TAD
The AI and Data Science Center
Tel Aviv University

TAD Newsletter January 2022

TAD Center's first community meeting at the Steinhardt Museum of Natural History,
Tel Aviv University, June 2021.

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News and Announcements

- We have a **new website**: datascience.tau.ac.il

  and a **new twitter account**: **@TAD_Tau** - you are welcome to follow us: twitter.com/TAD_Tau

- TAD center recently won a **16 million NIS grant from the Council for Higher Education**.

  The proposal included 5 research projects in the fields of fundamental data science, medical records, applications in life sciences and physics, and a unique collaboration with Israel Central Bureau of Statistics on data access with privacy and accountability. More than 30 faculty members from exact sciences, engineering, life sciences, medicine, social sciences and law are collaborating in these projects.

  مجلس التعليم العالي
  המועצה להשכלה גבוהה
  COUNCIL FOR HIGHER EDUCATION
  הוועדה לתכנון ולתקצוב

- We ask all researchers who are affiliated with TAD and are supported by the center to mention TAD support in all publications and presentations. See link to **acknowledgement format**.

Research

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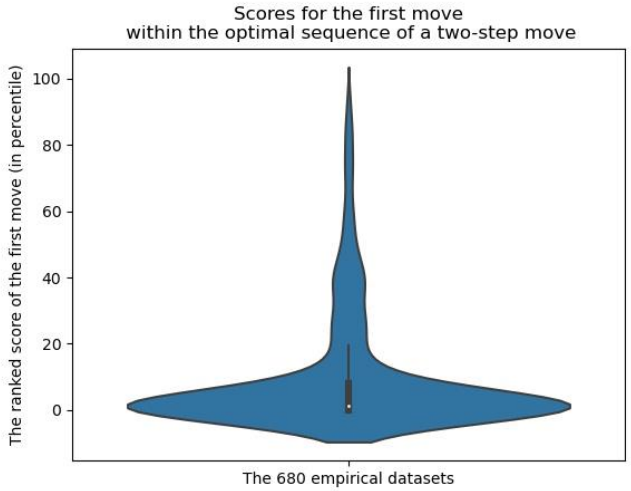
Research Highlight: Harnessing machine learning to guide phylogenetic-tree search algorithms.

Authors: Dana Azouri, Shiran Abadi, Yishay Mansour, Itay Mayrose & Tal Pupko.

Nature Communication, 2021.



One of the most fundamental goals in biology is to reconstruct the evolutionary history of all organisms on earth. The following two fields have never interacted before: reinforcement learning and molecular evolution. Here we develop a reinforcement-learning algorithm to solve the challenge of reconstructing phylogenetic trees. We demonstrated that a framework that optimizes a sequence of two "lookahead" moves into the horizon, is superior compared to a framework which optimizes a single move at a time (see figure). Our preliminary results thus suggest that reinforcement-learning techniques to learn an optimal strategy for the tree search, can boost tree search-heuristics without compromising accuracy.

This collaborative research, led by **Prof. Tal Pupko** and **Prof. Itay Mayrose** from the Faculty of Life Sciences together with **Prof. Yishay Mansour** from the school of Computer Science, is supported by a grant from the TAD Center.
See TAD supported **RESEARCH**.

Link to full article

Research

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Research Highlight: **Sliding-Window Pitch-Class Histograms as a Means of Modeling Musical Form.**

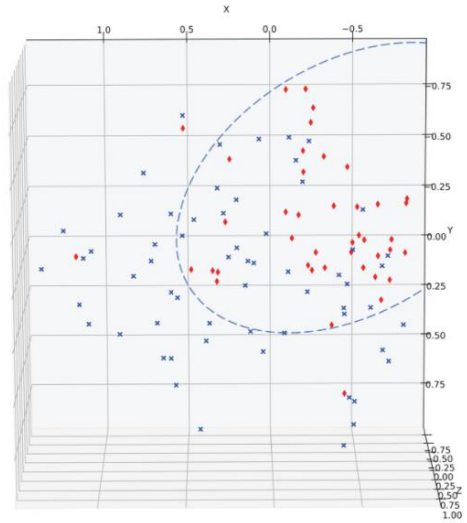
Authors: Dror Chawin & Uri B. Rom.

