and artistic knowledge.

Supporting the Community

Summer course in AI in collaboration with Tel Aviv Youth University - for underrepresented groups in the academia

The center collaborates with the Tel Aviv Youth University to offer a summer course in AI for junior high school students. The aim is to foster excellence in youth from groups that are underrepresented in academia and to bridge social gaps by making academia accessible to all sections of society. The center will provide full scholarships for all the participants.



Data Accessibility

UK Biobank

A major achievement this year was gaining access to a major new data addition of the UK Biobank. The UK Biobank is the world's most comprehensive biomedical research resource, and contains in-depth genetic and health information for half a million participants. In collaboration with the EJSCB, we successfully completed an application and gained access to all the data in the latest UK Biobank release.

The release of the new data was accompanied by the introduction of a novel cloud-based Research Analysis Platform. While the platform exponentially increases the scale and accessibility of the data, its use requires a deep understanding of the complex data structure and available tools. We used our expertise to assist researchers in selecting data and developing efficient analysis pipelines with the platform. We also converted previously developed pipelines to run on the platform in order to improve efficiency and robustness. Currently the data and platform are used by five research groups from Statistics, Computer Science, and Medicine.

Affiliated Researchers

Arts

Prof. Efrat Blumenfeld,
Architecture

Dr. Ehud Ben Arie,
Film and Television

Prof. Eran Neuman,
Architecture

Dr. Gal Raz,
Film and Television

Dr. Sefy Hendler,
Art History

Dr. Sharon Aronson Lehavi,
Theatre Arts

Prof. Talia Margalith,
Architecture

Dr. Tamar Mayer,
Art History

Dr. Uri Rom, Music

Engineering

Prof. Alex Liberzon,
Mechanical Engineering

Dr. Alon Peled-Cohen,
Electrical Engineering

Dr. Amichai Painsky,
Industrial engineering

Dr. Amiram Moshaiov,
Mechanical Engineering

Dr. Anatoly Khina,
Electrical Engineering

Prof. Anthony Weiss,
Electrical Engineering

Dr. Avishai Sintov,
Mechanical Engineering

Prof. Benny Applebaum,
Electrical Engineering

Dr. Dan Raviv,
Electrical Engineering

Prof. Dana Ron-Goldreich,
Electrical Engineering

Prof. Eran Toch,
Industrial Engineering

Prof. Erez Shmueli,
Industrial Engineering

Dr. Gili Bisker,
Biomedical Engineering

Prof. Goren Gordon,
Industrial Engineering

Dr. Hadar Averbuch-Elor,
Electrical Engineering

Prof. Hadas Mamane Steindel,
Mechanical Engineering

Prof. Hagit Messer-Yaron,
Electrical Engineering

Prof. Hayit Greenspan,
Biomedical Engineering

Prof. Irad Ben-Gal,
Industrial Engineering

Prof. Joachim Meyer,
Industrial Engineering

Prof. Meir Feder,
Electrical Engineering

Prof. Michal Tzur,
Industrial Engineering

Prof. Nahum Kiryati,
Electrical Engineering

Prof. Natan Tzvi Shaked,
Biomedical Engineering

Dr. Neta Rabin,
Industrial Engineering

Dr. Noam Ben-Eliezer,
Biomedical Engineering

Dr. Noam Koenigstein,
Industrial Engineering

Prof. Oded Maimon,
Industrial Engineering

Dr. Or Perlman,
Biomedical Engineering

Prof. Raja Giryes,
Electrical Engineering

Prof. Ran Gilad-Bachrach,
