

- Galaxy evolution
- Interstellar Medium
- Machine learning

Impact: 32 scientific publications (17 as first author), lecturer in 4 advanced schools on Machine Learning in Astrophysics, and PI/co-PI on 10 accepted observing proposals.

EDUCATION & EMPLOYMENT

Research Scientist , KIPAC, Stanford University	2024 — present
Carnegie-Princeton Fellow , Carnegie Observatories	2022 — 2024
Ph.D. in Physics , Astrophysics Department, Tel Aviv University	2019 — 2023
M.Sc. in Physics , Astrophysics Department, Tel Aviv University	2017 — 2019
B.Sc. in Physics , Tel Aviv University	2011 — 2017
B.Sc. in Electrical Engineering , Tel Aviv University	2011 — 2017

HONORS & AWARDS

Carnegie-Princeton Research Fellowship	2022–2024
The Asher Peres prize for excellent experimental PhD student Israel Physical Society	2021
The Adams fellowship for excellent graduate students Israel Academy of Sciences and Humanities	2020
The John Bahcall Prize for Excellence in Research School of Physics and Astronomy, Tel Aviv University	2020
The Wladimir Schreiber Excellence in Teaching Award School of Physics and Astronomy, Tel Aviv University	2019
The Wladimir Schreiber Excellence in Research Award School of Physics and Astronomy, Tel Aviv University	2019
Certificate of Merit for Exceptional Contribution to the TAU AstroClub Tel Aviv University	2018

CONFERENCE TALKS

Invited review talk: <i>Expediting the discovery process: Application of unsupervised machine learning algorithms to multi-wavelength astronomical datasets</i>	2024
International Conference on Machine Learning for Astrophysics, Catania, Italy	
Contributed talk: <i>PHANGS-ML: dissecting multiphase gas and dust in nearby galaxies with Machine Learning</i>	2024
The Physics and Impact of Astrophysical Dust conference, Aspen	
Contributed talk: <i>Star-formation and molecular gas properties of post-starburst galaxies</i>	2023
Olympian Symposium: Star Formation in the JWST Era conference, Greece	
Invited talk: <i>Finding simple structures in complex datasets</i>	2023

Galaxy Formation and Evolution in the Data Science Era workshop, KITP	
Invited talk: <i>Facilitating new discoveries in large and complex datasets</i> Data Science in Astronomy, EAS	2021
Invited talk: <i>Finding simple structures in complex datasets</i> Machine Learning in Astronomy MiM, AAS 238	2021
Invited talk: <i>A multi-phased view of outflows in AGN host galaxies</i> Israel Physical Society online conference	2021
Invited talk: <i>A multi-phased view of outflows in AGN host galaxies</i> YAGN online conference	2020
Invited talk: <i>Finding simple structures in complex astronomical datasets</i> ML Tools for Research in Astronomy, Ringberg Castle	2019
Contributed talk: <i>A multi-wavelength census of outflows in type II AGN</i> IAUS 356	2019
Invited review talk: <i>Facilitating new discoveries in astronomy with machine learning</i> AI in Astronomy workshop, ESO	2019
Invited talk: <i>Finding simple structures in complex astronomical datasets</i> Astronomical time series conference, Heidelberg	2019
Invited talk: <i>Finding simple structures in complex astronomical datasets</i> Astroinformatics, Heidelberg	2018
Invited talk: <i>Searching for unknown structures and objects in large spectroscopic data sets</i> Astroinformatics, Cape Town	2017
Contributed talk: <i>Anomaly detection on galaxy spectra</i> Detecting the unexpected conference, STSCI	2017
Invited talk: <i>Transients in the Sloan Digital Sky Survey</i> Big data in astronomy conference, Tel Aviv	2015

SEMINARS & COLLOQUIA

<i>From data to insight: expediting the discovery process in modern astronomy using data science techniques</i> Colloquium , Carnegie Observatories	2024
<i>From data to insight: expediting the discovery process in modern astronomy using data science techniques</i> Colloquium , UC Berkeley	2024
<i>PHANGS-ML: dissecting multiphase gas and dust in nearby galaxies with Machine Learning</i> Tea seminar, Caltech	2024
<i>Star formation and multi-phase gas properties of galaxies in transition</i> Astrophysics seminar, UC Riverside	2023
<i>Molecular gas and star formation properties of galaxies in transition</i> IPAC seminar, Caltech	2023
<i>The role of AGN feedback in galaxy evolution</i>	2023

