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Education

Stanford University, Stanford, CA [2021 – 2025]

Doctor of Philosophy in Aeronautics and Astronautics
(AI for Robotics and Autonomous Systems)

Advisor: Mykel J. Kochenderfer

Thesis: “Reasoning and Planning with Contextual Semantics in Unstructured Environments”

ETH Zürich, Zürich, Switzerland [2018 – 2021]

Master of Science in Robotics, System, and Control

Advisor: Ali Agha (NASA JPL), Juan Nieto, Roland Siegwart

Thesis: “Active Information Acquisition for Resource-constrained Navigation”

Bandung Institute of Technology, Bandung, Indonesia [2013 – 2017]

Bachelor of Science in Electrical Engineering

Advisor: Bambang Riyanto Trilaksono | Valedictorian

Thesis: “Guidance System Design and Implementation for Autonomous Underwater Glider”

Professional Appointments

FieldAI, Irvine, CA [Jan. 2026 – Present]

Senior Research Scientist

Leading the research and development of next-generation AI-powered Field Foundation Models (FFMs) to advance autonomy in field robotics. Designing risk-aware and uncertainty-driven contextual decision-making systems for complex, unstructured environments. Spearheading the translation of algorithmic breakthroughs into core product offerings for large-scale industrial deployment. Directing high-impact research publications and leading multiple patent application efforts to secure intellectual property in Embodied AI.

Stanford University, Stanford, CA [Jan. 2022 – Dec. 2025]

Graduate Research Assistant - Stanford Intelligent Systems Laboratory (SISL)

Led research projects on robotic reasoning and decision-making for complex missions in the Department of Aeronautics and Astronautics. Coordinated large-scale collaborative efforts with NASA Jet Propulsion Laboratory for planetary exploration and Field AI for industrial inspection. Published and disseminated research in premier venues, including Robotics: Science and Systems (RSS), ICRA, IROS, and CoRL. Delivered technical talks and seminars on campus and for external organizations to advance the field of autonomous systems. Mentored junior graduate students within the lab, guiding their research methodology and technical development.

FieldAI, Irvine, CA [Summer 2023, 2024, 2025]

Research Scientist Intern - Embodied AI

Developed active object search algorithm to inspect small objects with high-resolution for industrial predictive maintenance. Leading development of AI algorithms for robot deployments in manufacturing facilities. Developed semantic and contextual reasoning algorithms for autonomous robot inspections [3]. Initiated various robot demo leading to pilot projects to deploy robot for oil and gas inspections. Designed a mission autonomy framework called Semantic Belief Behavior Graph (SB2G) for object-based inspection algorithm [6]. Initiated various robot demo leading to pilot projects to deploy robot for patrolling, and construction sites.

NASA Jet Propulsion Laboratory, Pasadena, CA

[Sept. 2019 – Sept. 2021]

Visiting Robotics Student Researcher

Developed novel autonomy algorithm for rapid subsurface exploration in extreme environments. Developed multi-robot data sharing, global localization, sensor calibration, mission planning and object mapping algorithms for multi-robot operation in the DARPA Subterranean Challenge. Field tested multiple legged and wheeled robots in various caves and mines in the US. Participated in two events of the DARPA Subterranean Challenge as one of the pit crews in the field.

ETH Junior, Zurich, Switzerland

[Mar. 2019 – Aug. 2019]

Mixed Reality Developer

Led a project for one of the world's leading dental company pioneering innovative Mixed Reality solutions to assist dentist works.

Research

Stanford Intelligent Systems Laboratory (SISL), Stanford University

[2021 – 2025]

Graduate Research Assistant

Task planning under Operational Compliance using Retrieval-based Language Model (In collaboration with AI for Humanity Inc, DoB as Field AI) [3]: Proposed a method that grounds robotic task planning with domain-specific rules and operational manual for field robotics. Developed a hierarchical database and retrieval augmented generation technique to enable efficient retrieval of the relevant context under the limited context length of the LLMs. Performed experiments in simulations and real-world hardware experiments that outperforms the standard RAG method.

