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Dalya Baron

https://dalyabaron.com
https://github.com/dalya

- Galaxy evolution
- Interstellar Medium
- Machine learning

Impact: 31 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 **2021**
Israel Physical Society

The Adams fellowship for excellent graduate students **2020**
Israel Academy of Sciences and Humanities

The John Bahcall Prize for Excellence in Research **2020**
School of Physics and Astronomy, Tel Aviv University

The Wladimir Schreiber Excellence in Teaching Award **2019**
School of Physics and Astronomy, Tel Aviv University

The Wladimir Schreiber Excellence in Research Award **2019**
School of Physics and Astronomy, Tel Aviv University

Certificate of Merit for Exceptional Contribution to the TAU AstroClub **2018**
Tel Aviv University

Conference talks

Invited review talk: *Expediting the discovery process: Application of unsupervised machine learning algorithms to multi-wavelength astronomical datasets* **2024**
International Conference on Machine Learning for Astrophysics, Catania, Italy

Contributed talk: *PHANGS-ML: dissecting multiphase gas and dust in nearby galaxies with Machine Learning* **2024**
The Physics and Impact of Astrophysical Dust conference, Aspen

Contributed talk: *Star-formation and molecular gas properties of post-starburst galaxies* **2023**
Olympian Symposium: Star Formation in the JWST Era conference, Greece

Invited talk: *Finding simple structures in complex datasets* **2023**

Galaxy Formation and Evolution in the Data Science Era workshop, KITP

Invited talk: *Facilitating new discoveries in large and complex datasets* **2021**
Data Science in Astronomy, EAS

Invited talk: *Finding simple structures in complex datasets* **2021**
Machine Learning in Astronomy MiM, AAS 238

Invited talk: *A multi-phased view of outflows in AGN host galaxies* **2021**
Israel Physical Society online conference

Invited talk: *A multi-phased view of outflows in AGN host galaxies* **2020**
YAGN online conference

Invited talk: *Finding simple structures in complex astronomical datasets* **2019**
ML Tools for Research in Astronomy, Ringberg Castle

Contributed talk: *A multi-wavelength census of outflows in type II AGN* **2019**
IAUS 356

Invited review talk: *Facilitating new discoveries in astronomy with machine learning* **2019**
AI in Astronomy workshop, ESO

Invited talk: *Finding simple structures in complex astronomical datasets* **2019**
Astronomical time series conference, Heidelberg

Invited talk: *Finding simple structures in complex astronomical datasets* **2018**
Astroinformatics, Heidelberg

Invited talk: *Searching for unknown structures and objects in large spectroscopic data sets* **2017**
Astroinformatics, Cape Town

Contributed talk: *Anomaly detection on galaxy spectra* **2017**
Detecting the unexpected conference, STSCI

Invited talk: *Transients in the Sloan Digital Sky Survey* **2015**
Big data in astronomy conference, Tel Aviv

Seminars & Colloquia

From data to insight: expediting the discovery process in modern astronomy using data science techniques **2024**
Colloquium, Carnegie Observatories

From data to insight: expediting the discovery process in modern astronomy using data science techniques **2024**
Colloquium, UC Berkeley

PHANGS-ML: dissecting multiphase gas and dust in nearby galaxies with Machine Learning **2024**
Tea seminar, Caltech

Star formation and multi-phase gas properties of galaxies in transition **2023**
Astrophysics seminar, UC Riverside

Molecular gas and star formation properties of galaxies in transition **2023**
IPAC seminar, Caltech

The role of AGN feedback in galaxy evolution **2023**

Colloquium, Caltech

The role of AGN feedback in galaxy evolution **2023**
Colloquium, UC Santa Cruz

The Sequencer algorithm: finding sequences in astronomical datasets **2023**
TDA/Astroinformatics seminar, Caltech

A multi-phased view of outflows in active galaxies **2020**
University of Sheffield, Department of Astrophysics

A multi-wavelength study of outflows in type II AGN **2020**
Ben-Gurion University, Department of Astrophysics

A multi-wavelength study of outflows in type II AGN **2020**
Hebrew University, Department of Astrophysics

Massive AGN-driven winds in post starburst E+A galaxies **2018**
MPE, Garching

Finding simple structures in complex astronomical datasets **2018**
MPE, Garching

Automatic detection of structure in large and complex datasets **2017**
ETH Zurich, Department of Astrophysics

The sequencer - a novel algorithm for complex structure detection **2017**
Johns Hopkins University, Cosmology meeting

Finding the weirdest objects in astronomical surveys **2017**
Hebrew University, Department of Astrophysics

The weirdest SDSS galaxies: results from an outlier detection algorithm **2017**
Weizmann Institute, Department of Astrophysics

Anomaly detection on galaxy spectra **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 Sceince 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 – 2024**

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. 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.

2. M. Brazzini, et al., *"Metallicity calibrations based on auroral lines from PHANGS–MUSE data"*, 2024, accepted to A&A, Arxiv: 2410.00106.

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8. 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.

9. 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.

10. I. Reis, **D. Baron**, and S. Shahaf, *"Probabilistic Random Forest: A Machine Learning Algorithm for Noisy Data Sets"*, 2019, ApJ, 157, 12.

11. 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.

12. 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.

13. 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.

14. 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.