

BRYON TJANAKA

Ph.D. Candidate, ICAROS Lab @ USC

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RESEARCH INTERESTS

quality diversity optimization, reinforcement learning, human-robot collaboration, evolutionary algorithms

EDUCATION

Ph.D. Computer Science (passed qualifying exam Mar. 2022) Aug. 2020 - Present
University of Southern California (Los Angeles, CA, USA) • Advisor: Stefanos Nikolaidis • **GPA:** 4.0/4.0
M.S. Computer Science Aug. 2020 - May 2022
University of Southern California (Los Angeles, CA, USA) • **GPA:** 4.0/4.0
B.S. Computer Science (ICS Honors, AI specialization) Sep. 2017 - Jun. 2020
University of California, Irvine (Irvine, CA, USA) • **GPA:** 4.0/4.0 • **GRE:** 170/170 quant., 161/170 verbal, 5/6 writing
High School Aug. 2013 - May 2017
Bellarmine College Preparatory (San Jose, CA, USA) • **GPA:** 4.3/4.0 • **SAT:** 2350/2400

HONORS AND AWARDS

NVIDIA Academic Hardware Grant (Award: NVIDIA RTX A6000) Mar. 2022
National Science Foundation Graduate Research Fellowship Mar. 2021
George Bekey Fellowship (USC) Feb. 2021
USC Graduate School Fellowship for Incoming Students Feb. 2020
Summa Cum Laude, UCI School of ICS Jun. 2020
National Science Foundation Graduate Research Fellowship Honorable Mention Mar. 2020
UCI Dean's Honor List Sep. 2017 - Mar. 2020
UCI Regents' Scholarship Sep. 2017 - Jun. 2020
UCI UROP Fellowship(s) for *Improving Molecular Simulations* Jan. 2020, Jan. 2019
UCI UROP Honorary Fellowship for *Implications of Mall Security Robots* Jan. 2018
Best Entrepreneurial Hack at HackUCI V hackathon Feb. 2019
John Hollowell Composition Program Award for Best Advocacy Project, UCI School of Humanities May 2018
2017 VEX Robotics High School World Champion Apr. 2017
Recognition for VEX Robotics Championship, Rep. Ro Khanna, CA-17 Aug. 2017

RESEARCH AND PROFESSIONAL EXPERIENCE

Research Assistant Aug. 2020 - Present
ICAROS Lab, University of Southern California (icaros.usc.edu), Advisor: Stefanos Nikolaidis
Ph.D. Research Intern May 2023 - Sep. 2023
InstaDeep (Boston, Massachusetts, USA)
Undergraduate Researcher Oct. 2019 - Jun. 2020
Intelligent Dynamics Lab, UC Irvine (indylab.org), Advisor: Roy Fox
Undergraduate Researcher Oct. 2018 - Jun. 2020
Mobley Lab, UC Irvine (mobleylab.org), PI: David Mobley, Graduate Mentor: Jessica Maat
Independent Undergraduate Researcher Oct. 2017 - Jun. 2018
Mentor: Caesar Sereseres
Software Engineering Intern, Google Ads Jun. 2020 - Aug. 2020
Software Engineering Intern, Google Ads Jun. 2019 - Sep. 2019
Engineering Practicum Intern, Google Assistant Jun. 2018 - Sep. 2018
Google, Inc. (Mountain View, California, USA)

PUBLICATIONS

JOURNALS

B. Tjanaka, M. C. Fontaine, D. H. Lee, A. Kalkar, S. Nikolaidis. "Training Diverse High-Dimensional Controllers by Scaling Covariance Matrix Adaptation MAP-Annealing." *Robotics and Automation Letters (RA-L)*, vol. 8, no. 10, pp. 6771-6778, October 2023. Impact factor: 5.2. <https://scalingcmamae.github.io>

CONFERENCES

D. H. Lee, A. V. Palaparthi, M. C. Fontaine, **B. Tjanaka**, S. Nikolaidis. "Density Descent for Diversity Optimization." *Genetic And Evolutionary Computation Conference (GECCO)*, July 2024. Acceptance rate: 36.0%. <https://arxiv.org/abs/2312.11331>

S. Batra, **B. Tjanaka**, M. C. Fontaine, A. Petrenko, S. Nikolaidis, G. Sukhatme. "Proximal Policy Gradient Arborescence for Quality Diversity Reinforcement Learning." *International Conference on Learning Representations (ICLR)*, May 2024. **Spotlight Presentation**. Acceptance rate: 5%. <https://arxiv.org/abs/2305.13795>