Colloquium, Caltech	
<i>The role of AGN feedback in galaxy evolution</i>	2023
Colloquium, UC Santa Cruz	
<i>The Sequencer algorithm: finding sequences in astronomical datasets</i>	2023
TDA/Astroinformatics seminar, Caltech	
<i>A multi-phased view of outflows in active galaxies</i>	2020
University of Sheffield, Department of Astrophysics	
<i>A multi-wavelength study of outflows in type II AGN</i>	2020
Ben-Gurion University, Department of Astrophysics	
<i>A multi-wavelength study of outflows in type II AGN</i>	2020
Hebrew University, Department of Astrophysics	
<i>Massive AGN-driven winds in post starburst E+A galaxies</i>	2018
MPE, Garching	
<i>Finding simple structures in complex astronomical datasets</i>	2018
MPE, Garching	
<i>Automatic detection of structure in large and complex datasets</i>	2017
ETH Zurich, Department of Astrophysics	
<i>The sequencer - a novel algorithm for complex structure detection</i>	2017
Johns Hopkins University, Cosmology meeting	
<i>Finding the weirdest objects in astronomical surveys</i>	2017
Hebrew University, Department of Astrophysics	
<i>The weirdest SDSS galaxies: results from an outlier detection algorithm</i>	2017
Weizmann Institute, Department of Astrophysics	
<i>Anomaly detection on galaxy spectra</i>	2016
Galaxy Journal Club, STSCI	

INVITED LECTURER IN ADVANCED SCHOOLS

Teacher in Summer School	2023
Topic: Unsupervised Machine Learning algorithms	
Vatican Observatory Summer School on Data Science and Machine Learning, Castel Gandolfo.	
Panelist in Advanced School	2021
Topic: Applications of unsupervised learning to astronomical datasets.	
SOMACHINE 2021 school, held online.	
Lecturer in Winter School	2018
Topic: Machine learning methods for non-supervised classification and dimensionality reduction techniques.	
Big Data in Astronomy, Winter School of Astrophysics, Canary Islands.	
Lecturer in Winter School	2018
Topic: Machine learning in astronomy.	
AHEAD X-ray and Multi-wavelength school, MPE Garching.	

OBSERVATIONAL EXPERIENCE

1. FIRE on the Magellan telescope (Chile)

From starburst to quiescence: multi-phased gas properties of transitioning galaxies.

I am the program PI. The program consisted of 20 nights on the Magellan 6.5-m telescope and used the near-infrared echelle spectrograph FIRE to obtain high-resolution spectra of about 90 local galaxies.

I was the co-PI (or delegate-PI) and the lead writer of several observing proposals. I was in charge of the object selection, proposal writing and preparation, and calibration and analysis of the observations.

2. MUSE on the Very Large Telescope (Chile)

Mapping AGN-driven outflows in quiescent post starburst E+A galaxies: over 30 hours in total using the WFM, including AO.

Proposals: 100, 102, 105.

3. XMM Newton

X-ray properties of quiescent post starburst galaxies with AGN-driven winds: total of 71 ksec.

Proposals: AO-17.

4. ALMA

AGN-driven molecular outflows in post starburst E+A galaxies: total of 19.5 hours.

Proposals: Cycle 6.

5. NOEMA

Molecular gas content and outflows in post starburst E+A galaxies with massive AGN-driven winds: total of 52 hours.

Proposals: 2019, 2020, 2022.

TEACHING & MENTORING EXPERIENCE

Carnegie-UCR Fellowship host

2023 – present

As part of the ongoing collaboration between Carnegie Observatories and UC Riverside, I was the host of a Carnegie-UCR graduate student fellow (UCR advisor: Prof. G. Canalizo). The student has been working on estimating the electron density of ionized outflows in active galaxies using KCWI/Keck observations and photoionization modelling. The student has been granted 2 KCRM/Keck nights (summer 2024) to form the sample to be used for this project.

Mentor of a Princeton PhD student

2023 – 2024

As part of the ongoing collaborations between Carnegie Observatories and Princeton, I hosted a PhD student from Princeton during the summer months.

Project title: Constraining the most-energetic component of galactic outflows in galaxies in transition using coronal lines.

First paper of the project is in an advanced stage of preparation.

Mentor of a summer research project

2023

Mentored an undergraduate student during the summer as part of the CASSI program (Carnegie Astrophysics Summer Student Internship). The student presented a poster with

their results in AAS Meeting #243.

A. Patel, D. Baron, and M. Graham, "Using Unsupervised Machine Learning to Extract Novel Information from Zwicky Transient Facility Light Curves", 2024, Vol. 56, No. 2 e-id 2024n2i359p04.

Laboratory instructor in undergrad physics laboratories

2018 — 2022

School of Physics, Tel Aviv University

VOLUNTEER EXPERIENCE

1. "Tel Aviv University Astronomy Club"

2015 — 2021

During the time I volunteered in "TAU AstroClub", we hosted tens of events on campus, including lectures on physics and astrophysics at a popular science level, and sky observing events.

