

Mark Zolotas

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Robotics researcher working on **robot foundation models**, such as vision-language-action (VLA) models, with the goal of enabling effective human-robot interaction. Experienced across the full robot learning stack, from data collection, processing, and curation to policy training, evaluation, and deployment in simulation and on hardware. Background in extended reality (XR) headsets, shared control for robot teleoperation, and learning-based methods for estimating human intent.

Employment

Toyota Research Institute (TRI)

June 2024 – Present

Large Behavior Models Division

Manager (Apr. 2026 – Present); **Research Scientist** (June 2024 – Apr. 2026)

- Research lead on robot foundation models, with hands-on contributions across the entire stack, including the data pipeline, model training, and empirical policy evaluation, resulting in state-of-the-art deployments on **humanoids**, such as the Unitree G1 and eAtlas
- Exploring scalable approaches to robot learning centered on **data flywheels**, **interactive imitation learning**, and **in-context learning**, with the goal of enabling VLA models to learn continuously and adapt to people and their environments

Northeastern University

Jan. 2021 – May 2024

Department of Electrical and Computer Engineering

Research Scientist (Dec. 2022 – May 2024); **Postdoctoral Research Associate** (Jan. 2021 – Dec. 2022)

- Led research directions for NSF/DARPA-funded projects, with responsibilities spanning grant writing, technical presentations, demonstrations of project deliverables, lecturing courses, and student supervision
- Produced first-author publications on **XR systems for shared control teleoperation** and **ergonomic human-robot collaboration**

Education

PhD in Robotics, Imperial College London

Oct. 2016 – Oct. 2020

Department of Electrical and Electronic Engineering

- Thesis: “Explainable Shared Control in Assistive Robotics”
- Supervisor: Professor Yiannis Demiris

MEng in Electronic and Information Engineering, Imperial College London

Oct. 2012 – June 2016

Department of Electrical and Electronic Engineering

- Graduated with First Class Honours, equivalent to a GPA of 4.0/4.0
- Dissertation: “Self-Organising Error Detection and Correction in Open Multi-Agent Systems”

Research Projects

Technical Contributor, Boston Dynamics Collaboration project on the Atlas Humanoid

TRI

“Large Behavior Models and Atlas Find New Footing”

2024 – 2025

- Core technical member of the AI research team focused on building language-conditioned imitation learning policies for the eAtlas humanoid to perform long-horizon, whole-body manipulation tasks
- Contributed to the development, training, deployment, and evaluation of large behavior models (LBMs), with particular focus on establishing the **whole-body behavior cloning pipeline**

Research Scientist, LBM Team

TRI

“A Careful Examination of Large Behavior Models for Multitask Dexterous Manipulation”

2024 – 2025

- Designed and implemented components of an XR robot teleoperation system leveraging the Apple Vision Pro headset
- Supported robot operations for data collection and experimentation as part of the LBM empirical study

Co-investigator, DARPA Perceptually-enabled Task Guidance (PTG) program

Northeastern University

“ENKIX: Enabling Knowledgeable Task Guidance In the Extremes”

2022 – 2024

- Directed a team of researchers to develop perception and environment modeling capabilities for ENKIX, an augmented reality task guidance system designed within the scope of the DARPA PTG program
- Represented the Northeastern University subcontractor of the ENKIX project at principal investigators’ meetings and demos

Senior Personnel, NSF Future of Work at the Human-Technology Frontier project

Northeastern University

“Co-worker Robots to Impact Seafood Processing (CRISP)”

2021 – 2024

- Defined and managed research directions for the CRISP project, investigating the development and deployment of collaborative robots to improve sustainability, productivity, safety, and workers’ quality of life in the seafood processing industry
- Published and presented findings on human-robot collaboration frameworks to enhance human factors and ergonomics

Project Coordinator, Verizon industry project

Northeastern University

“Supporting Aging In Place Through Multimodal Sensing and Reasoning”

Sept. 2021 – Sept. 2022

- Led a project funded by Verizon spanning five research labs at Northeastern University, aimed at building a mobile robot platform with an integrated multimodal sensor suite that could monitor and support elderly people during their day-to-day activities at home
- Maintained and managed all project deliverables, including reports, software integration, and demonstrations of the robot prototype

Awards

DARPA PTG ENKIX Award (~350,000 USD) Co-investigator on the Northeastern University subcontract for perceptual grounding in the ENKIX system.	2023
U.S. DOE Marine Energy Collegiate Competition Selection Award (5,000 USD) Faculty advisor for Northeastern University's 2024 national competition team.	2023
NASA Challenge Second Place & Best Technical Paper (4,000 USD) Faculty advisor for the Northeastern University team in the 2020–2021 RASC-AL Moon to Mars Challenge.	2021
Departmental Graduate Teaching Assistant of the Year Imperial College London; university-wide finalist.	2019
IET Prize for Innovation in Robotics (~340 USD) For a student paper presented at the leading annual UK Robotics conference: Towards Autonomous Robotic Systems (TAROS).	2019
EPSRC Doctoral Training Award (~94,000 USD) Full EPSRC doctoral studentship.	2016