Biomedical Engineering

Dr. Roi Livni,
Electrical Engineering

Prof. Shai Avidan,
Electrical Engineering

Prof. Tal Raviv,
Industrial Engineering

Dr. Tamir Bendory,
Electrical Engineering

Prof. Tamir Tuller,
Biomedical Engineering

Prof. Uri Nevo,
Biomedical Engineering

Dr. Yoram Kozak,
Mechanical Engineering

Prof. Yuval Shavitt,
Electrical Engineering

Exact Sciences

Prof. Abner Soffer,
Physics and Astronomy

Dr. Alon Shepon,
Porter School for the Environment
and Earth Sciences

Prof. Amir Averbuch,
Blavatnik School of Computer Science

Prof. Amir Globerson,
Blavatnik School of Computer Science

Dr. Amir Rubinstein,
Blavatnik School of Computer Science

Dr. Amit Bermano,
Blavatnik School of Computer Science

Dr. Amit Moscovich,
Mathematical sciences

Dr. Barak Hirshberg,
Chemistry

Prof. Colin Price,
Porter School of the Environment
and Earth Sciences

Prof. Dan Halperin,
Blavatnik School of Computer Science

Prof. Daniel Deutch,
Blavatnik School of Computer Science

Dr. Daniel Nevo,
Mathematical Sciences

Prof. Daniel Yekutieli,
Mathematical Sciences

Prof. David Steinberg,
Mathematical Sciences

Dr. Dmitry Batenkov,
Mathematical Sciences

Prof. Dovi Poznanski,
Physics and Astronomy

Prof. Dror Avisar,
Physics and Astronomy

Prof. Elhanan Borenstein,
Blavatnik School of Computer Science

Prof. Eyal Ben-Dor,
Porter School of the Environment
and Earth Sciences

Dr. Eyal Ronen,
Computer Science

Prof. Felix Abramovich,
Mathematical Sciences

Prof. Gil Navon,
Chemistry

Prof. Guy Cohen,
Chemistry

Prof. Haim Avron,
Mathematical Sciences

Prof. Haim Kaplan,
Blavatnik School of Computer Science

Prof. Haim Suchowski,
Physics and Astronomy

Prof. Haim Wolfson,
Blavatnik School of Computer Science

Prof. Itzhak Benenson,
Porter School of the Environment
and Earth Sciences

Prof. Jonathan Berant,
Blavatnik School of Computer Science

Prof. Juval Portugali,
Porter School of the Environment
and Earth Sciences

Prof. Lior Wolf,
Blavatnik School of Computer Science

Dr. Liron Barak,
Physics and Astronomy

Dr. Mahmood Sharif,
Blavatnik School of Computer Science

Prof. Malka Gorfine,
Mathematical sciences

Prof. Michal Feldman,
Blavatnik School of Computer Science

Prof. Nachum Dershowitz,
Blavatnik School of Computer Science

Dr. Nadav Cohen,
Blavatnik School of Computer Science

Prof. Nili Harnik,
Porter School for the Environment
and Earth Sciences

Dr. Omer Levy,
Blavatnik School of Computer Science

Prof. Roded Sharan,
Blavatnik School of Computer Science

Prof. Ron Lifshitz,
Physics and Astronomy

Prof. Ron Shamir,
Blavatnik School of Computer Science

Prof. Ruth Heller,
Mathematical Sciences

Prof. Saharon Rosset,
Mathematical Sciences

Prof. Shay Zucker,
Porter School for the Environment
and Earth Sciences

Prof. Sivan Toledo,
Blavatnik School of Computer Science

Prof. Tali Hatuka,
Porter School for the Environment
and Earth Sciences

Dr. Tomer Koren,
Blavatnik School of Computer Science

Prof. Tova Milo,
Blavatnik School of Computer Science

Dr. Uri Obolski,
Porter School for the Environment
and Earth Sciences

Prof. Vered Blass,
Porter School for the Environment
and Earth Sciences

Dr. Yair Carmon,
Blavatnik School of Computer Science

Prof. Yaron Oz,
Physics and Astronomy

Prof. Yishay Mansour,
Blavatnik School of Computer Science

Prof. Yoav Benjamini,