2. Working with children from underprivileged backgrounds

2017 — 2020

In collaboration with organizations such as "Pre-Atidim" and "Future female scientists", we hosted hundreds of children at the university for half a day of activities. During these visits, the children heard lectures about different topics in astronomy, and used a telescope to observe the sun or the night sky.

I was the leader of these activities, and was in charge of contacting the organizations and relevant schools, coordinating their visit to the university, coordinating the lectures, and giving some of the lectures.

3. "Astronomy on Tap TLV"

2019 — 2020

4. "Girls Think Science"

2019 — 2020

I gave >10 lectures to young girls about astronomy, and coordinated different activities after the lectures, including observations with a solar telescope, experimentation with an optical table, and drawing galaxies in different bands.

PUBLICATIONS

Lead author: submitted or accepted

1. **D. Baron**, K. M. Sandstrom, J. Sutter, H. Hassani, B. Groves, A. K. Leroy, E. Schinnerer, M. Boquien, M. Brazzini, J. Chastenet, D. A. Dale, O. V. Egorov, S. C. O. Glover, R. S. Klessen, D. Pathak, E. Rosolowsky, M. Chevance, K. Grasha, A. Hughes, J. Pety, T. G. Williams and the PHANGS collaboration "*PHANGS-ML: the universal relation between PAH band and optical line ratios across nearby star-forming galaxies*", 2024, accepted to ApJ.
2. **D. Baron**, K. M. Sandstrom, E. Rosolowsky, O. V. Egorov, R. S. Klessen, A. K. Leroy, J. Sutter, M. Boquien, E. Schinnerer, J. E. Méndez-Delgado, E. W. Koch, F. Belfiore, E. Emsellem, T. G. Williams, and the PHANGS collaboration "*PHANGS-ML: dissecting multi-phased gas and dust in nearby galaxies using machine learning*", 2024, ApJ, 968, 1, 37.

3. **D. Baron**, H. Netzer, D. Lutz, R. Davies, and J. X. Prochaska, “*Not so windy after all: MUSE disentangles AGN-driven winds from merger-induced flows in galaxies along the starburst sequence*”, 2024, ApJ, 968, 1, 30.
4. **D. Baron**, H. Netzer, F. K. Decker, D. Lutz, R. Davies, and J. X. Prochaska, “*Star formation and molecular gas properties of post-starburst galaxies*”, 2023, MNRAS, 524, 2, 2741.
5. **D. Baron**, H. Netzer, D. Lutz, J. X. Prochaska, and R. Davies, “*Multi-phase outflows in post starburst E+A galaxies – I. General wind properties and the prevalence of starbursts*”, 2022, MNRAS, 509, 4457.
6. **D. Baron** and B. Ménard, “*Extracting the main trend in a dataset: the Sequencer algorithm*”, 2021, ApJ, 916, 91B.
7. **D. Baron**, H. Netzer, R. I. Davies, and J. X. Prochaska, “*Multi-phase outflows in post starburst E+A galaxies - II. direct connection between neutral and ionized outflows in SDSS J124754.95-033738.6*”, 2020, MNRAS, 494, 5396.
8. **D. Baron** and B. Ménard, “*Black hole mass estimation for Active Galactic Nuclei from a new angle*”, 2019, MNRAS, 487, 3404.
9. **D. Baron** and H. Netzer, “*Discovering AGN-driven winds through their infrared emission - II. Mass outflow rate and energetics*”, 2019, MNRAS, 486, 4290.
10. **D. Baron** and H. Netzer, “*Discovering AGN-driven winds through their infrared emission - I. General method and wind location*”, 2019, MNRAS, 482, 3915.
11. **D. Baron**, H. Netzer, J. X. Prochaska, Z. Cai, S. Cantalupo, D. C. Martin, M. Matuszewski, A. M. Moore, P. Morrissey, and J. D. Neill, “*Direct evidence of AGN-feedback: a post starburst galaxy stripped of its gas by AGN-driven winds*”, 2018, MNRAS, 480, 3993.
12. **D. Baron**, H. Netzer, D. Poznanski, J. X. Prochaska, and N. M. Forster Schreiber, “*Evidence of ongoing AGN-driven feedback in a quiescent post-starburst E+A galaxy*”, 2017, MNRAS, 470, 1687.
13. **D. Baron** and D. Poznanski, “*The weirdest SDSS galaxies: results from an outlier detection algorithm*”, 2017, MNRAS, 465, 4530.
14. **D. Baron**, J. Stern, D. Poznanski, and H. Netzer, “*Evidence That Most Type-1 AGNs are Reddened by Dust in the Host ISM*”, 2016, ApJ, 832, 16.
15. **D. Baron**, D. Poznanski, D. Watson, Y. Yao, N. L. J. Cox, and J. X. Prochaska, “*Using Machine Learning to classify the diffuse interstellar bands*”, 2015, MNRAS, 451, 332.
16. **D. Baron**, D. Poznanski, D. Watson, Y. Yao, and J. X. Prochaska, “*Dusting off the diffuse interstellar bands: DIBs and dust in extragalactic Sloan Digital Sky Survey spectra*”, 2015, MNRAS, 447, 545.