Reasoning and Planning for Long-term Active Embodied Question Answering (In collaboration with Field AI) [2]: Introduced the new task of Long-term Active Embodied Question Answering (LA-EQA). Proposed a structured memory system as scene-graph-based world instances to support targeted retrieval and guided navigation. Evaluated the method in both large-scale simulations and real-world industrial sites, demonstrating significant improvements in answer accuracy and exploration efficiency compared to state-of-the-art baselines.

Semantic Reasoning for Object Goal Navigation (In collaboration with AI for Humanity Inc) [5]: Proposed a framework that uses prior spatial configuration and relational semantic knowledge for semantic-guided navigation. Developed a method to build a relational semantic network using common-sense knowledge contained in an LLM. Designed a probabilistic planning algorithm for object-goal navigation with relational semantic knowledge. Validated the framework through simulation and real-world demonstrations with a legged robot.

Locomotion Adaptation using Semantic Belief Graph (In collaboration with NASA JPL) [7]: Proposed a geo-semantic-based representation of a robot's probabilistic roadmap for robot navigation. Designed a new motion planning architecture that uses semantic information to control the robot to a goal location while selecting the best gait locomotion controller based on the perceived terrain type.

Multi-robot task allocation (In collaboration with NASA JPL) [8]: Formulated a multi-robot task allocation framework for an exploration mission of a robot team with heterogeneous capabilities. Evaluated the framework on a real-world scenario in the context of the DARPA Subterranean Challenge. Evaluated a design trade-off on building a multi-robot team with different capabilities.

NASA JPL Mobility and Robotic Systems (Section 347), NASA Jet Propulsion Laboratory [2019 – 2021]
Autonomous Legged Robot Navigation [15]: Designed and integrated NeBula autonomy capability [11] on a Boston Dynamics Spot legged robot and evaluated system behavior arising from the interaction between NeBula framework and Boston Dynamics locomotion controller.

Distributed Multi-Robot Data sharing [13]: Developed a distributed multi-robot data sharing using ROS 2. Deployed the solution in the DARPA Subterranean Challenge and enabled reliable data sharing of critical data between robots and the human supervisor in the base station.

Belief-aware Autonomy System Integration [11]: Maintained and integrated various autonomy modules to enable multi-robot operations with different mobility types. Evaluated and improved interaction between modules by accounting for the uncertainty introduced across the system.

Global Fiducial Calibration [9]: Designed an accurate and time-effective algorithm and procedure for global localization using fiducial landmarks and a total station. Deployed the solution for multi-robot calibration in the DARPA Subterranean Challenge.

Martian Subsurface Exploration Mission Design [10,16,17]: Investigated a new space mission to explore martian subsurface with a team of legged robots. Wrote a NASA NIAC Phase 1A proposal.

ETH Zürich Autonomous Systems Laboratory (ASL), ETH Zürich [2019 – 2020] *Graduate Research Assistant*
Active Information Acquisition for Resource-constrained Navigation [18]: Developed an active SLAM framework to improve robot map accuracy by planning information acquisition of global references.

Text-based Visual Localization: Designed a learning-based method to perform visual localization and mapping using text-based landmark, and leveraging text descriptor with an existing localization method in place recognition task.

Distributed State Estimation: Developed a state estimation method for swarm drones formation estimation using relative distance between agents in a distributed manner.

Multi-Camera Tracking: Extended the Deep Tracking and Mapping (DeepTAM) pipeline for multi-camera setup, and evaluated the benefit of the approach in perceptually degraded environment.

ITB Advanced Robotics Laboratory, Bandung Institute of Technology [2017 – 2018] *Research Engineer*
Guidance system for Autonomous Underwater Glider [19,20]: Developed Line-of-Sight planning method underwater exploration and performed hardware-in-the-loop simulation.