Transactions of the International Society for Music Information Retrieval, 2021.

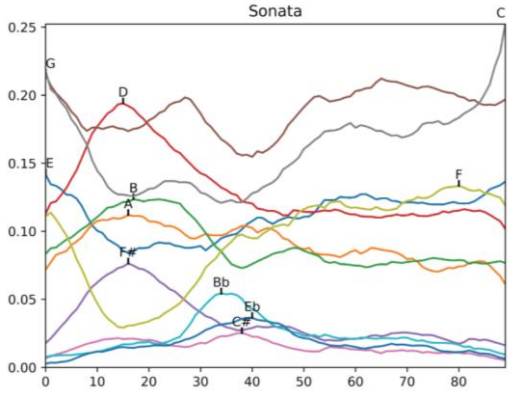
In this research **Dr. Uri B. Rom** and **Dror Chawin** from the School of Music examined the hypothesis that separate distributions of pitches in various points along the piece's timeline may yield information about the large-scale formal arrangement and structure of the music. They extracted distributions of all major-mode movements in the piano sonatas of **W.A. Mozart and L.V. Beethoven** and trained a Support Vector Machine and an Artificial Neural Network to classify musical pieces by form. Results support their hypothesis, showing that such a metric is indeed well-suited for modelling the temporal aspects of musical form, information which was previously inaccessible from any simple automated analysis of the music.

The 'bridge' unit of TAD, led by Dr. Moni Shahar, assisted with the statistical analysis.

Link to full article



Beethoven Vs. Mozart: composer-separated visualization of the sliding-window data from all labeled movements (blue crosses = Beethoven; red diamonds = Mozart).



Development of selected pitch-class weights over time in sliding-window data averaged for all sonata form movements of the corpus.

Research

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Additional selected research publications in 2021, supported by TAD center

- Stacey S Cherny, Daniel Nevo, Avi Baraz, Shoham Baruch, Ohad Lewin-Epstein, Gideon Y Stein, Uri Obolski, Revealing antibiotic cross-resistance patterns in hospitalized patients through Bayesian network modelling, *Journal of Antimicrobial Chemotherapy* (2021).

- Nitzan Farhi, Efrat Kohen, Hadas Mamane, Yuval Shavitt, Prediction of wastewater treatment quality using LSTM neural network, *Environmental Technology & Innovation* (2021).

- Shay Gershtein, Tova Milo, Brit Youngmann. Multi-Objective Influence Maximization. *EDBT* (2021).

- Eilon Krashin, Barbara Silverman, David M Steinberg, Daniel Yekutieli, Shmuel Giveon, Offer Fabian, Aleck Hercbergs, Paul J Davis, Martin Ellis and Osnat Ashur-Fabian. Opposing effects of thyroid hormones on cancer risk based on patient age and tumor type. *Eur J Endocrinol* (2021).

- Albert Kolomansky, Roy Malka, Edo Cohen-Karlik, Gal Barequet, Sagi Tauber, Itay Kalev, Ruben Wolhandler , Yoav Gaulan, Roee Esquira, Moni Shahar, Yishay Mansour, Amir Globerson, Drorit Neumann, Moshe Mittelman, Howard S. Oster. Patients Diagnosed with Myelodysplastic Syndromes Display Lower Bone Mass: Assessment Using Bone Marrow Biopsies Manually and with Articial Intelligence. *Blood* (2021).

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Funding

- Four PhD students received **excellence fellowships**:

  Ben Kantor (Social Sciences), Keren Halabi (Life Sciences), Noam Razin (Exact Sciences) and Yotam Liel (Management).

