Xiaomin Lin

Doctor of Philosophy,
Maryland Robotics Center (MRC),
Perception and Robotics Group (PRG),
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Studies (UMIACS),
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🎓 Google Scholar
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Education

- **University of Maryland, College Park** *Sept 2018 - Dec 2024*

  Ph.D. in Electrical and Computer Engineering College Park, MD

  Thesis: TOWARDS EFFICIENT OCEANIC ROBOT LEARNING WITH SIMULATION

  Advisor: Yiannis Aloimonos

  Sponsor: USDA NIFA Sustainable Agriculture System Program

- **University of Maryland, College Park** *Sept 2015 - May 2018*

  Master in Electrical and Computer Engineering College Park, MD

  Project: Unmanned Aircraft Systems (UAS) for Transporting Human Organs

  Advisor: Gilmer Blankenship

  Sponsor: Laboratory for Physical Sciences, University of Maryland

- **University of Dayton & NJUST** *Sept 2011 - May 2015*

  Bachelor of Science in Electrical Engineering (Dual Degree from both Universities) Dayton, OH & Nanjing, China

  Magna cum Laude from University of Dayton

  Dean's list 2014, 2015

  Achievement: One of only two students selected from 600 in the engineering school for a dual-degree program

Honors and Awards

- **Best control framework for autonomous navigation and control** *Oct, 2024*

  Autonomous Robotic Systems in Aquaculture: ResearchChallenges and Industry Needs, workshop, Abu Daibi, IROS 🌐

- **Best Poster Award** *May, 2023*

  Maryland Robotics Center (MRC) Research Symposium 🌐

- **Thrid Place Image Segmentation Challenge** *Dec, 2020*

  Northrop Grumman

Press Coverage

- **'OysterNet' + underwater robots will aid in accurate oyster count,** Maryland robotics Center, News Story., Subsea Scholar Journals, Institute of System Research, News Story. 2023

- **Precision Aquaculture (Robotics),** University of Maryland Extension

- **UMD's SeaDroneSim can generate simulated images and videos to help UAV systems recognize 'objects of interest' in the water,** Institute for System Research, News Story, 2021

- **IFIG framework helps robots follow instructions,** Institute for System Research, News Story, 2020

- **S3AM (Smart Sustaining Shellfish Aquaculture Management),** Newsletter Coverage, Summer 2024, Winter 2024, Fall 2023, Spring 2023

Grant

- **[G1] Air Force Research Lab (AFRL) Small Technology Transfer Research Program (STTR) Phase II: Mobile Software Tool for Counting Small Objects Using Computer Vision and Machine Learning (**FA864920P1011**)**

  *Xiaochun Zhang, **Xiaomin Lin**, Yiannis Aloimonos ($500k, 09/2020–12/2021)*

Slightly longer story

My research lies at the intersection of robotics and perception, with a focus on enhancing autonomous underwater systems. I work within a perception lab to bring advanced perceptual capabilities to robots, enabling them to perform complex tasks in dynamic oceanic environments. I view robotics and perception as deeply interwoven: robots need to move to perceive their surroundings effectively, and active perception, in turn, aids them in executing tasks. Specifically, I develop frameworks for autonomous underwater vehicles (AUVs) to detect and map marine objects like oyster beds and coral reefs using both real and synthetic data. I leverage simulation-based techniques, data-driven decision-making, and multi-modal sensor integration to create robust systems that thrive in challenging conditions. My ultimate goal is to advance autonomous systems that support conservation, research, and sustainable marine ecosystem management.

Fully-Refereed Publications C=Conference, S=In Submission, T=Thesis

[C.6] Joshi, K., Liu, T., Williams, A., Gray, M., Lin, X., & Chopra, N. (2024, Oct).**3D Water Quality Mapping using Invariant Extended Kalman Filtering for Underwater Robot Localization.**. In *2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), workshop of "Autonomous Robotic Systems in Aquaculture: Research Challenges and Industry Needs"*. IEEE. Abu Dhabi, UAE.