Autonomous Underwater Glider field deployment: Characterized underwater sensor and conducted field testing in a diving pool and in the sea.

CERN Summer Student Program, CERN [Jun. - Aug. 2016] *Research Intern*
Microcontroller design: Devised a controlled high voltage module for Micro Pattern Gas Detectors (MPGD) and presented the result to the International MPGD Collaboration meeting.

Publications

- [1] **World Model Failure Classification and Anomaly Detection for Autonomous Inspection**
M. Ho, M. F. Ginting, I. R. Ward, A. Reinke, M. Kochenderfer, A. Agha-mohammadi, *et al.*
IEEE International Conference on Robotics and Automation (ICRA), 2026
- [2] **Enter the Mind Palace: Reasoning and Planning for Long-term Active Embodied Question Answering**
M. F. Ginting, D. K. Kim, X. Meng, A. Reinke, B. J. Krishna, N. Kayhani, O. Peltzer, *et al.*
Conference on Robot Learning (CoRL), 2025
- [3] **SayComply: Grounding Field Robotic Tasks in Operational Compliance through Retrieval-Based Language Models**
M. F. Ginting, D. K. Kim, S. K. Kim, B. J. Krishna, M. J. Kochenderfer, S. Omidshafiei, and A. Agha-mohammadi
IEEE International Conference on Robotics and Automation (ICRA), 2025

- [4] **An Addendum to NeBula: Towards Extending TEAM CoSTAR's Solution to Larger Scale Environments**
B. Morrell, K. Otsu, A. Agha-mohammadi, D. D. Fan, S. K. Kim, **M. F. Ginting**, Xianmei Lei, et al.
IEEE Transactions on Field Robotics, 2024
- [5] **SEEK: Semantic Reasoning for Object Goal Navigation in Real World Inspection Tasks**
M. F. Ginting, S. K. Kim, D.D. Fan, M. Palieri, M. J. Kochenderfer, and A. Agha-mohammadi
Robotics: Science and Systems, 2024
- [6] **Semantic Belief Behavior Graph: Enabling Autonomous Robot Inspection in Unknown Environments**
M. F. Ginting, D. D. Fan, S. K. Kim, M. J. Kochenderfer, and A. Agha-mohammadi
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2024
- [7] **Safe and Efficient Navigation in Extreme Environments using Semantic Belief Graphs**
M. F. Ginting, S. K. Kim, O. Peltzer, J. Ott, S. Jung, M. J. Kochenderfer, and A. Agha-mohammadi
IEEE International Conference on Robotics and Automation (ICRA), 2023
- [8] **Capability-Aware Task Allocation and Team Formation Analysis for Cooperative Exploration of Complex Environments**
M. F. Ginting, K. Otsu, M. J. Kochenderfer, and A. Agha-mohammadi
IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2022
- [9] **LAMP 2.0: A Robust Multi-Robot SLAM System for Operation in Challenging Large-Scale Underground Environments**
Y. Chang, K. Ebadi, C. E. Denniston, **M. F. Ginting**, A. Rosinol, A. Reinke, M. Palieri, J. Shi, A. Chatterjee, B. Morrell, A. Agha-mohammadi, L. Carlone
IEEE Robotics and Automation Letters (RA-L), 2022
- [10] **Autonomous Mapping and Characterization of Terrestrial Lava Caves Using Quadruped Robots: Preparing for a Mission to a Planetary Cave**
J. G. Blank, B. Morrell, A. Bouman, T. Touma, **M. F. Ginting**, C. Patterson, A. Agha-mohammadi
Workshop on Terrestrial Analogs for Planetary Exploration, 2021
- [11] **Nebula: Quest for Robotic Autonomy in Challenging Environments; Team CoSTAR at the DARPA Subterranean Challenge**
Journal of Field Robotics, 2022
- [12] **Campus Autonomous Robot Tours**
M. F. Ginting, A. Hartman, N. Busca, C. Bracamontes, N. T. Ho
ASCEND, 2021
- [13] **CHORD: Distributed Data-sharing via Hybrid ROS 1 and 2 for Multi-robot Exploration of Large-scale Complex Environments**
M. F. Ginting, K. Otsu, J. A. Edlund, J. Gao, and A. Agha-Mohammadi
IEEE Robotics and Automation Letters (RA-L), 2021
- [14] **Copilot MIKE: An Autonomous Assistant for Multi-Robot Operations in Cave Exploration**
M. Kaufmann, T. S. Vaquero, G. J. Correa, K. Otsu, **M. F. Ginting**, G. Beltrame, A. Agha-Mohammadi
IEEE Aerospace Conference, 2021
- [15] **Autonomous Spot: Long-range Autonomous Exploration of Extreme Environments with Legged Locomotion**
M. F. Ginting*, A. Bouman*, N. Alatur*, M. Palieri, D. D. Fan, T. Touma, T. Pailevanian, S. K. Kim, K. Otsu, J. Burdick, and A. Agha-Mohammadi
IEEE International Conference on Intelligent Robots and Systems (IROS), 2020
Best Paper Award on Safety, Security, and Rescue Robotics
- [16] **Deployable Mesh Network for Enabling Reliable Communication from within Subsurface Voids to the Planetary Surface**
M. F. Ginting, T. Touma, J. A. Edlund, and A. Agha-Mohammadi
American Geophysical Union (AGU), 2020

