Chris Agia

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Education

Stanford University 2021 – Present
Doctor of Philosophy in Computer Science
Advisors: Prof. Jeannette Bohg, Prof. Marco Pavone
Co-founder & President, Canadian Student Association at Stanford. Lead Organizer, Stanford AI Salon

University of Toronto 2016 – 2019, 2020 – 2021
Bachelor of Applied Science in Engineering Science, Robotics
Advisor: Prof. Florian Shkurti. Graduation with Honours, Dean's Honour List 2018 – 2021

Research Experiences

NASA Jet Propulsion Laboratory, California Institute of Technology — Pasadena, CA, USA
Visiting Researcher advised by Dr. Issa Nesnas and Dr. Saptarshi Bandyopadhyay — 2023-06 – 2023-09
Topics: autonomy for deep space exploration [Paper, Site]; *Section 347: mobility and robotic systems*

Autonomous Systems Lab, Stanford University — Stanford, CA, USA
Graduate Researcher advised by Prof. Marco Pavone and Dr. Edward Schmerling — 2022-03 – Present
Topics: (focus) failure detection for model-free policies [Site], *foundation models for robotic safety* [Site, Site]; *(involved) neural network uncertainty quantification, out-of-distribution detection, deep offline reinforcement learning*

Interactive Perception and Robot Learning Lab, Stanford University — Stanford, CA, USA
Graduate Researcher advised by Prof. Jeannette Bohg — 2022-01 – Present
Topics: (focus) long-horizon robot planning with learned skills [Site, Code], *task and motion planning with large language models* [Site, Site, Site]; *(involved) deep reinforcement learning, optimization*

Stanford Vision and Learning Lab, Stanford University — Stanford, CA, USA
Graduate Researcher advised by Prof. Jiajun Wu — 2021-09 – 2022-02
Topics: neuro-symbolic propositional logic models for AI task planning

Robot Vision and Learning Lab, Vector Institute & University of Toronto — Toronto, Canada
Undergraduate Researcher advised by Prof. Florian Shkurti — 2020-05 – 2021-05
Topics: learning to plan in symbolic 3D scene graphs with graph neural networks [Site, Code]

Mobile Robotics Lab, MILA & McGill University — Montreal, QC, Canada
Research Intern co-supervised by Prof. Gregory Dudek and Prof. David Meger — 2020-01 – 2020-05
Topics: depth prediction for visual SLAM [Paper], *visual representation learning for self-driving control* [Paper]

Noah's Ark Lab, Huawei Research Canada — Markham, ON, Canada
Deep Learning Research Intern, perception and localization with Dr. Bingbing Liu — 2019-05 – 2020-05
Topics: 3D semantic understanding for scene reconstruction [Paper], *road estimation and SLAM* [Paper]

Autonomous Systems and Biomech. Lab, University of Toronto — Toronto, ON, Canada
Research Intern supervised by Prof. Goldie Nejat — 2018-05 – 2018-08
Topics: sim2real transfer of deep reinforcement learning based autonomous navigation policies [Paper]

Industry Experiences

Mixed Reality and Robotics, **Microsoft** — Redmond, WA, USA
Software Engineering Intern on the Scene Understanding and Data Teams (HoloLens) — 2021-05 – 2021-08
Topics: bridging multi-agent reinforcement learning scenarios into mixed reality environments

Cloud, **Google** — San Francisco, CA, USA
Software Engineering Intern building ABI simulators with the Istio Networking Team — 2020-05 – 2020-08

Honors and Awards

Clear Ventures Deeptech Fellowship 2023
Awarded to promising PhD candidates and post-docs that aspire to build deep tech companies

Stanford School of Engineering Fellowship, Computer Science 2021
Awarded to outstanding students pursuing doctoral degrees in computer science and engineering

Ontario Engineering Competition 2019
Awarded first prize at Toronto's district and Ontario's provincial programming competitions

NSERC Undergraduate Student Research Award 2018
Awarded to undergraduate science and engineering students on the basis of research aptitude

President's Scholarship Program 2016
Awarded to top engineering candidates pursuing studies at the University of Toronto

Publications

Papers In Submission

[1] C. Agia, R. Sinha, J. Yang, Z. Cao, R. Antonova, M. Pavone, and J. Bohg, "Unpacking failure modes of generative policies: Runtime monitoring of consistency and progress," 2024, Under review. [Online]. Available: https://sites.google.com/view/detecting-policy-failure.

[2] Y. Huang, C. Agia, J. Wu, T. Hermans, and J. Bohg, "Points2plans: From point clouds to long-horizon plans with composable relational dynamics," 2024, Under review. [Online]. Available: https://arxiv.org/abs/2408.14769.