[C.5] Wu, J., Lin, X., Negahdaripour, S., Fermüller, C., & Aloimonos, Y. (2024, Oct).**MARVIS: Motion & Geometry Aware Real and Virtual Image Segmentation.**. In proceeding of *2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*. IEEE. Abu Dhabi, UAE.

[C.4] Lin, X., Karapetyan, N., Joshi, K., Liu, T., Chopra, N., Yu, M., ... & Aloimonos, Y.(2023, Oct). **Uivnav: Underwater information-driven vision-based navigation via imitation learning.**. In *2024 IEEE International Conference on Robotics and Automation (ICRA)*, pp. 5250-5256. IEEE. Yokohama, Japan. DOI:10.1109/ICRA57147.2024.10611203

[C.3] Karabatis, Y., Lin, X., Sanket, N. J., Lagoudakis, M. G., & Aloimonos, Y. (2023, Oct). **Detecting Olives with Synthetic or Real Data? Olive the Above.**. In *2023 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, pp. 4242-4249. IEEE. Detroit, MI, USA. DOI:10.1109/IROS55552.2023.10341765

[C.2] Lin, X., Sanket, N. J., Karapetyan, N., & Aloimonos, Y. (2023, May). **Oysternet: Enhanced oyster detection using simulation.**. In *2023 IEEE International Conference on Robotics and Automation (ICRA)*, pp. 5170-5176. IEEE. London, United Kingdom. DOI:10.1109/ICRA48891.2023.10160830

[C.1] Lin, X., Liu, C., Pattillo, A., Yu, M., & Aloimonous, Y. (2023). **Seadronesim: Simulation of aerial images for detection of objects above water.**. In *IEEE/CVF Winter Conference on Applications of Computer Vision*, pp. 216-223. IEEE. 2023, Waikoloa, HI, USA. DOI:10.1109/WACVW58289.2023.00027

[S.3] Atzili, T., Bhamidipati, A., Jain, Y., Yang, W. W., Kommaraju, S. K., Kona, K., Lin, X., & Zha, Y. (2024). **AAM-SEALS: Developing Aerial-Aquatic Manipulators in SEa, Air, and Land Simulator**. Manuscript submitted for publication in *RA-L*.

[S.2] Lin, X., Mange, V., Suresh, A., Neuberger, B., Palnitkar, A., Campbell, B., ... & Aloimonos, Y. (2024). **ODYSSEE: Oyster Detection Yielded by Sensor Systems on Edge Electronics.** Manuscript submitted for publication in *ICRA, 2025*.

[S.1] Wu, J., Lin, X., He, B., Fermuller, C., & Aloimonos, Y, et al. (2024). **ViewActive: Active viewpoint optimization from a single image.** Manuscript submitted for publication in *ICRA, 2025*.

Lightly-Refereed Publications O=Conference, A=Abstract

[O.6] Negahdaripour, S., Kyatham, H., Xu, M., Lin, X., Aloimonos, Y., & Yu, M.(2024, September).**GoPro Modeling and Application in Opti-Acoustic Stereo Imaging.**. In *OCEANS 2024-MTS/IEEE Halifax*, IEEE. Halifax, NS, Canada.

[O.5] Kyatham, H., Negahdaripour, S., Xu, M., Lin, X., Yu, M., & Aloimonos, Y(2024, September).**Performance Assessment of Feature Detection Methods for 2-D FS Sonar Imagery.**. In *OCEANS 2024-MTS/IEEE Halifax*, IEEE. Halifax, NS, Canada.