- [17] **Mars Dogs: Biomimetic Robots for the Exploration of Mars, from its Rugged Surface to its Hidden Caves**
T. Touma, J. G. Blank, **M. F. Ginting**, C. Patterson, and A. Agha-Mohammadi
American Geophysical Union (AGU), 2020
- [18] **Active Information Acquisition for Resource-constrained Navigation in Unknown Environment**
M. F. Ginting
M.Sc. Thesis, Department of Mechanical and Process Engineering, 2020
- [19] **Hardware In the Loop Simulation Development of Guidance System for Autonomous Underwater Glider**
T. W. O. Putri, **M. F. Ginting**, B. R. Trilaksono, E. M. I. Hidayat, and M. F. Sagala
IEEE International Conference on Electrical Engineering and Informatics (ICEEI), 2017
- [20] **Guidance System Implementation and Hardware in the Loop Simulation for Autonomous Underwater Glider**
M. F. Ginting
B.Sc Thesis, Bandung Institute of Technology, 2017

Research Grants

Stanford Sponsored Research Program (PI: Mykel J. Kochenderfer)

AI for Humanity Inc., October 2023 - June 2025

Amount awarded: \$ 182,000

Project title: *Semantic-based Planning for Autonomous Robot Inspection*

Role: *Doctoral Researcher*

Stanford Sponsored Research Program (PI: Mykel J. Kochenderfer)

NASA Jet Propulsion Laboratory, January 2022 - December 2024

Amount awarded: \$ 600,000

Project title: *Active Source Seeking in Multi-Robot Exploration Missions*

Role: *Doctoral Researcher*

Stanford Graduate Student Research Fellowship

Stanford University, October 2021 - September 2022

Amount awarded: \$ 100,000

ARCS Pre-Doctoral Research Fellowship

Autonomy Research Center for STEAHM (ARCS), October 2020 - September 2021

Amount awarded: \$ 36,000

Project title: *Campus Autonomous Robot Tours*

Awards and Recognitions

1st place in the DARPA Subterranean Challenge Urban Circuit

For winning DARPA robotics competition in subterranean exploration

Defense Advanced Research Projects Agency (DARPA), 2020

Best Paper Award in Safety, Security, and Rescue Robotics

For the paper "Autonomous Spot: Long-range Autonomous Exploration of Extreme Environments"

with Legged Locomotion''

IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020

NASA Research Affiliate STAR Award

Development of novel autonomy capabilities and maintaining JPL's national leadership in autonomy