Technical Skills

Robot Learning	Data pipelines, policy pre-training & fine-tuning, inference & evaluation of VLA models or related imitation learning algorithms, and a proven track record of deploying learned behavior policies on real robots
Programming	Proficient in C/C++, Python, C# and familiar with Swift, Java, Matlab, SQL, Prolog
Software	ROS 1 & 2, TensorFlow, PyTorch, JAX, Amazon Web Services (AWS) SageMaker, Google Cloud, Ray, Bazel build, Unity3D, Git, Docker, Linux, Jupyter, OpenCV, scikit-learn, .NET
Robots	Unitree G1, Boston Dynamics eAtlas, custom-built robotic wheelchairs, UR Cobot arms, Kinova Gen3, ABB YuMi, Hello Robot Stretch, Franka Emika Panda, Aldebaran Nao
XR Headsets	Apple Vision Pro (visionOS), HTC Vive, HoloLens 1 & 2, Valve Index
Simulators	MuJoCo, Isaac Sim, Drake, Gazebo

Selected Publications

- F. Lin, K. Arora, J. Mercat, H. Nishimura, P. Shah, C. Xu, M. Zhang, M. Zolotas, M. Angeles, O. Pfannenstiehl, A. Beaulieu, J. Barreiros, “A Systematic Study of Data Modalities and Strategies for Co-training Large Behavior Models for Robot Manipulation”, Robotics: Science and Systems (**RSS**), 2026.
- R. Ye, N. Ha, S. Chen, Q. Liu, G. Chen, S. Stassen, M. Zolotas, J. Barreiros, T. Bhattacharjee, “RAG-Diff: Adapting Diffusion Policies to Dynamic Constraints with Retrieval-Augmented Guidance”, Robotics: Science and Systems (**RSS**), 2026.
- R. Madan, A. Xie, S. Saak, A. Blanco, D. Lee, S. G. Brown, Y. Yan, M. Zolotas, J. Barreiros, T. Bhattacharjee, “TACTIC: Tactile and Vision Conditioned Contact-Centric Control for Whole-Arm Manipulation”, Robotics: Science and Systems (**RSS**), 2026.
- TRI LBM Team, “A Careful Examination of Large Behavior Models for Multitask Dexterous Manipulation”, **Science Robotics (cover page)**, 2026.
- J. Grannen, M. Pan, K. Llontop, C. Ho, M. Zolotas, J. Bohg, D. Sadigh, “Robot-Powered Data Flywheels: Deploying Robots in the Wild for Continual Data Collection and Foundation Model Adaptation”, **arXiv**, 2025.
- A. Trivedi, S. Prajapati, M. Zolotas, M. Everett, T. Padir, “Chance-Constrained Convex MPC for Robust Quadruped Locomotion Under Parametric and Additive Uncertainties”, IEEE Robotics and Automation Letters (**RA-L**), **IEEE RAS TC Best Paper Award Finalist on Optimization for Robotics**, 2025.
- M. Zolotas*, P. Long*, K. Sagar, T. Padir, “constrained_manipulability: A ROS 2 library to Compute and Visualize Constrained Capacities for Robotic Manipulators”, The Journal of Open Source Software (**JOSS**), 2025.
- M. Zolotas*, P. Long*, T. Padir, “robot_collision_checking: A Lightweight ROS 2 Interface to FCL (Flexible Collision Library)”, The Journal of Open Source Software (**JOSS**), 2025.
- A. Trivedi, S. Prajapati, A. Shirgaonkar, M. Zolotas, T. Padir, “Data-Driven Sampling Based Stochastic MPC for Skid-Steer Mobile Robot Navigation”, IEEE International Conference on Robotics and Automation (**ICRA**), 2025.
- M. Zolotas, R. Luo, S. Bazzi, D. Saha, K. Mabulu, K. Kloeckl, T. Padir, “Imposing Motion Variability for Ergonomic Human-Robot Collaboration”, **IIEE Transactions on Occupational Ergonomics and Human Factors**, 2024.
- R. Luo*, M. Zolotas*, D. Moore, T. Padir, “User-customizable Shared Control for Robot Teleoperation via Virtual Reality”, IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2024.
- A. Trivedi, M. Zolotas, A. Abbas, S. Prajapati, S. Bazzi, T. Padir, “A Probabilistic Motion Model for Skid-Steer Wheeled Mobile Robot Navigation on Off-Road Terrains”, IEEE International Conference on Robotics and Automation (**ICRA**), 2024.
- M. Zolotas and Y. Demiris, “Disentangled Sequence Clustering for Human Intention Inference”, IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2022.
- M. Zolotas, M. Wonsick, P. Long, T. Padir, “Motion Polytopes in Virtual Reality for Shared Control in Remote Manipulation Applications”, **Frontiers in Robotics and AI**, 2021.
- M. Zolotas and Y. Demiris, “Towards Explainable Shared Control using Augmented Reality”, IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2019.
- M. Zolotas, J. Elsdon, Y. Demiris, “Head-Mounted Augmented Reality for Explainable Robotic Wheelchair Assistance”, IEEE/RSJ International Conference on Intelligent Robots and Systems (**IROS**), 2018.