Tom Silver

✉ tomssilver@gmail.com   🌐 https://tomsilver.github.io   📞 +1 (551) 804-9151

Education

Ph.D. Massachusetts Institute of Technology
Computer Science (EECS)
Advised by Leslie Kaelbling and Joshua Tenenbaum
Thesis: *Neuro-Symbolic Learning for Bilevel Robot Planning*

Cambridge, MA
May 2020 – May 2024
(Expected)

S.M. Massachusetts Institute of Technology
Computer Science (EECS)
Thesis: *Few-Shot Bayesian Imitation Learning with Logical Program Policies*
GPA: 5.0/5.0

Cambridge, MA
Aug 2018 – May 2020

A.B. Harvard College
Computer Science and Mathematics
Thesis: *Luna: A Game-Based Rating System for Artificial Intelligence*
Magna cum laude with highest honors

Cambridge, MA
Aug 2012 – May 2016

Professional Experience

Boston Dynamics AI Institute
Research Intern
Manager: Jenny Barry

Cambridge, MA
May 2023 – Present

Google Brain Robotics
Research Intern
Managers: Shane Gu and Saminda Abeyruwan

Mountain View, CA (Remote)
Jun – Aug 2021

Vicarious AI
Research Engineer; Researcher

Union City, CA
Jul 2016 – Aug 2018

Google
Software Engineering Intern

Cambridge, MA
Jun – Aug 2014

Conference Publications

1. **Silver, T.**, Dan, S., Srinivas, K., Tenenbaum, J., Kaelbling, L., Katz, M. Generalized Planning in PDDL Domains with Pretrained Large Language Models. *AAAI Conference on Artificial Intelligence (AAAI) 2024.*

2. Kumar, N.[*†], McClinton, W.[*†], Chitnis, R., **Silver, T.**, Lozano-Perez, T., Kaelbling, L. Learning Efficient Abstract Planning Models that Choose What to Predict. *Conference on Robot Learning (CoRL) 2023.*

3. Li, A.[†], **Silver, T.** Embodied Active Learning of Relational State Abstractions for Bilevel Planning. *Conference on Lifelong Learning Agents (CoLLAs) 2023.* **Oral presentation (Top 12).**

4. **Silver, T.**[*], Chitnis, R.[*], Kumar, N.[†], McClinton, W.[†], Lozano-Perez, T., Kaelbling, L., Tenenbaum, J. Predicate Invention for Bilevel Planning. *AAAI Conference on Artificial Intelligence (AAAI) 2023.* **Oral presentation.**

[*] Equal contribution   [†]Students for whom I am the primary supervisor

5. **Silver, T.**, Athalye, A.[†], Tenenbaum, J., Lozano-Perez, T., Kaelbling, L. Learning Neuro-Symbolic Skills for Bilevel Planning. *Conference on Robot Learning (CoRL) 2022.*

6. Chitnis, R.[*], **Silver, T.**[*], Tenenbaum, J., Kaelbling, L., Lozano-Perez, T. Learning Neuro-Symbolic Relational Transition Models for Bilevel Planning. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2022.*

7. Yang, R.[*†], **Silver, T.**[*], Curtis, A., Lozano-Perez, T., Kaelbling, L. PG3: Policy-Guided Planning for Generalized Policy Generation. *International Joint Conference on Artificial Intelligence (IJCAI) 2022.*

8. Gehring, C.[*], Asai, M.[*], Chitnis, R., **Silver, T.**, Kaelbling, L. Sohrabi, S., Katz, M. Reinforcement Learning for Classical Planning: Viewing Heuristics as Dense Reward Generators. *International Conference on Automated Planning and Scheduling (ICAPS) 2022.*

9. Curtis, A., **Silver, T.,** Tenenbaum, J., Lozano-Perez, T., Kaelbling, L. Discovering State and Action Abstractions for Generalized Task and Motion Planning. *AAAI Conference on Artificial Intelligence (AAAI) 2022.*