[O.4] Gaur, A., Liu, C., Lin, X., Karapetyan, N., & Aloimonos, Y.(2023, September). **Whale detection enhancement through synthetic satellite images.**. In *OCEANS 2023-MTS/IEEE US Gulf Coast*, pp. 1-7. IEEE. Biloxi, MS, DOI:10.23919/OCEANS52994.2023.10337400

[O.3] Palnitkar, A., Kapu, R., Lin, X., Liu, C., Karapetyan, N., & Aloimonos, Y..(2023, September). **Chatsim: Underwater simulation with natural language prompting.**. In *OCEANS 2023-MTS/IEEE US Gulf Coast*, pp. 1-7. IEEE. Biloxi, MS, DOI:10.23919/OCEANS52994.2023.10337406

[O.2] Lin, X., Jha, N., Joshi, M., Karapetyan, N., Aloimonos, Y.,& Yu, M. (2022, October). **Oystersim: Underwater simulation for enhancing oyster reef monitoring**. In *OCEANS 2022, Hampton Roads*, pp. 1-6. IEEE. 2022, Hampton Roads. DOI:10.1109/OCEANS47191.2022.9977233

[O.1] Kanu, J., Dessalene, E., Lin, X., Fermuller, C., & Aloimonos, Y. (2020). **Following instructions by imagining and reaching visual goals.** arXiv preprint arXiv:2001.09373. *Arxiv, 2020*.

[A.1] Lin, X., Pattillo, A., & Aloimonos, Y.(2022, Feburay). **Simulation Based Oyster Detection**. In *Aquaculture America 2023 Conference and Exposition*, New Orleans, Louisiana USA

Thesis

[T.1] Xiaomin Lin. (2024). **TOWARDS EFFICIENT OCEANIC ROBOT LEARNING WITH SIMULATION**. Manuscript submitted for publication in *University of Maryland, 2024*.

Under Preparation

[P.6] Feng, Y., Pallerla, C., Sohrabipour, P. S., Bist, R. B., Mahmoudi, S., Davar, A., Lin, X., & Wang, D. (2024). **Synthetic Data Augmentation for Enhanced Chicken Carcass Instance Segmentation**. In preparation.

[P.5] Modi, A., Rajyaguru, N., Aloimonos, Y.& Lin, X. (2024). **DEEP-VLM: Dynamic Exploration and Efficient Policy with Vision-Language Model**. In preparation.

[P.4] Wu, J., Shine, J., Lin, X., & Aloimonos, Y. (2024). **Underwater NeRF with Uncertainty Reduction for Enhanced Exploration**. In preparation.

[P.3] Gaur, A., Kondamudi, P., Duporge, I., Isupova, O., Aloimonos, Y., & Lin, X. (2024). **Automated Blue Whale Detection Using Synthetic VHR Satellite Imagery**. In preparation; planned submission to *Journal of Remote Sensing in Marine Biology*. Elsevier.

[P.2] Palnitkar, A., Surush, A., Duporge, I., Aloimonos, Y., & Lin, X. (2024). **Dual Species Detection: Distinguishing Rhinos and Elephants in VHR Satellite Imagery**. In preparation; planned submission to relevant journal on remote sensing and conservation.

[P.1] Surush, A., Palnitkar, A., Duporge, I., Aloimonos, Y., & Lin, X. (2024). **Simulated Sightings: Synthetic Data for Enhancing Rhino and Elephant Detection in Satellite Imagery**. In preparation; planned submission to relevant journal on synthetic data and conservation technology.

