Chandima Fernando

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Curriculum Vitae

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EDUCATION AND EMPLOYMENT HISTORY

Education History

University of Nebraska-Lincoln — Lincoln, NE
Ph.D., Computer Science — Jan 2023
Thesis: Design and Deployment of Resource-Aware Distributed Multi-Agent Algorithms
Advisers: Dr. Justin Bradley and Dr. Carrick Detweiler
Area of Study: Multi-Agent Systems, Distributed Control, Active-Learning

North Dakota State University — Fargo, ND
M.S., Computer Science — May 2016
Thesis: Blood Glucose Prediction Models for Personalized Diabetes Management
Adviser: Dr. Jen Li

University of Colombo - School of Computing — Colombo, Sri Lanka
B.S., Computer Science — February 2014
Thesis: Topic Model Approach to Mood-Based Song Classification Using Lyrics
Adviser: Dr. Ruwan Weerasinghe

Charted Institute of Management Accountants (CIMA), UK — Online
Advanced Diploma in Management Accounting — February 2011

Employment History

Brookhaven National Lab — Upton, NY

- **Post Doctoral Research Associate** — January 2023 – Present
  Manager/Supervisor: Dr. Phil Maffettone
  National Synchrotron Light Source II (NSLS-II)
  Role: Design and implement controllers for a UR3E 6-DOF robot arm + hand-e gripper to pick and place sample holders in front of a "beamline" NSLS-II. Uses Moveit library in ROS2 for control and Bluesky to integrate the designed controllers into the existing scientific experimental workflow at NSLS-II.

University of Nebraska — Lincoln, NE

- **Graduate Research Assistant** — August 2017 – Augues 2022
  School of Computing
  Graduate researcher for the NIMBUS Lab
  Role: Design and implement distributed controllers and learning algorithms for multi-agent Unmanned Areal Systems(UAS). Team member of the project to deploy a multi-agent UAS

system controlled under hierarchical reinforcement learning.

- **Graduate Teaching Assistant**   Spring 2017 and Fall 2021
  School of Computing
  Teaching assistant for undergraduate classes
  Role: Design course material, conduct lectures, and grade student assignments.

North Dakota State University   Fargo, ND

- **Graduate Research Assistant**   June 2015 – May 2016
  Department of Computer Science
  Role: Research on automatic detection of blood glucose levels through the smartphone. Software development of autonomous detection of the signature in an email.

- **Graduate Teaching Assistant**   Jan 2015 - Dec 2016
  Department of Computer Science
  Teaching assistant for undergraduate classes.
  Role: Conduct lab sessions and grade student assignments.

RESEARCH ACCOMPLISHMENTS

Publication Record

Peer Reviewed Journal Publications

[J1] **C. Fernando**, C. Detweiler, and J. Bradley, "Co-regulated consensus of cyber-physical resources in multi-agent unmanned aircraft systems," *Electronics*, vol. 8, no. 5, p. 569, 2019

Peer Reviewed Conference Proceedings

[C1] **C. Fernando**, C. Detweiler, and J. Bradley, "Co-regulated information consensus with delays for multi-agent uas," in *2020 59th IEEE Conference on Decision and Control (CDC)*.   IEEE, 2020, pp. 180–187

[C2] **C. Fernando**, C. Detweiler, and J. Bradley, "Co-regulating communication for asynchronous information consensus," in *2018 IEEE Conference on Decision and Control (CDC)*.   IEEE, 2018, pp. 6994–7001

[C3] J. Li and **C. Fernando**, "Smartphone-based personalized blood glucose prediction," *ICT Express*, vol. 2, no. 4, pp. 150–154, 2016 **(contribution:50%)**

[C4] S. Udalagama, L. Sahabandu, L. Samarkoon, **D. Fernando**, P. Chanthirasegaran, S. Udana, D. Asanga, **C. Fernando**, C. Keppetiyagama, and C. Ranasinghe, "A sustainable mechanism for gathering road traffic data using smart-phones," in *International Conference on Advances in ICT for Emerging Regions (ICTer2012)*.   IEEE, 2012, pp. 224–224 **(contribution:20%)**

