Xiaomin Lin

Doctor of Philosophy,
Maryland Robotics Center (MRC),
Perception and Robotics Group (PRG),
Computer Vision Laboratory (CVL),
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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=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=Preparation, A=Abstract

[P.5] Modi, A., Rajyaguru, N., Aloimonos, Y.& Lin, X. (2024). **Vision-Language Models for Underwater Exploration: Enhancing Autonomous Navigation and Object Analysis**. 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

- **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 international exhibitions, including the World Manufacturing Conference.

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

Mentoring/Advising

- **Jiayi Wu**, [C.5], [S.1], [P.4] *2023-current*
  Currently Ph.D. Student at the University of Maryland
- **Yianni Karabatis**, [C.3] *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
- **Kaustubh Joshi**, [C.4], [C.6] *2022-current*
  Currently Ph.D. Student at the University of Maryland
- **Hitesh Kyatham**, [O.5], [O.6] *2023-current*
  Currently graudate Student at the University of Maryland
- **Aadi Palnitkar**, [O.3], [S.2], [P.2] *2022-current*
  Currently Undergraduate 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
- **Rashmi Kapu**, [O.3] *2023*
  Currently Master's Student at the University of Maryland
- **Cheng Liu**, [C.1], [O.4] *2022-2024*
  Currently Ph.D. Student at George Washington University
- **Nitesh Jha**, [O.2] *2021-2022*
  Currently software engineer at Caterpillar Inc.
- **Mayank Joshi**, [O.2] *2021-2022*
  Currently Systems Engineer at Qualcomm Inc.
- **Krithika Govindaraj**, **master thesis** *2019-2021*
  Currently Computer Vision Software Engineer at Niantic Inc.

Inivted talks and presentations

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

Community Engagements

- **AI4ALL, University of Maryland summer camp**, Volunteer Instructor *summer, 2019*
- **Maryland Day, University of Maryland, Around 80,000 attendance each year**, Volunteer *2019-2024*
- **Senir capstone project, University of Maryland Eastern Shore**, Mentor/Sponsor *Spring, 2022*
- **Summer Undergraduate Research Program (SURP), Salisbury University**, Mentor *Summer, 2022*
- **Smart Sustainable Aquaculture Management (S3AM) summit**, Maryland *2022 - 2024*
- **Robotics @ Maryland (club of 100+ members)**, Mentor *2021 - 2024*
- **Mechanical Engineering Capstone Class**, Sponsor, University of Maryland *2023-2024*
- **Tour for President Pines**, IDEA Factory at Maryland *Sept 6th, 2023*
- **2023 International SeaPerch Challenge (RoboNation)**, Neutral Buoyancy Research Facility *May 13th, 2023*
- **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*
- **Robomaster Workshop**, Robotics Automation Lab, IDEA Factory *Aug 1st, 2023*
- **Tours for Governor Moore's Cabinet**, University of Maryland, IDEA Factory *Sept 6th, 2024*
- **Maryland Department of Natural Resources**, Collaboration on Oyster Yield Estimation *2024*
- **Delaware Department of Natural Resources and Environmental Control**, Oyster Yield Estimation *2024*
- **Korea-U.S. Joint Coordination Panel for Aquaculture Cooperation Tour**, Maryland *June 27th, 2024*
- **NOAA Cooperative Oxford Laboratory, Marine Spatial Ecology Division**, Oyster Yield Estimation*Nov, 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)

References

1. **Prof. Yiannis Aloimonos**
   Professor, Department of Computer Science
   University of Maryland
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2. **Prof. Miao Yu**
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   University of Maryland - College Park
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3. **Prof. Ioannis Rekleitis**
   Professor, Department of Computer Science and Engineering
   University of South Carolina
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4. **Prof. Shahriar Negahdaripour**
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   University of Miami
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5. **Prof. Herbert G. Tanner**
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   University of Delaware
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