Professional Experience

- **University of Maryland, Perception and Robotic Group[⊕]**   *Sept 2019 - Dec 2024*
  Graduate Research Assistant, Advisor: Yiannis Aloimonos   College Park, Maryland
- **University of Maryland, Autonomous System Lab**   *Sept 2017 - August 2019*
  Graduate Research Assistant, Advisor: Gilmer Blaneknship   College Park, Maryland
- **Budy.bot [⊕], led by CEO Samay Kohil, founder of GreyOrange**   *May 2024 – July 2024*
  Machine Learning Engineer (One of four team members in a $4.2M seed-funded startup)   Palo Alto, CA
  ◦ Led the research and development of Large Language Models (LLMs) tailored for enterprise software, optimizing SaaS-specific tasks through Retrieval-Augmented Generation (RAG) and fine-tuning LLama3 to enhance system efficiency and relevance.
  ◦ Directed the hiring process, including designing and conducting coding and behavioral interviews, and making final hiring decisions to expand the technical team.
  ◦ Mentored junior engineers, providing guidance on machine learning best practices, model fine-tuning, and software engineering workflows.
- **Distat Co. Ltd [⊕]**   *Jan 2021 - Sept 2021*
  Computer Vision Software Engineering(Lead Engineer for this project [G1])   Kennett Square, PA
  ◦ Defined and led the AFRL STTR project to develop accurate industrial component counting algorithms achieving 97% accuracy with synthetic datasets and AWS-based implementation.
  ◦ Led the project from conception to completion, defining the initial problem, conducting a pre-proposal demo, writing the proposal, and executing all stages to deliver the final solution in collaboration.
- **Bosch Automotive Products Co. Ltd [⊕]**   *June 2016 - Aug 2016*
  Robot System Developer Intern   Suzhou, China
  ◦ Designed and showcased an industrial robot system with Fanuc (APAS) robots and Manufacturing Execution System (MES) for the World Manufacturing Conference international exhibitions

Teaching Experience

- **CMSC 426: Computer Vision (Fall 2020)**   *professor: Yiannis Aloimonos[⊕]*
  Teaching Assistant. Topics: Image Processing, Feature Detection, Object Recognition
- **ENEE350: Computer Organization (Spring 2021, 2020, 2019)**   *professor: Yavuz Oruc*
  Teaching Assistant. Topics: Microprocessors, Assembly Language, Computer Architecture
- **ENEE303(H): Analog and Digital Electronics (Fall 2019)**   *Senior lecture: Danilo Romero*
  Teaching Assistant. Topics: Transistors, Amplifiers, Digital Logic Design
- **ENEE408I: Capstone Design Project(Fall 2018, 2019)**   *professor: Gilmer Blankenship*
  Teaching Assistant. Topics: Robotics, Autonomous Systems, Multi-agent Control
- **ENEE380: Electromagnetic Theory (Fall 2018)**   *professor:Dagenais Mario*
  Teaching Assistant. Topics: Maxwell's Equations, Wave Propagation, Electromagnetic Fields

Inivted talks and presentations

- **Where is my Oyster** *November 16th, 2022*
  S₃AM webinar [🌐]
- **MRC Research Symposium** *May 25th - 2023*
  Maryland Robotics Center

Mentoring/Advising

Students Mentored

- **Jiayi Wu,** [**C.5**], [**S.1**], [**P.4**] *2023-current*
  Currently Ph.D. Student at the University of Maryland
- **Aadi Palnitkar,** [**O.3**], [**S.2**], [**P.2**] *2022-current*
  Currently Undergraduate Student at the University of Maryland
- **Kaustubh Joshi,** [**C.4**], [**C.6**] *2022-current*
  Currently Ph.D. Student at the University of Maryland
- **Michael Xu,** [**O.5**], [**O.6**] *2022-current*
  Currently Ph.D. Student at the University of Maryland
- **Hitesh Kyatham,** [**O.5**], [**O.6**] *2023-current*
  Currently Grauduate Student at the University of Maryland
- **Arjun Suresh,** [**S.2**], [**P.1**] *2022-current*
  Currently Undergraduate Student at the University of Maryland
- **Akshaj Gaur,** [**O.4**], [**P.3**] *2021-current*
  Currently graduate Student at the University of Maryland
- **Cheng Liu,** [**C.1**], [**O.4**] *2022-2024*
  Currently Ph.D. Student at George Washington University
- **Vivek Mange,**[**S.2**] *2024-current*
  Currently Graduate Student at the University of Delaware
- **Abhinav Modi,** [**P.5**] *2024-current*
  Currently Senior Computer Vision Engineer at Rivian
- **Yianni Karabatis,** [**C.3**] *2022-current*
  Currently Ph.D. Student at the University of Maryland
- **Yihong Feng,** [**P.6**] *2024-current*
  Currently Graduate Student at University of Arkansas
- **Yashveer Jain,** [**S.3**] *2023-2024*
  Currently Graduate Student at the University of Maryland
- **Adonai Vera ,** [**S.2**] *2023-2024*
  Currently Graduate Student at the University of Cincinnati
- **Abhinav Bhamidipati,** [**S.3**] *2023-2024*
  Currently Robotics Software Intern at Inception Robotics
- **Rashmi Kapu,** [**O.3**] *2023*
  Currently Master's Student at the University of Maryland
- **Mayank Joshi,** [**O.2**] *2021-2022*
  Currently Software Engineer at Caterpillar Inc.
- **Nitesh Jha,** [**O.2**] *2021-2022*
  Currently Systems Engineer at Qualcomm Inc.
- **Krithika Govindaraj, Unblock: Interactive Perception for Decluttering,** master thesis *2019-2021*
  Currently Computer Vision Software Engineer at Niantic Inc.

