

# Parthan Olikkal

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## EDUCATION

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<b>University of Maryland Baltimore County</b>	Baltimore, MD
Ph.D., Computer Science	In-Progress
<i>Thesis: Synergy-based Learning in Human-Robot Interaction</i>	
M.S., Computer Science	2019 - 2021
<i>Thesis: Kinematic and Muscle Synergies in Grasping Hand</i>	
Committee: Ramana Vinjamuri (advisor), Tulay Adali, Nilanjan Banerjee	
<b>Cochin University of Science and Technology</b>	Kochi, India
B.Tech., Computer Science	2013 - 2017

## INDUSTRY EXPERIENCE

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<b>MathWorks</b>	Natick, MA
Engineering Development Group Intern	Summer 2023
Team: Parallel Code Generation	
Supervisor: Zhen Wang, Drew Glaser	
Engineering Development Group Intern	Summer 2022
Team: Embedded Coder and Domain Specific Code Generation	
Supervisor: Jun Yan, Drew Glaser	
<b>IBM</b>	India
Application Developer	Nov 2017 – Jul 2019
Team: Specialized and Distributed ML	
Supervisor: Sandeep Kandoliya, Om Prakash Yadav	

## RESEARCH AREAS

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My research lies at the intersection of artificial intelligence and robotics, with a particular focus on developing intelligent, human-centric systems that integrate perception, control, and cognition. I contribute across three main areas: (1) Perception and Understanding: enabling robust scene interpretation through computer vision, object recognition, and signal processing methods (e.g., image segmentation, feature extraction, dimensionality reduction, and Transformer-based deep learning); (2) Human-AI Interaction: designing intuitive interfaces that bridge human intent and machine action, leveraging Multimodal signals such as EMG and EEG for Brain-Computer Interfaces, Prosthetic Control, and Assistive Exoskeletons; (3) Learning and Control: applying Reinforcement Learning and neural network-based optimization for Dexterous Robot Manipulation, adaptive behavior, and Human-in-the-Loop collaboration.

## AWARDS

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• <b>National I-Corps NSF Grant</b> , NSF	2025
• <b>COEIT Research Award</b> , UMBC	2025
• <b>GSA Professional Development Grant</b> , IEEE ROBIO Travel	2024
• <b>UMBC Financial Aid Scholarship</b> , UMBC	2022

## PUBLICATIONS

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### Preprints

- [18] **Parthan Olikkal**, Chris Dollo, Akshara Ajendla, and Ramana Vinjamuri. “*Reconstructing Hand Gestures with Synergies Extracted from Dance Movements.*” In *Nature, Scientific Reports*, 2025. (under review)
- [17] **Parthan Olikkal**, Habib Ali, Ramana Vinjamuri. “*Hybrid EEG-EMG Transformer Model for Humanoid Robot Control in Center-Out Reaching Task.*” In *IEEE Transactions on Medical Robotics and Bionics*, 2024. (under review)

### Journals and Conferences

- [16] Farshad Safavi, **Parthan Olikkal**, Dingyi Pei, Sadia Kamal, Helen Meyerson, Varsha Penumalee, Ramana Vinjamuri. “*Biomimetic Learning of Hand Gestures in a Humanoid Robot.*” In *Frontiers in Human Neuroscience*, 2024.
- [15] Farshad Safavi, **Parthan Olikkal**, Dingyi Pei, Sadia Kamal, Helen Meyerson, Varsha Penumalee, Ramana Vinjamuri. “*Emerging Frontiers in Human-Robot Interaction.*” In *Journal of Intelligent and Robotics System*, 2024.
- [14] Pooya Chanu Maibam, Dingyi Pei, **Parthan Olikkal**, Ramana Kumar Vinjamuri, Nayan M Kakoty. “*Enhancing prosthetic hand control: A synergistic multi-channel electroencephalogram.*” In *Wearable Technologies*, 2022.
- [13] Dingyi Pei, **Parthan Olikkal**, Tülay Adali, Ramana Vinjamuri. “*Reconstructing Synergy-Based Hand Grasp Kinematics from EEG Signals.*” In *Sensors*, 2022.
- [12] **Parthan Olikkal**, Dingyi Pei, Tülay Adali, Nilanjan Banerjee, Ramana Vinjamuri. “*Data fusion-based musculoskeletal synergies in the grasping hand.*” In *Sensors*, 2022.
- [11] Dingyi Pei, **Parthan Olikkal**, Tülay Adali, Ramana Vinjamuri. “*Dynamical synergies of multi-digit hand prehension.*” In *Sensors*, 2022.
- [10] **Parthan Olikkal**, Branesh M Pillai, Jackrit Suthakorn, Habib Ali, Ramana Vinjamuri. “*A hybrid EEG-EMG framework for humanoid control using deep learning transformers.*” In *IEEE Robotics and Biomimetics*, 2024.
- [9] Sai Praveen Kadiyala, Ke Chen, Ziyang Guo, **Parthan Olikkal**, Andrew Catlin, Ashwin Satyanarayana, Ramana Vinjamuri. “*Novel Hand Gesture Classification based on Empirical Fourier Decomposition of sEMG Signals.*” In *IEEE Engineering in Medicine and Biology Society*, 2023.
- [8] **Parthan Olikkal**, Dingyi Pei, Bharat Kashyap Karri, Ashwin Satyanarayana, Nayan M Kakoty, Ramana Vinjamuri. “*Learning hand gestures using synergies in a humanoid robot.*” In *IEEE Robotics and Biomimetics*, 2023.
- [7] Maibam Pooya Chanu, Dingyi Pei, **Parthan Olikkal**, Ramana Vinjamuri, Nayan M Kakoty. “*Electroencephalogram based Control of Prosthetic Hand using Optimizable Support Vector Machine.*” In *Advances in Robotics*, 2023.
- [6] Dingyi Pei, **Parthan Olikkal**, Tulay Adali, Ramana Vinjamuri. “*Dynamical Synergies in Multi-digit Hand Prehension.*” In *IEEE Engineering in Medicine and Biology Society*, 2023.