NASA Jet Propulsion Laboratory, 2020

Indonesia Endowment Fund for Education Scholarship

Full scholarship to pursue Master's degree at ETH Zurich

Indonesia Ministry of Finance, 2018

Valedictorian

Departement of Electrical Engineering, Bandung Institute of Technology, 2017

Young Leaders for Indonesia Top 10 Graduate

McKinsey Young Leader for Indonesia, 2017

Outstanding Student Award

Departement of Electrical Engineering, Bandung Institute of Technology, 2016

2nd Runner-up of ABU Robocon (Asia Pacific Broadcasting Union Robot Contest)

Asia Pacific Broadcasting Union, 2015

Professional Service and Volunteering

Reviewer for Journals and Conferences

[2020 – Present]

Transactions on Robotics (T-RO)

Institute of Electrical and Electronics Engineers (IEEE)

Robotics and Automation Letters (RA-L)

Institute of Electrical and Electronics Engineers (IEEE)

Robotics and Automation Magazine (RAM)

Institute of Electrical and Electronics Engineers (IEEE)

International Conference on Robotics and Automation (ICRA)

Institute of Electrical and Electronics Engineers (IEEE)

International Conference on Intelligent Robots and Systems (IROS)

Institute of Electrical and Electronics Engineers (IEEE)

Journal of Aerospace Information Systems (JAIS)

American Institute of Aeronautics and Astronautics (AIAA)

Scientific Reports

Springer Nature

Workshop Organization

Conference on Robot Learning Workshop

2025

2nd Workshop on Safe and Robust Robot Learning for Operation in the Real World

IEEE International Conference on Robotics and Automation (ICRA) Workshop

2025

Towards Reliable and Trustworthy Embodied AI in Everyday Scenarios

Student Mentorship

[2017 – Present]

Michelle Ho (PhD, Stanford University)
Joshua Lee (MS, Stanford University)
Lana Saadeddin (BSc, Stanford University)
Bandi Jai Khrisna (MS, Field AI)
Brian Wu (MS, Stanford University)
Kyle Strickland (BSc, CSUN/NASA JPL)
Nicolae Bucsa (BSc, CSUN/NASA JPL)
Isfan Fauzi (BSc, Bandung Institute of Technology)
Muhammad Hanif (BSc, Bandung Institute of Technology)
Silmi Ath Thahirah (BSc, Bandung Institute of Technology)
Albertus Adrian (BSc, Bandung Institute of Technology)

Volunteering

Career, graduate study, and scholarship seminars for Indonesian student communities. 2020.
Career inspiration class for primary school students in Rusunawa Cakung, Indonesia. Mar. 2018.
Robotics workshop for senior high school students in SMA Negeri 5 Bandung, Indonesia. Jan. 2017.
Robotics demo for local kindergarten and primary school students. 2016.
Field coordinator for university graduation parade. Mar. 2015.

Leadership Program

Leadership and Graduate Study Preparation Program by LPDP Scholarship. Feb. 2018.
McKinsey Young Leader for Indonesia Regional Wave 4. Oct. 2016 - May. 2017.

Teaching

Robotics Senior Design Project

[Fall 2020 – Spring 2021]

California State University Northridge, Northridge, CA
Research Mentor

Visual Navigation for Autonomous Vehicles

[Fall 2020]

Massachusetts Institute of Technology, Remote
Course Project Mentor

Electronics Laboratory

[Spring 2017]

Bandung Institute of Technology, Bandung, Indonesia
Lab Coordinator

Control Systems

[Fall 2016]

Bandung Institute of Technology, Bandung, Indonesia
Teaching Assistant

Microprocessor Systems Laboratory

[Fall 2016]

Bandung Institute of Technology, Bandung, Indonesia
Lab Assistant

Electronics

Bandung Institute of Technology, Bandung, Indonesia
Teaching Assistant

[Spring 2016]

Invited Talks

Robotics and AI technologies for Space and Terrestrial Applications

[2024]