Non-refereed

1. **D. Baron**, “*Machine Learning in Astronomy: a practical overview*”, 2019, A review article published following a winter school in astronomy, arXiv:1904.07248.

Co-author

1. D. A. Dale, et al., “PAH Feature Ratios in 19 Nearby Galaxies”, 2024, submitted to ApJ.
2. R. Chown, et al., “Polycyclic Aromatic Hydrocarbon and CO(2-1) Emission at 50-150 pc Scales in 66 Nearby Galaxies”, 2024, submitted to ApJ, Arxiv: 2410.05397.
3. M. Brazzini, et al., “Metallicity calibrations based on auroral lines from PHANGS–MUSE data”, 2024, accepted to A&A, Arxiv: 2410.00106.
4. B. C. Whitmore, et al., “Empirical SED Templates for Star Clusters Observed with HST and JWST: No Strong PAH or IR Dust Emission after Five Myr”, 2024, submitted to ApJ.
5. B. Pathak, et al., “Linking stellar populations to HII regions across nearby galaxies. II. Infrared Reprocessed and UV Direct Radiation Pressure in HII Regions”, 2024, submitted to ApJ.
6. F. Santoro, C. Tadhunter, **D. Baron**, R. Morganti and J. Holt, “AGN-driven outflows and the AGN feedback efficiency in young radio galaxies”, 2020, A&A, 644, 38.
7. R. Davies, **D. Baron**, T. Shimizu, H. Netzer, L. Burtscher, P.T. de Zeeuw, R. Genzel, E.K.S. Hicks, M. Koss, M.-Y. Lin, D. Lutz, W. Maciejewski, F. Müller-Sánchez, G. Orban de Xivry, C. Ricci, R. Riffel, R.A. Riffel, D. Rosario, M. Schartmann, A. Schnorr-Müller, J. Shangguan, A. Sternberg, E. Sturm, T. Storchi-Bergmann, L. Tacconi, and S. Veilleux, “Ionized outflows in local luminous AGN: what are the real densities and outflow rates?”, 2020, MNRAS, 498, 4150.
8. D. Kim, V. Lekic, B. Ménard, **D. Baron** and M. Taghizadeh-Popp, “Sequencing Seismograms: A Panoptic View of Scattering in the Core-Mantle Boundary Region”, 2020, Science, 368, 6496, 1223.
9. J. Wolf, M. Salvato, D. Coffey, A. Merloni, J. Buchner, R. Arcodia, **D. Baron**, F. J. Carrera, J. Comparat, D. P. Schneider, and K. Nandra, “Exploring the Diversity of Type 1 Active Galactic Nuclei Identified in SDSS-IV/SPIDERS”, 2020, MNRAS, 492, 3580.
10. T. Shimizu, R. I. Davies, D. Lutz, L. Burtscher, M. Lin, **D. Baron**, R. L. Davies, R. Genzel, E. K. S. Hicks, M. Koss, W. Maciejewski, F. Müller-Sánchez, G. O. de Xivry, S. H. Price, C. Ricci, R. Riffel, R. A. Riffel, D. Rosario, M. Schartmann, and A. Schnorr-Müller, “The multiphase gas structure and kinematics in the circumnuclear region of NGC 5728”, 2019, MNRAS, 490, 5860.
11. I. Reis, **D. Baron**, and S. Shahaf, “Probabilistic Random Forest: A Machine Learning Algorithm for Noisy Data Sets”, 2019, ApJ, 157, 12.
12. T. Lan, B. Ménard, **D. Baron**, S. Johnson, D. Poznanski, J. X. Prochaska, and J. M. O’Meara, “On the limitations of statistical absorption studies with the Sloan Digital Sky Surveys I–III”, 2018, MNRAS, 477, 3520.
13. I. Reis, D. Poznanski, **D. Baron**, G. Zasowski, and S. Shahaf, “Detecting outliers and learning complex structures with large spectroscopic surveys - a case study with APOGEE stars”, 2017, MNRAS, 476, 2117.

14. Y. Vadai, D. Poznanski, **D. Baron**, P. Nugent, and D. Schlegel, “*The effect of interstellar absorption on measurements of the baryon acoustic peak in the Lyman α forest*”, 2017, MNRAS, 472, 799.
15. Y. Yao, B. P. Bowen, **D. Baron**, and D. Poznanski, “*SciDB for High-Performance Array-Structured Science Data at NERSC*”, 2015, Computing in Science & Engineering, 17, 3.