- [5] Poomipat Boonyakitanont, Ben Gabrielson, Irina Belyaeva, **Parthan Olikkal**, Jitkomut Songsiri, Yu-Ping Wang, Tony W Wilson, Vince D Calhoun, Julia M Stephen, Tulayi Adali. “*An ICA-based framework for joint analysis of cognitive scores and MEG event-related fields.*” In *IEEE Engineering in Medicine and Biology Society*, 2023.
- [4] **Parthan Olikkal**, Dingyi Pei, Tulay Adali, Nilanjan Banerjee, Ramana Vinjamuri. “*Musculoskeletal synergies in the grasping hand.*” In *IEEE Engineering in Medicine and Biology Society*, 2023.
- [3] Akshara Ajendla, Mahi Patel, **Parthan Olikkal**, Ramana Vinjamuri. “*Mental Health Management Through Wearables and AI Innovation.*” In *Smart Healthcare, Clinical Diagnostics, and Bioprinting Solutions for Modern Medicine*, 2025.
- [2] Farshad Safavi, Dingyi Pei, **Parthan Olikkal**, Ramana Vinjamuri. “*New Horizons in Human-Robot Interaction: Synergy, Cognition, and Emotion.*” In *Discovering the Frontiers of Human-Robot Interaction: Insights and Innovations in Collaboration, Communication, and Control*, 2024.
- [1] Helen Meyerson, **Parthan Olikkal**, Dingyi Pei, Ramana Vinjamuri. “*Human-Robot Interaction-Advances and Applications.*” In *Human-Robot Interaction-Perspectives and Applications*, 2023.

## ACADEMIC EXPERIENCE

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### University of Maryland Baltimore County

Guest Lecturer Spring 2025

CMSC 691 Intro to Brain Computer Interaction

Supervisor: Dr. Ramana Vinjamuri

Graduate Teaching Assistant Spring 2022

CMSC 461 Database Management and Systems

Supervisor: Dr. Konstantinos Kalpakis

Graduate Teaching Assistant Fall 2021

CMSC 641 Design Analysis and Algorithms

Supervisor: Dr. David Chapman

Graduate Assistant Fall 2020, Spring 2021

CMSC 313 Assembly Language and Computer Organization

Supervisor: Ivan Sekyonda

**Reviewer:** Artificial Intelligence Review, IEEE EMBC, Human Movement Science, Journal of Biomechanics, Heliyon, IEEE Access, Medical & Biological Engineering and Computing

### Invited Talks:

- 17/05/2024: "Learning Hand Gestures using Synergies in a Humanoid Robot" The 2nd Workshop on NeuroDesign in Human-Robot Interaction. IEEE ICRA (Virtual)
- 18/03/2022: "Kinematic and Muscle Synergies in Grasping Hand." At BCI & Neurotech Masterclass US Captial Region 1.0 (Virtual). Host: Dr. Christoph Guger

## PROGRAMMING SKILLS

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**Languages/Tools:** Python, MATLAB, SIMULINK, C++, SQL, AWS (Practitioner), Git, RESTful API, Perforce

**Libraries/Frameworks:** PyTorch, ROS2, NumPy, Pandas, Matplotlib, Scikit-learn, SciPy, MediaPipe, OpenCV, Gym, Isaac Lab, Unity,

**Robotic Platforms:** Kinova Gen3 (7 DoFs), Mitra Humanoid (22 DoFs), ArmAble (2 DoFs), g.tec 64-channel EEG HIAMP system, Delsys EMG Avanti Sensors, Wearable Sensing DSI-24 16-channel EEG Headset, g.tec 8-channel EEG UniCorn Hybrid, Inspire-Robots Dexterous Hand