V. Bhatt, H. Nemlekar, M. C. Fontaine, **B. Tjanaka**, H. Zhang, Y.-C. Hsu, S. Nikolaidis. "Surrogate Assisted Generation of Human-Robot Interaction Scenarios." *Conference on Robot Learning (CoRL)*, November 2023. **Oral Presentation**. Acceptance rate: 6.6%. <https://arxiv.org/abs/2304.13787>

B. Tjanaka, M. C. Fontaine, D. H. Lee, Y. Zhang, N. R. Balam, N. Dennler, S. S. Garlanka, N. D. Klapsis, S. Nikolaidis. "pyribs: A Bare-Bones Python Library for Quality Diversity Optimization." *Genetic And Evolutionary Computation Conference (GECCO)*, July 2023. Acceptance rate: 34.7%. <https://pyribs.org/paper>

V. Bhatt*, **B. Tjanaka***, M. C. Fontaine*, S. Nikolaidis. "Deep Surrogate Assisted Generation of Environments." *Neural Information Processing Systems (NeurIPS)*, November 2022. Acceptance rate: 25.6%. <https://dsagepaper.github.io>

B. Tjanaka, M. C. Fontaine, J. Togelius, S. Nikolaidis. "Approximating Gradients for Differentiable Quality Diversity in Reinforcement Learning." *Genetic And Evolutionary Computation Conference (GECCO)*, July 2022. Acceptance rate: 37%. <https://dqd-rl.github.io>

M. C. Fontaine*, Y.-C. Hsu*, Y. Zhang*, **B. Tjanaka**, S. Nikolaidis. "On the Importance of Environments in Human-Robot Coordination." *Robotics: Science and Systems (RSS)*, July 2021. Acceptance rate: 27%. <https://overcooked-lsi.github.io>

SHORT PAPERS

S. Batra, **B. Tjanaka**, S. Nikolaidis, G. Sukhatme. "Quality Diversity for Robot Learning: Limitations and Future Directions." *Genetic And Evolutionary Computation Conference (GECCO) Companion*, July 2024.

WORKSHOPS

B. Tjanaka, M. C. Fontaine, D. H. Lee, A. Kalkar, S. Nikolaidis. "Scaling Covariance Matrix Adaptation MAP-Annealing to High-Dimensional Controllers." *Southern California Robotics Symposium*, September 2023. <https://scalingcmamae.github.io>

B. Tjanaka, M. C. Fontaine, A. Kalkar, S. Nikolaidis. "Scaling Covariance Matrix Adaptation MAP-Annealing to High-Dimensional Controllers." *Deep Reinforcement Learning Workshop at NeurIPS 2022*, December 2022. <https://scalingcmamae.github.io>

B. Tjanaka, M. C. Fontaine, J. Togelius, S. Nikolaidis. "Differentiable Quality Diversity for Reinforcement Learning by Approximating Gradients." *Southern California Robotics Symposium*, September 2022. <https://dqd-rl.github.io>

B. Tjanaka, M. C. Fontaine, S. Nikolaidis. "Quantifying Efficiency in Quality Diversity Optimization." *Workshop on Benchmarks for Quality-Diversity Algorithms at GECCO 2022*, July 2022.

B. Tjanaka, M. C. Fontaine, J. Togelius, S. Nikolaidis. "Differentiable Quality Diversity for Reinforcement Learning by Approximating Gradients." *Workshop on Agent Learning in Open-Endedness (ALOE) at ICLR 2022*, April 2022. **Spotlight Paper**. <https://dqd-rl.github.io>

SOFTWARE

B. Tjanaka, M. C. Fontaine, D. H. Lee, Y. Zhang, T. T. M. Vu, S. Sommerer, N. Dennler, S. Nikolaidis. "pyribs: A bare-bones Python library for quality diversity optimization." *GitHub repository*, February 2021. <https://pyribs.org>

PRIOR TO JOINING USC

N. Monath*, K. A. Dubey, G. Guruganesh, M. Zaheer, A. Ahmed, A. McCallum, G. Mergen, M. Najork, M. Terzihan, **B. Tjanaka**, Y. Wang, Y. Wu. "Scalable Hierarchical Agglomerative Clustering." *27th ACM SIGKDD Conference on Knowledge Discovery & Data Mining*, August 2021.

Y. Qiu, D. G. A. Smith, S. Boothroyd, H. Jang, D. F. Hahn, J. Wagner, C. C. Bannan, T. Gokey, V. T. Lim, C. D. Stern, A. Rizzi, **B. Tjanaka**, G. Tresadern, X. Lucas, M. R. Shirts, M. K. Gilson, J. D. Chodera, C. I. Bayly, D. L. Mobley, L.-P. Wang. "Development and Benchmarking of Open Force Field v1.0.0 — the Parsley Small-Molecule Force Field." *Journal of Chemical Theory and Computation*, October 2021.