(photo credit: Ofer Amram)

- **Call for high impact research** (LOI deadline: December 2021) - we received more than 30 LOIs. Announcements on full application stage will be sent during January 2022.
- **TAD and Google** launched a three-year program for promoting **AI-related multidisciplinary research for the benefit of society**. 10 grants were awarded, seven of them are supported by Google. The grant winners:
  Dr. Michal Segal-Rozenheimer, Dr. Jonathan Belmaker & Prof. Raja Giryes, Dr. Daniel Nevo, Dr. Ofir Levy, Dr. Roi Livni, Prof. Nachum Dershowitz & Prof. Jonathan Ben Dov, Dr. Bonnie Levin-Asher & Prof. Liat Kishon Rabin, Prof. Ran Gilad-Bachrach, Dr. Omer Levy, Dr. Shai Tejman-Yarden & Dr. Dan Raviv.

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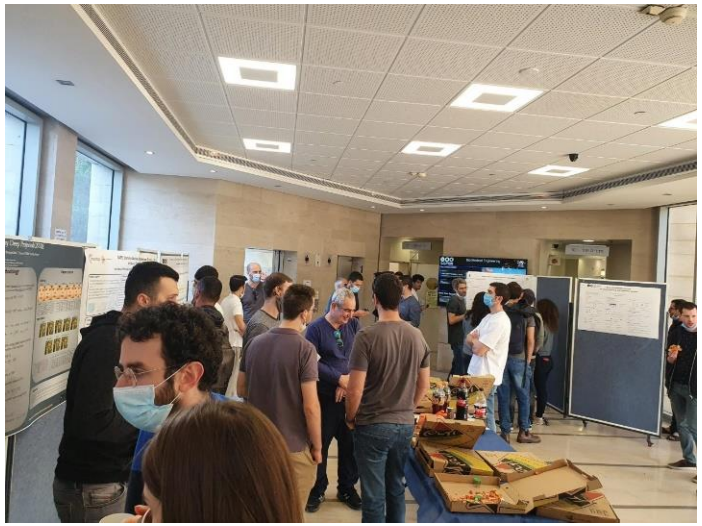
Communities

- TAD established **13 communities** with the participation of more than 260 faculty members at TAU to promote collaborations and sharing of knowledge in campus. Several faculty members lead each of the communities. Selected pictures from community meetings in 2021:

Fundamentals of AI and DS



Community leaders:
Prof. Raja Giryes & Prof. Ran Gilad Bachrach

Digital Humanities

Community leaders:
Prof. Jonathan Ben-Dov, Prof. Liora Sarfati & Prof. Amir Teicher

AI, Ethics & Law

Community leaders:
Prof. Assaf Hamdani, Prof. Eran Toch & Prof. Niva Elkin Koren

Check our website for next gatherings.
To join a community – please email: datascience@tauex.tau.ac.il

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Events

We held several events to promote interdisciplinary research across campus during 2021, including two Meet and Collaborate events at TAU's Art Gallery and the Steinhardt Museum of Natural History.

The center's **'Bridge' unit** can find solutions to your applied research through academic participation in research and advising students. You are welcome to contact us!

Events

- The TAD Center's **AI, Ethics and Law Community**, together with the Faculty of Law, held a special event to launch the book ***Personalized Law: Different Rules for Different People*** (Oxford University Press, 2021), written by Prof. Omri Ben-Shahar, University of Chicago Law School, and Prof. Ariel Porat, President, TAU. Link to full article.

(photos credit: Ofer Amram)

- We held the first **TAD – Google AI4Good joint seminar**, led by Dr. Deborah Cohen (Google) and Dr. Shiri Stempler (TAD). The seminar focused on the ***Environment***.

Prof. Hadas Mamane Steindel (Mechanical Engineering), Dr. Orr Spiegel (Zoology) and Prof. Itzhak Benenson (Geography), presented their research in various environmental fields. Google researchers gave a tutorial on Earth Engine and presented research on flood forecasting. Link to event details.

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Contact Us

You are invited to join our communities and contact us !

TAD Team

Email: datascience@tauex.tau.ac.il

Website: https://datascience.tau.ac.il/