10. **Silver, T.**[*], Chitnis, R.[*], Tenenbaum, J., Kaelbling, L., Lozano-Perez, T. Learning Symbolic Operators for Task and Motion Planning. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2021.* **Best paper finalist (Top 5).**

11. **Silver, T.**[*], Chitnis, R.[*], Curtis, A., Tenenbaum, J., Lozano-Perez, T., Kaelbling, L. Planning with Learned Object Importance in Large Problem Instances Using Graph Neural Networks. *AAAI Conference on Artificial Intelligence (AAAI) 2021.*

12. Chitnis, R.[*], **Silver, T.**[*], Tenenbaum, J., Lozano-Perez, T., Kaelbling, L. GLIB: Efficient Exploration for Relational Model-based Reinforcement Learning via Goal-Literal Babbling. *AAAI Conference on Artificial Intelligence (AAAI) 2021.*

13. Chitnis, R.[*], **Silver, T.**[*], Kim, B., Tenenbaum, J., Lozano-Perez, T., Kaelbling, L. CAMPs: Learning Context-Specific Abstractions for Efficient Planning in Factored MDPs. *Conference on Robot Learning (CoRL) 2020.* **Plenary talk (Top 20).**

14. Zhi-Xuan, T., Mann J. L., **Silver, T.**, Tenenbaum, J., Mansinghka, V. K. Online Bayesian Goal Inference for Boundedly-Rational Planning Agents. *Conference on Neural Information Processing Systems (NeurIPS) 2020.*

15. **Silver, T.**, Allen, K., Lew, A., Kaelbling, L., Tenenbaum, J. Few-Shot Bayesian Imitation Learning with Logical Program Policies. *AAAI Conference on Artificial Intelligence (AAAI) 2020.* Earlier versions at RLDM 2019 and ICLR SPiRL Workshop 2019.

16. Loula, J., Allen, K., **Silver, T.,** Tenenbaum, J. Learning Constraint-Based Planning Models from Demonstrations. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2020.*

17. Xia, V.[*], Wang, Z.[*], Allen, K., **Silver, T.,** Kaelbling, L. Learning Sparse Relational Transition Models. *International Conference on Learning Representations (ICLR) 2019.*

18. Loula, J., **Silver, T.,** Allen, K., Tenenbaum, J. Discovering a Symbolic Planning Language from Continuous Experience. *Annual Meeting of the Cognitive Science Society (CogSci) 2019.*

19. Stark, M., Schlegel, A., Wendelken, C., Park, D., Purdy, E., **Silver, T**., Phoenix, S., George, D. Behavior is Everything – Towards Representing Concepts with Sensorimotor Contingencies. *AAAI Conference on Artificial Intelligence (AAAI) 2018*.

20. Kansky, K., **Silver, T.**, Mely, D. A., Eldawy, M., Lazaro-Gredilla, M., Lou, X., Dorfman N., Sidor S., Phoenix S., George, D. Schema Networks: Zero-Shot Transfer with a Generative Causal Model of Intuitive Physics. *International Conference on Machine Learning (ICML) 2017*.

Journal Publications

21. Garrett, C.R., Chitnis, R., Holladay, R., Kim, B., **Silver, T.,** Kaelbling, L., Lozano-Perez, T. Integrated Task and Motion Planning. *Annual Review of Control, Robotics, and Autonomous Systems. Vol. 4 2021*.

22. Colubri, A.*, **Silver, T.***, Fradet, T., Retzepi, K., Fry, B., Sabeti, P. Transforming Clinical Data into Actionable Prognosis Models: Machine-Learning Framework and Field-Deployable App to Predict Outcome of Ebola Patients. *PLoS Neglected Tropical Diseases 2016*.

Workshop Publications

23. **Silver, T.***, Hariprasad, V.*†, Shuttleworth, R.*†, Kumar, N†., Lozano-Perez, T., Kaelbling, L. PDDL Planning with Pretrained Large Language Models. *Workshop on Foundation Models for Decision Making (FMDM) @ NeurIPS 2022*.