Students Advised

- **Wei-Yu(Williams) Chen, perception and control for underwater and surface vehicle** *2021-now*
  Currently Ph.D. Student at University of Maryland
- **Yangsheng Xu, Cross-domain Drone Design** *2024-now*
  Currently Graduate Student at University of Maryland
- **Yisheng Zhang, Active Perception for Manipulator** *2024-now*
  Currently Graduate Student at University of Maryland
- **Puneeth Sarma Kondamudi, Multi-modal Perception** *2024-now*
  Currently Graduate Student at University of Maryland
- **Mahima Beltur, Adaptive Sampling for Underwater Environment** *2024-now*
  Currently Graduate Student at University of Maryland
- **Venkata Madhav, Dynamic Obstacle Avoidance for Surface Vehicle** *2024-now*
  Currently Graduate Student at University of Maryland
- **Ashlesha Kumar, Sonar Points Matching** *2023*
  Currently Member of Technical Staff at Salesforce Inc.

- **Pratik Bhujbal**, Underwater Robot and Simulation   *2021-2022*
  Currently Rapyuta Robotics
- **Maaruf Vazifdar**, Underwater Robot and Simulation   *2021-2022*
  Currently Robotics Software Intern at Inception Robotics
- **Bharath Chandra Irigireddy**, Image 2 Image Translation   *2021-2022*
  Currently Machine Learning Engineer at USDA
- **Akash Srinivasan**, Underwater Robot Simulation   *2023-2024*
  Currently undergraduate student at the University of Maryland
- **Akhil Chalamcharla**, Underwater Image Translation   *2023-2024*
  Currently Software Engineer at WorkDay
- Sanjana Mayenkar, Electronics for Building Surface Vehicle   *2023-2024*
  Currently undergraduate student at the University of Maryland
- **Bhavana Rao**, Autonomous Surface Vehicle   *2024*
  Currently graduate Student at the University of Maryland
- **Naveen Anil**, Autonomous Surface Vehicle   *2022-2023*
  Currently Senior Mechanical Engineer at Terrapin Work

Community Engagements

Volunteering Service

- **AI4ALL, University of Maryland summer camp**, Instructor   *Summer, 2019*
- **Robotics Workshop for Zimbabwe High Schoolers at Maryland**, Instructor   *August 1st, 2023*
- **Inception Robotics**, Mentor   *2023 - Present*
- **Maryland Robotics Center, University of Maryland**, Student Ambassador   *2021 - Present*
- **Maryland Day, University of Maryland**, Volunteer   *2017-2024*
- **Senior Capstone Project, University of Maryland Eastern Shore**, Mentor/Sponsor   *Spring, 2022*
- **Summer Undergraduate Research Program (SURP), Salisbury University**, Mentor   *Summer, 2022*
- **Robotics @ Maryland (club of 100+ members)**, Mentor   *2021 - Present*
- **Mechanical Engineering Capstone Class**, Mentor/Sponsor, University of Maryland   *2023 - Present*
- **Maryland Department of Natural Resources**, Collaborator on Oyster Yield Estimation *2024*
- **NOAA Cooperative Oxford Laboratory**, Collaborator on Oyster Yield Estimation   *2024*