[3] J. Thumm, C. Agia, M. Pavone, and M. Althoff, "Text2interaction: Establishing safe and preferable human-robot interaction," 2024, Under review. [Online]. Available: https://arxiv.org/abs/2408.06105.

Refereed Conference Papers

[1] M. Bazzi, S. Ali, C. Agia, J. Alora, L. Pabon, M. Pavone, and L. Roveda, "Robomorph: In-context meta-learning for robot dynamics modeling," in *Internationl Conference on Informatics in Control*, 2024.

[2] R. Sinha, A. Elhafsi, C. Agia, M. Foutter, E. Schmerling, and M. Pavone, "Real-time anomaly detection and reactive planning with large language models," in *Robotics: Science and Systems*, Outstanding Paper Award, 2024. [Online]. Available: https://arxiv.org/abs/2407.08735.

[3] DROID Dataset Team, "Droid: A large-scale in-the-wild robot manipulation dataset," in *Robotics: Science and Systems*, 2024. [Online]. Available: https://arxiv.org/abs/2403.12945.

[4] Open X-Embodiment Collaboration, "Open X-Embodiment: Robotic learning datasets and RT-X models," in *2024 IEEE International Conference on Robotics and Automation (ICRA)*, Best Paper Award, 2024. [Online]. Available: https://arxiv.org/abs/2310.08864.

[5] C. Agia, G. C. Vila, S. Bandyopadhyay, D. S. Bayard, K. Cheung, C. H. Lee, E. Wood, I. Aenishanslin, S. Ardito, L. Fesq, M. Pavone, and I. A. D. Nesnas, "Modeling considerations for developing deep space autonomous spacecraft and simulators," in *IEEE Aerospace Conference (AeroConf)*, 2024. [Online]. Available: https://arxiv.org/abs/2401.11371.

[6] C. Agia, T. Migimatsu, J. Wu, and J. Bohg, "Stap: Sequencing task-agnostic policies," in *2023 IEEE International Conference on Robotics and Automation (ICRA)*, 2023, pp. 7951–7958. DOI: 10.1109/ICRA48891.2023.10160220. [Online]. Available: https://arxiv.org/abs/2210.12250.

[7] C. Agia, K. M. Jatavallabhula, M. Khodeir, O. Miksik, V. Vineet, M. Mukadam, L. Paull, and F. Shkurti, "Taskography: Evaluating robot task planning over large 3d scene graphs," in *Proceedings of the 5th Conference on Robot Learning (CoRL)*, ser. Proceedings of Machine Learning Research, vol. 164, PMLR, 2022, pp. 46–58. [Online]. Available: https://arxiv.org/abs/2207.05006.

[8] R. Cheng, C. Agia, F. Shkurti, D. Meger, and G. Dudek, "Latent attention augmentation for robust autonomous driving policies," in *2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2021, pp. 130–136. DOI: 10.1109/IROS51168.2021.9636449.

[9] R. Cheng, C. Agia, Y. Ren, X. Li, and L. Bingbing, "S3cnet: A sparse semantic scene completion network for lidar point clouds," in *Proceedings of the 2020 Conference on Robot Learning (CoRL)*, ser. Proceedings of Machine Learning Research, vol. 155, PMLR, 2021, pp. 2148–2161. [Online]. Available: https://arxiv.org/abs/2012.09242.

[10] R. Cheng, C. Agia, D. Meger, and G. Dudek, "Depth prediction for monocular direct visual odometry," in *2020 17th Conference on Computer and Robot Vision (CRV)*, IEEE Computer Society, 2020, pp. 70–77.

Refereed Journal Papers

[1] K. Lin, C. Agia, T. Migimatsu, M. Pavone, and J. Bohg, "Text2motion: From natural language instructions to feasible plans," *Autonomous Robots, Special Issue: Large Language Models in Robotics*, 2023. DOI: 10.1007/s10514-023-10131-7. [Online]. Available: https://arxiv.org/abs/2303.12153.

[2] A. Elhafsi, R. Sinha, C. Agia, E. Schmerling, I. A. D Nesnas, and M. Pavone, "Semantic anomaly detection with large language models," *Autonomous Robots, Special Issue: Large Language Models in Robotics*, 2023. DOI: 10.1007/s10514-023-10132-6. [Online]. Available: https://arxiv.org/abs/2305.11307.

[3] Y. Ren, B. Liu, R. Cheng, and C. Agia, "Lightweight semantic-aided localization with spinning lidar sensor," *IEEE Transactions on Intelligent Vehicles*, vol. 8, no. 1, pp. 605–615, 2021. DOI: 10.1109/TIV.2021.3099022.