24. **Silver, T.***, Chitnis, R.*, Kumar, N.†, McClinton, W.†, Lozano-Perez, T., Kaelbling, L., Tenenbaum, J. Inventing Relational State and Action Abstractions for Effective and Efficient Bilevel Planning. *Multi-disciplinary Conference on Reinforcement Learning and Decision Making (RLDM) 2022*. Short version of "Predicate Invention for Bilevel Planning" (AAAI 2023). **Spotlight talk.**

25. Zeng, C.†, **Silver, T.** Learning Search Guidance from Failures with Eliminable Edge Sets. *Workshop on Bridging the Gap Between AI Planning and Reinforcement Learning (PRL) @ ICAPS 2021*.

26. **Silver, T.**, Chitnis, R. PDDLGym: Gym Environments from PDDL Problems. *Workshop on Bridging the Gap Between AI Planning and Reinforcement Learning (PRL) @ ICAPS 2020*.

27. **Silver, T.***, Chitnis, R.*, Tenenbaum, J., Lozano-Perez, T., Kaelbling, L. Learning Skill Hierarchies from Predicate Descriptions and Self-Supervision. *Workshop on Generalization in Planning (GenPlan) @ AAAI 2020*.

28. Loula, J., **Silver, T.**, Allen, K., Tenenbaum, J. Learning Models for Mode-based Planning. *Workshop on Generative Modeling and Model-Based Reasoning for Robotics and AI (MBRL) @ ICML 2019*.

Preprints and Others

29. **Silver, T.***, Allen, K.*, Tenenbaum, J., Kaelbling, L. Residual Policy Learning. *arXiv 2018*.

30. **Silver, T.** Luna: A Game-Based Rating System for Artificial Intelligence. *Undergraduate thesis with Professor Stuart M. Shieber*, Harvard College 2016.

31. Kumar, N.*†, **Silver, T.***, McClinton, W.†, Zhao, L., Proulx, S., Lozano-Perez, T., Kaelbling, L., Barry, J. Practice Makes Perfect: Planning to Learn Skill Parameter Policies. *arXiv 2024*.

Teaching Experience

6.s058 / 16.420: Representation, Inference and Reasoning in AI   MIT
Co-instructor   Aug – Dec 2021

6.882: Structured Models for AI   MIT
Teaching Assistant   Aug – Dec 2020

CS 121: Theory of Computation   Harvard College
Head Teaching Fellow; Teaching Fellow   Sep – Dec 2014; Sep – Dec 2015

CS 20: Discrete Math   Harvard College
Head Teaching Fellow; Teaching Fellow   Jan – May 2015; Jan – May 2016

Digital Literacy Project   Harvard College / Boston Schools
President; Teaching Volunteer   Sep 2013 – May 2016

Invited Talks

Cornell Tech (Rush Group)   Nov 2023
Cornell University (Bhattacharjee Group)   Oct 2023
Yale University (Scassellati Group)   Sep 2023
Princeton University (Griffiths Group)   Mar 2023
Rutgers University (CS Department Colloquium)   Mar 2023
Columbia University (Song Group)   Feb 2023
George Mason University (Controls and Robotics Seminar)   Feb 2023
AAAI AI & Robotics Bridge Session   Feb 2023
Oxford University (CS Department Seminar)   Jan 2023
DeepMind London (Shanahan Group)   Jan 2023
New York University (Pinto Group)   Jan 2023
Massachusetts Institute of Technology (Andreas Group)   Nov 2022
Northeast Robotics Colloquium (NERC) (Poster)   Oct 2022
University of New Hampshire (Ruml Group)   Sep 2022
Meta Reality Labs Research (Desai Group)   Sep 2022
Stanford University (BEHAVIOR Group)   Sep 2022
Technical University of Berlin (TU Berlin) (Toussaint Group)   Dec 2021
CogSci 2021 Workshop: Minds At Play   Jul 2021
Allen Institute for AI (AI2)   Mar 2021
Delft University of Technology (TU Delft) (Oliehoek Group)   Feb 2021
Brown University (Konidaris, Tellex, Littman Groups)   Jan 2021
Arizona State University (Srivastava Group)   Jan 2021
Brown University (Konidaris, Tellex, Littman Groups)   Mar 2020