Outreach Activities

- **Tour for President Pines**, IDEA Factory at Maryland   *September 6th, 2023*
- **International SeaPerch Challenge (RoboNation)**, Neutral Buoyancy Research Facility *May 13th, 2023*
- **RoboNation Open House**, Robotics Automation Lab, IDEA Factory   *May 13th, 2023*
- **Tour for Clark Foundation**, Robotics Automation Lab, IDEA Factory   *April 25th, 2023*
- **Tour for Congressman Glenn Ivey**, Robotics Automation Lab, IDEA Factory   *July 24th, 2023*
- **Smart Sustainable Aquaculture Management (S3AM) Summit**, Maryland   *Summer, 2022, 2023, 2024*
- **Tours for Governor Moore's Cabinet**, University of Maryland, IDEA Factory   *September 6th, 2024*
- **Korea-U.S. Joint Coordination Panel for Aquaculture Cooperation Tour**, Maryland   *June 27th, 2024*
- **D.C. Science Writers Association Tour of the School of Engineering**, UMD   *November, 2024*
- **Tour for Clearview Regional High School FTC Teams led by coach Kyle Gray**, UMD   *November, 2024*

Academic Service

- **Reviewer of International Journal of Distributed Sensor Networks**   *2023,2024*
- **Reviewer of Robotics automation- Letter**   *2022 - 2024*
- **Reviewer of IEEE International Conference on Robotics and Automation**   *2022 - 2024*
- **Reviewer of IEEE/RSJ International Conference on Intelligent Robots and Systems**   *2022 - 2024*
- **Organizer for PRG Seminar for robotics and computer vision**   *2022 - current*
- **Associate Coordinator for MRC Seminar,** Ioannis Reckletis, Katherina Skinner, Jane Shine   *2020 - current*
- **Computer Vision and Language Reading Group, University of Maryland,** Founder,   *2018 - 2019*

Professional Memberships

- **IEEE, member**, Membership ID: 98616648   *Octorbor, 2022 - Present*
- **Marine Technology Society**, Membership ID: 30892   *Octorbor,2024 - Present*
- **Society for Marine Mammalogy**   *Nov,2024 - Present*

Skills

- **Programming & Development:** Python, C++, JavaScript (React.js), SQL, Docker, Kubernetes, Git, AWS (including SageMaker), and FastAPI
- **Data Science & AI/ML:** PyTorch, TensorFlow, Scikit-learn, Keras, Large Language Models (LLMs), Computer Vision, Robotics, Autonomous Navigation, and Statistical Tools (Pandas, Matlab, PySpark)
- **Tools & Platforms:** Apache Kafka, AWS, Ubuntu, Raspbian, Windows, Blender, Unity, SQL Databases, and Cloud & DevOps (Docker, Kubernetes)

Robots worked with

- **Ground Vehicle**
  - Custom-modified Autonomous Terrain Vehicle
  - Custom-built Autonomous Ground Vehicle
  - Turtlebot
  - DJI Robomaster
- **Aerial Vehicle**
  - Custom-built Autonomous Aerial Vehicle
  - Custom-built Autonomous Drone Capable of Landing on Water.
  - Cross-Domain Drone
- **Underwater Vehicle**
  - 4-H underwater robot
  - BlueROV2 Heavy Configuration.
  - Aqua Robot
- **Water Surface Vehicle**
  - Terpbot (Custom-built Autonomous Surface Vehicle)
- **Humanoid**
  - Nao robot
- **Manipulators**
  - Baxtor
  - Sawyer
  - UR10
  - UR5

References

1. **Prof. Yiannis Aloimonos**
   Professor, Department of Computer Science
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2. **Prof. Miao Yu**
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3. **Prof. Ioannis Rekleitis**
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4. **Prof. Shahriar Negahdaripour**
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