Mathematical Sciences

Dr. Yoav Lahini,
Physics and Astronomy

Prof. Yoel Shkolnisky,
Mathematical Sciences

Dr. Yohai Bar Sinai,
Physics and Astronomy

Prof. Yuval Ebenstein,
Chemistry

Humanities

Dr. Amir Teicher,
History

Dr. Arnon HersHKovitz,
Education

Prof. Asaf Goldschmidt,
History

Prof. Audrey Addi-Raccah,
Education

Prof. Aya Meltzer-Asscher,
Philosophy,
Linguistics and Science Studies

Dr. Ella Daniel,
Education

Dr. Eshbal Ratzon,
Jewish Studies and Philsophy

Prof. Jonathan Ben-Dov,
Jewish Studies and Archeology

Prof. Leo Corry,
History and Philosophy of Science

Prof. Lilach Shalev-Mevorach,
Education

Dr. Liora Sarfati,
History

Prof. Miriam Shefer-Mossensohn,
History

Dr. Nir Evron,
English and American Studies

Prof. Roni Katzir,
Philosophy, Linguistics
and Science Studies

Dr. Roy Tzohar,
History

Prof. Uri Yiftach,
Classics

Prof. Yoram Cohen,
Archaeology

Law

Prof. Alon Klement

Dr. Amit Pundik

Prof. Assaf Hamdani

Prof. Ehud Kamar

Prof. Kobi Kastiel

Prof. Michael Birnhack

Prof. Niva Elkin-Koren

Prof. Ron Harris

Prof. Ronen Avraham

Prof. Tamar Kricheli-Katz

Dr. Uri Hacohen

Life Sciences

Dr. Aldema Sas-Chen,
Shmunis School of Biomedicine
and Cancer Research

Dr. Anan Moran,
Neurobiology, Biophysics
and Biochemistry

Dr. David Burstein,
Shmunis School of Biomedicine
and Cancer Research

Prof. Ehud Gazit,
Shmunis School of Biomedicine
and Cancer Research

Prof. Gali Prag,
Neurobiology, Biochemistry
and Biophysics

Prof. Inon Scharf,
Zoology

Prof. Irit Gat-Viks,
Shmunis School of Biomedicine
and Cancer Research

Prof. Itay Mayrose,
Plant Sciences and Food Security

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Selected List of Publications

2023

Cain, S., Solomon, T., Leshem, Y. *et al.* Movement predictability of individual barn owls facilitates estimation of home range size and survival. *Movement Ecology* (2023).

Chaikin, S., De-Beer, G., Yitzhak, N. *et al.* The invasive silver-cheeked toadfish (*Lagocephalus sceleratus*) predominantly impacts the behavior of other non-indigenous species in the Eastern Mediterranean. *Biol Invasions* (2023).

Cohen-Karlik, E., Menuhin-Gruman, I. Giryes, R. *et al.* Learning Low Dimensional State Spaces with Overparameterized Recurrent Neural Nets. *International Conference on Learning Representations (ICLR)* (2023).

Friedlander, T., Wolf, L. Dynamically-Scaled Deep Canonical Correlation Analysis. *The Pacific-Asia Conference on Knowledge Discovery and Data Mining (PAKDD)* (2023).

Ghosal, A., Bisker, G. Entropy production rates for different notions of partial information. *Journal of Physics D: Applied Physics* (2023).

Izakson, L., Gal, S., Shahar, M. *et al.* Similar functional networks predict performance in both perceptual and value-based decision tasks. *Cerebral Cortex* (2023).

Jerome, T., Lifshits, L.A., Michael N., *et al.* Funneling modulatory peptide design with generative models: Discovery and characterization of disruptors of calcineurin protein-protein interactions. *Plos Computational Biology* (2023).

Kenig, M., Lahini, Y. Unsupervised generalization of correlated quantum dynamics on disordered lattices. *Physical Review A* (2023).

Khait, I., Lewin-Epstein, O., Sharon, R. *et al.* Sounds emitted by plants under stress are airborne and informative. *Cell* (2023).