PRESENTATIONS

Improving Molecular Simulations through Force Field Development and Computational Techniques

INVITED TALKS

“Building a Modern Business Card with Eleventy,” 2021 11ties (hosted by Jamstack Toronto) Nov. 2021

TEACHING

Teaching Assistant, USC CSCI 360 (Introduction to Artificial Intelligence) Jan. 2022 - May 2022
 Teaching Assistant, USC CSCI 545 (Introduction to Robotics) Aug. 2021 - Dec. 2021

MENTORSHIP

David H. Lee (undergraduate, ICAROS Lab) Jun. 2022 - Present
 Awarded USC Provost’s Undergraduate Research Fellowship Sep. 2022
 Aniruddha Kalkar (master’s, ICAROS Lab) May 2022 - Dec. 2022
 Melissa Lorenzo-Mendez (high school, USC SHINE – viterbik12.usc.edu/shine) Jun. 2022 - Aug. 2022
 Bridget Bell (undergraduate, ICAROS Lab) Mar. 2022 - May 2022
 Vincent Vu (undergraduate, ICAROS Lab, USC URAP grant) Nov. 2021 - Sep. 2022
 Yuecheng Li (master’s, ICAROS Lab) Sep. 2021 - Apr. 2022
 Raymond Dion Walker II (high school, USC SHINE – viterbik12.usc.edu/shine) Jun. 2021 - Aug. 2021
 Sam Sommerer (undergraduate, ICAROS Lab) Aug. 2020 - Apr. 2021
 Kai Malloy (Fulbright scholarship applicant, awarded semifinalist) Aug. 2020

LEADERSHIP & SERVICE ACTIVITIES

Organizer, USC Robotics Seminar (UROS) Jan. 2023 - May 2023
 Digital Officer / Webmaster, USC Viterbi Graduate Student Association (vgsa.usc.edu) Aug. 2020 - Feb. 2023
 Panelist, Viterbi External Graduate Fellowship Information Session Sep. 2023
 Webmaster, SoCal Graduate Pathways to STEM (vgsa.usc.edu/gps) Oct. 2020, May 2022, Apr. 2023
 Panel Moderator, USC Beyond the Ph.D. Conference (sites.usc.edu/beyondphd/) Oct. 2022
 Panelist, UCI Undergraduate Research Symposium Alumni Panel May 2022
 Panelist, USC SURE (viterbigradadmission.usc.edu/sure) Ph.D. Panel Jun. 2021, Jul. 2023
 Panelist, UCI WICS (wics.ics.uci.edu) Grad School Panel Apr. 2021
 Senator, USC Graduate Student Government (gsg.usc.edu) Aug. 2020 - May 2021
 Internal Vice President / Competitor, ACM UC Irvine Chapter (acm-uci.org) Sep. 2017 - Feb. 2020
 Speaker / Volunteer, Google Girl-Powered VEX Robotics Workshop Jul. 2017, Aug. 2018, Jun. 2019

SELECTED PROJECTS

Approximating Gradients for Differentiable Quality Diversity in Reinforcement Learning ([dqd-rl.github.io](https://github.com/dqd-rl))

Associated with: Research Assistant at ICAROS Lab

Consider the problem of training robustly capable agents. One approach is to generate a diverse collection of agent policies. Training can then be viewed as a quality diversity (QD) optimization problem, where we search for a collection of performant policies that are diverse with respect to quantified behavior. Recent work shows that differentiable quality diversity (DQD) algorithms greatly accelerate QD optimization when exact gradients are available. However, agent policies typically assume that the environment is not differentiable. To apply DQD algorithms to training agent policies, we must approximate gradients for performance and behavior. We propose two variants of the current state-of-the-art DQD algorithm that compute gradients via approximation methods common in reinforcement learning (RL). We evaluate our approach on four simulated locomotion tasks. One variant achieves results comparable to the current state-of-the-art in combining QD and RL, while the other performs comparably in two locomotion tasks. These results provide insight into the limitations of current DQD algorithms in domains where gradients must be approximated. Source code is available at <https://github.com/icaros-usc/dqd-rl>

pyribs: A bare-bones Python library for quality diversity optimization (pyribs.org)

Associated with: Research Assistant at ICAROS Lab

Pyribs is an ongoing project to develop a library of quality diversity algorithms that is simple, flexible, and accessible. Pyribs has grown to become one of the most popular QD software libraries, with over 170 stars on GitHub and appearances in over 20 publications.