Avionics and Control Systems: Challenges and Opportunities in Aerospace Technology
National Research and Innovation Agency of Indonesia, Indonesia

Planning under Uncertainty for Robotic Space Exploration

[2024]

AA229/CS239: Advanced Topics in Sequential Decision Making
Stanford University, Stanford, CA

Commencement Speech for Graduation Event

[2022]

School of Electrical Engineering and Informatics
Bandung Institute of Technology, Bandung, Indonesia

SARSOP: Efficient Point-Based POMDP Planning by Approximating Optimally Reachable Belief Spaces

[2022]
AA229/CS239: Advanced Topics in Sequential Decision Making
Stanford University, Stanford, CA

Career Prospect as a Roboticist

[2021]

Electrical Engineering Student Association
Bandung Institute of Technology, Bandung, Indonesia

Enrich your Future by Studying at ETH Zurich

[2020]

Graduate School Seminar
Kobi Education, Indonesia

Robotics Research at NASA Jet Propulsion Laboratory

[2020]

IEEEEngage Student Seminar
IEEE Student Branch, Bandung, Indonesia

What to do after graduation? Career as a Researcher

[2020]

Engineering Physics Student Association
Bandung Institute of Technology, Bandung, Indonesia

Building Robots to Explore Earth and Space

[2020]

Student seminar series
Indonesian Student Association in Switzerland, Switzerland

Media Coverage

How Field AI Is Conquering Unstructured Autonomy

IEEE Spectrum, 2024

Interns Lead the Way in DARPA Robotics Challenge and Find Their Futures

NASA JPL News, 2022

How JPL's Team CoSTAR Won the DARPA SubT Challenge: Urban Circuit Systems Track

IEEE Spectrum, 2020

Meet Au-Spot, the AI robot dog that's training to explore caves on Mars

Live Science, 2020

Team CoSTAR Trains Robots for Exploring Caves on Earth and Space

IEEE Spectrum, 2020

Late Nights, Cool Hacks, and More Stories From the DARPA SubT Urban Circuit

IEEE Spectrum, 2020

Robots Autonomously Navigate Underground in DARPA Challenge

NASA JPL News, 2020

Organizations

Stanford Intelligent Systems Laboratory (SISL)

[2021 – Present]

Part of the Stanford Artificial Intelligence Laboratory (SAIL)

Stanford University, Stanford, CA

Stanford Robotics Center (SRC)

[2023 – Present]

Student Committee

Stanford University, Stanford, CA

Indonesian Student Association at Stanford

[2022 – 2023]

Co-President

Stanford University, Stanford, CA

NASA JPL Team CoSTAR

[2020 – 2021]

Strategic Communication Lead

NASA Jet Propulsion Laboratory, Stanford, CA

IEEE Robotics and Automation Society

[2020 – Present]

IEEE Student Member

The American Geophysical Union (AGU)

[2020]

Student Member

Student Robotics Organization

[2015 – 2016]

President

Bandung Institute of Technology, Bandung, Indonesia

Electrical Engineering Student Association

[2016]

Senior Staff of Character Development Division

Bandung Institute of Technology, Bandung, Indonesia

Student Tennis Club

[2015]

Head of Media and Communication Division

Bandung Institute of Technology, Bandung, Indonesia

Technical Skills

Language: English, Indonesian, German (B1)

Programming languages: Python, Julia, MATLAB, C, C++, JavaScript, Java, \LaTeX , POMDPs.jl

Software Systems (Linux, Windows, ROS/ROS 2), Tensorflow, Pytorch, CUDA, OpenCV, PCL, Git, Eigen, LabVIEW, MPI, Eagle, Altium Designer, Visual Studio, Unity, Android Studio

External Links

- Website: <https://mfadhilgtg.github.io>
- GitHub: <https://github.com/mfadhilgtg>
- Google Scholar: <https://bit.ly/ginting-scholar>
- LinkedIn: <https://www.linkedin.com/in/mfadhilgtg/>