Londner, S., Philips, Y., Miller, H. *et al.* Linguistic Knowledge within Handwritten Text Recognition Models: A Real-World Case Study. *Proceedings of the 17th International Conference on Document Analysis and Recognition (ICDAR)* (2023).

Luisa Vissat, L., Cain, S., Toledo, S. *et al.* Categorizing the geometry of animal diel movement patterns with examples from high-resolution barn owl tracking. *Movement Ecology* (2023).

Lutati, S., Wolf, L. OCD: Learning to Overfit with Conditional Diffusion Models. *International Conference on Machine Learning (ICML)* (2023).

Pickholtz, R., Kiflawi, M., Buba, Y. *et al.* Confronting the ‘nocturnal problem’ in coral reefs: sleeping site selection and cocoon formation in parrotfishes. *Coral Reefs* (2023).

Rosenman, G., Malkiel, I., Greental, A. *et al.* Pre-Training Transformers for Fingerprinting to Improve Stress Prediction in fMRI. *Medical Imaging with Deep Learning (MIDL)* (2023).

Roth, M., Painsky, A., Bendory, T. Detecting Non-Overlapping Signals with Dynamic Programming. *Entropy* (2023).

Rotman, M., Wolf, L. Energy Regularized RNNs for Solving Non-Stationary Bandit Problems. *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)* (2023).

Shaharabany, T., Wolf, L. Learning a Weight Map for Weakly-Supervised Localization. *International Conference on Acoustics, Speech, and Signal Processing (ICASSP)* (2023).

Shimron, E., Perlman, O. AI in MRI: Computational Frameworks for a Faster, Optimized, and Automated Imaging Workflow. *Bioengineering* (2023).

Weitzner, D., Giryes, R. On the Relationship Between Universal Adversarial Attacks and Sparse Representations. *IEEE Open Journal of Signal Processing* (2023).

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Ben-Dor, G., Klein, I., Ogulenko, A. *et al.* Modal Shift and Shared Automated Demand-Responsive Transport: A Case Study of Jerusalem. *Procedia Computer Science* (2022).

Ben-Dov, J., Gayer, A., & Ratzon, E. Material and Digital Reconstruction of Fragmentary Dead Sea Scrolls. *Brill* (2022).

Ben-Zuk, N., Daon, Y., Sasson, A. *et al.* Assessing COVID-19 vaccination strategies in varied demographics using an individual-based model. *Frontiers of Public Health* (2022).

Benarous, M., Toch, E., Ben-Gal, I. Synthesis of Longitudinal Human Location Sequences: Balancing Utility and Privacy. *ACM Transactions on Knowledge Discovery from Data (TKDD)* (2022).

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Cohen-Karlik, E., Ben David, A., Cohen, N. *et al.* [On the Implicit Bias of Gradient Descent for Temporal Extrapolation](#). *Proceedings of the 25th International Conference on Artificial Intelligence and Statistics* (2022).

Deutch, D., Gilad, A., Milo, T. *et al.* [FEDEX: An Explainability Framework for Data Exploration Steps](#). *Proceedings of the VLDB Endowment* (2022).

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Ecker, N., Azouri, D., Bettisworth, B. *et al.* [A LASSO-based approach to sample sites for phylogenetic tree search](#). *Bioinformatics* (2022).

Gershtein, S., Milo, T., Novgorodov, S. *et al.* [Classifier Construction Under Budget Constraints](#). *Proceedings of the 2022 International Conference on Management of Data* (2022).

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Keren, K., Busse, M., Fritz, N. E. *et al.* [Quantification of Daily-Living Gait Quantity and Quality Using a Wrist-Worn Accelerometer in Huntington's Disease](#). *Frontiers in neurology* (2021).

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[Lower Bone Mass: Assessment Using Bone Marrow Biopsies Manually and with Artificial Intelligence](#). *Blood* (2021).

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