[4] H. Hu, K. Zhang, A. H. Tan, M. Ruan, C. Agia, and G. Nejat, "A sim-to-real pipeline for deep reinforcement learning for autonomous robot navigation in cluttered rough terrain," *IEEE Robotics and Automation Letters*, vol. 6, no. 4, pp. 6569–6576, 2021. DOI: 10.1109/LRA.2021.3093551.

Refereed Workshop Papers

[1] C. Agia, R. Sinha, J. Yang, Z. Cao, R. Antonova, M. Pavone, and J. Bohg, "Unpacking failure modes of generative policies: Runtime monitoring of consistency and progress," in *Robotics: Science and Systems Workshops (RSS)*, 2024. [Online]. Available: https://drive.google.com/file/d/1vEyKj5n8yaEowa_tgEDxoQxGPC7KU7zJ/view.

[2] M. Foutter, P. Bhoj, R. Sinha, A. Elhafsi, S. Banerjee, C. Agia, J. Kruger, T. Guffanti, D. Gammelli, S. D'Amico, and M. Pavone, "Adapting a foundation model for space-based tasks," in *Robotics: Science and Systems Workshops (RSS)*, 2024. [Online]. Available: https://arxiv.org/abs/2408.05924.

[3] A. Elhafsi, R. Sinha, C. Agia, E. Schmerling, I. A. D Nesnas, and M. Pavone, "Semantic anomaly detection with large language models," in *Robotics: Science and Systems Workshops (RSS)*, 2023. [Online]. Available: https://sites.google.com/view/rss2023-safe-autonomy/accepted-papers?authuser=0.

[4] K. Lin, C. Agia, T. Migimatsu, M. Pavone, and J. Bohg, "Text2motion: From natural language instructions to feasible plans," in *International Conference on Robotics and Automation Workshops (ICRA)*, 2023. [Online]. Available: https://openreview.net/pdf?id=M1yTyG5P7Cl.

Thesis Papers

[1] C. Agia and F. Shkurti, "Contextual graph representations for task-driven 3d perception and planning," Undergraduate Dissertation, University of Toronto, Toronto, ON, 2021. [Online]. Available: https://drive.google.com/file/d/1LjTdgwuiJa-gIiVbbqj9vh-qoEZgqkb_/view?usp=sharing.

Invited Talks

SystemX Conference, Stanford University. Learning to solve long-horizon tasks 2023-11

Robot Vision and Learning Lab, UofT. Task and motion planning with skills and language models 2023-07

Facebook AI Research. Taskography: Evaluating robot task planning over large 3d scene graphs 2021-07

Microsoft Research. Robot task planning in structured world models 2021-07

Embodied AI Lab, MILA. Contextual graph representations for task-driven 3d planning 2021-06

Patents

- Agia, C.G., Cheng, R., Ren, Y., Liu, B. (2022). *Systems and Methods for Generating a Road Surface Semantic Segmentation Map from a Sequence of Point Clouds* (U.S. Application No. 17/676,131). U.S. Patent and Trademark Office.
- Cheng, R., Agia, C.G., Ren, Y., Liu, B. (2022). *Methods and Systems for Semantic Scene Completion for Sparse 3D Data* (U.S. Application No. 17/492,261). U.S. Patent and Trademark Office.

Community Service and Leadership

Canadian Student Association, Stanford University 2024-01 – Present
Co-founder and President of Stanford's Canadian Student Association

Stanford AI Salon, Stanford University 2021-10 – Present
Lead Organizer of Stanford's AI Salon, a platform facilitating open-ended discussion between graduate students, industry, and academic leaders on contemporary ML & AI topics and their societal implications

Stanford CS Mentorship Program, Stanford University 2021-10 – Present
Advising students from underrepresented and minority groups to lead fruitful careers in computer science research

Frosh Scholars Mentorship Program, Stanford University 2021-10 – 2022-07
Mentoring first generation college students towards balanced progress in academics, career and well-being

Pro Bono Research Mentoring 2021-01 – Present
Guided five undergraduate research students through to applications at top graduate engineering schools

NSight Student Mentorship Program, University of Toronto 2018-09 – 2019-05
Provided academic, social and personal support to first and second year Engineering Science students

Professional Service and Teaching

Journal Service: Reviewer for IJRR, RA-L
Conference Service: Reviewer for RSS, CoRL, ICRA, IROS, ISER, AeroConf
Teaching assistant for Stanford AA174A: Principles of Robot Autonomy 1

Skills

Languages: (*Proficient*) Python, C/C#/C++, MATLAB, Rust, LaTeX, Bash - (*Working*) Java, Assembly
Tools: Git, Linux/Unix, Unity, Docker, Wasmtime (WebAssembly), Kubernetes
Libraries: PyTorch, TensorFlow, ROS, NumPy, ml-agents, PCL, OpenCV, SciPy, scikit-learn, Pandas, Jupyter