Fellowships, Honors, and Awards

Outstanding MIT UROP Mentor Awards (Nominated)   Apr 2023
IJCAI-ECAI 2022 Distinguished PC (Top 3% Reviewer)   Sep 2022
MIT EECS Hazen Teaching Award   June 2022
NSF Graduate Research Fellowship   Aug 2018 – May 2023
MIT Stata Family Presidential Fellowship   Aug 2018 – May 2019
Blumberg Creative Science Prize (Mather House, Harvard)   May 2016
Derek Bok Certificate of Distinction in Teaching (Harvard)   Jan 2015, May 2015, Jan 2016
Harvard College PRISE Fellowship   May – June 2013
Research Science Institute (RSI)   May – June 2011

Workshop Organizing Committees

Learning Effective Abstractions for Planning (LEAP) @ CoRL 2023   Atlanta, GA
Co-organizers: Naman Shah, Eric Rosen, David Paulius, Beomjoon Kim, Georgia Chalvatzaki   Nov 2023

Learning for Task and Motion Planning @ RSS 2023   Daegu, Korea
Co-organizers: Danfei Xu, Danny Driess, Jeannette Bohg, Rohan Chitnis, Shuo Cheng, Zhutian Yang   Jul 2023

Learning, Perception, and Abstraction for Long-Horizon Planning @ CoRL 2022   Auckland, NZ
Co-organizers: Gregory Stein, Jana Kosecka, Rohan Chitnis, Yezhou Yang   Dec 2022

Advisees

Nishanth Kumar (MIT PhD Student)	Fall 2021 – Present
Willie McClinton (MIT PhD Student)	Fall 2021 – Present
Ryan Yang (MIT Undergrad)	Spring 2021 – Present
Reece Shuttleworth (MIT Undergrad)	Summer 2022 – Spring 2023
Ashay Athalye (MIT Master's Student → Boston Dynamics AI)	Fall 2021 – Spring 2023
Lilian Luong (MIT Master's Student → Applied Intuition)	Fall 2022 – Spring 2023
Jagdeep Bhatia (MIT Undergrad → Startup Founder)	Fall 2021 – Spring 2023
Amber Li (MIT Master's Student → Two Sigma)	Fall 2021 – Fall 2022
Varun Hariprasad (RSI → MIT Undergrad)	Summer 2022
Abraham Mitchell (University of Arkansas Undergrad, MSRP)	Summer – Fall 2022
Wester J Aldarondo-Torres (UPR Undergrad, MSRP)	Summer – Fall 2022
Catherine Zeng (Harvard Undergrad → CMU PhD Student)	Fall 2020 – Spring 2022
Shariqah N Hossain (MIT Undergrad → InterSystems)	Fall 2020 – Spring 2021

Reviewing

AAAI Conference on Artificial Intelligence (AAAI)	2021, 2022, 2023, 2024
Conference on Robot Learning (CoRL)	2022, 2023
Workshop on Generalization in Planning (GenPlan)	2021, 2022, 2023
International Conference on Learning Representations (ICLR)	2021, 2022
International Conference on Machine Learning (ICML)	2022, 2023
International Conference on Robotics and Automation (ICRA)	2021, 2022, 2023
International Joint Conference on Artificial Intelligence (IJCAI)	2022, 2023
International Conference on Intelligent Robots and Systems (IROS)	2023, 2024
International Symposium on Robotics Research (ISRR)	2022
Journal of Artificial Intelligence Research (JAIR)	2022
Conference on Neural Information Processing Systems (NeurIPS)	2021, 2022, 2023
Workshop on Planning and Robotics (PlanRob @ ICAPS)	2023
Workshop on Bridging Planning and Reinforcement Learning (PRL @ IJCAI)	2023
Robotics and Automation Letters (RA-L)	2021, 2022, 2023
Robotics: Science and Systems (RSS)	2024
Transactions on Machine Learning Research (TMLR)	2022, 2023