[C5] G. Phillips, J. M. Bradley, and **C. Fernando**, "A deployable, decentralized hierarchical reinforcement learning strategy for trajectory planning and control of uav swarms," in *AIAA SCITECH 2024 Forum*, 2024, p. 2761 **(contribution:40%)**

Abstracts and Technical Reports: Other than Peer Reviewed

[C6] **C. Fernando**, E. Zaman, P. a. Q. B. Dawar, and J. Li, "A machine learning - based blood glucose prediction model for personalized diabetes management," *The 10th International Workshop on*

Information Search, Integration, and Personalization (ISIP), 2015

Publications Accepted

[J2] **C. Fernando**, S. Campbell, D. Olds, and P. Maffettone, "Facile integration of robots into experimental orchestration at scientific user facilities," in *ICRA 2024* **(contribution:50%)**

[J3] M. R. Carbone, H. J. Kim, **C. Fernando**, S. Yoo, D. Olds, H. Joress, B. DeCost, B. Ravel, Y. Zhang, and P. M. Maffettone, "Emulating expert insight: A robust strategy for optimal experimental design," *arXiv preprint arXiv:2307.13871*, 2023 **(contribution:5%)**

Publications In Review

[J4] **C. Fernando**, E. Basha, C. Detweiler, and J. Bradley, "Consensus enabled active learning for multi-agent systems in ground classification of wetlands," *Journal of Aerospace Information System*

Publications In Preparation

[J5] **C. Fernando**, C. Detweiler, and J. Bradley, "Analysis on co-regulating communication for asynchronous information consensus."

Reviewer Record

- IEEE Computer Magazine 2022.
- Multidisciplinary Digital Publishing (MDPI) 2021.
- IEEE Conference on Control Technology and Applications (CCTA) 2021.
- IEEE Transactions on Automatic Control (TAC) 2021.
- IEEE Conference on Control Technology and Applications (CCTA) 2020.
- IEEE Conference on Decision and Control (CDC) 2020.
- IEEE Transactions on Control of Network Systems (TCNS) 2020.
- American Control Conference (ACC) 2020.

Significant Project Involvements

Development of co-regulation techniques for multi-agent UASs   *Jan 2017- Jan 2023*

Introduced novel controllers on top of the consensus algorithms to co-regulate the communication rate and inter-agent connectivity in the distributed multi-agent system to achieve the desired level of performance in convergence time and resource utilization. The proposed controllers are robust to communication and controller delay found in real systems. Key contributions include:

- Develop theorems to provide stability and convergence guarantees on proposed co-regulated controllers for consensus algorithms.
- Conduct simulation experiments to measure the effectiveness of the proposed controllers.
- Implement the proposed controllers on a 4-agent UAS system and conduct field experiments.

Development of Consensus Enabled Active Learning   *August 2019 - May 2020*

Led the algorithm design and implementation in a collaboration between the University of Nebraska-Lincoln and the University of the Pacific. The introduction of distributed consensus algorithms into traditional multi-agent deep active learning techniques drastically reduces the cost of communication and the cost of re-training the network. Key contributions include:

- Analyze the existing deep active learning algorithms to select the best acquisition function for consensus-based algorithms.
- Pre-process acquired real-world image data.
- Implement the proposed algorithm in NVIDIA Jetson Xavier NX single-board processor in Python.
- Conduct simulation experiments to quantify the advantages of the proposed method over traditional active learning methods.

Multi-Agent deployment of Hierarchical Reinforcement Learning   *August 2020- present*

Led the algorithm design and implementation in a group project funded through US Army Research Labs to implement a hierarchical reinforcement learning-based linear quadratic integral controller on a swarm of quad-copters. Key contributions include:
- Identify and implement solutions for implementation-specific issues when transferring an algorithm from a simulation-based to a robotic hardware-based.
- Develop code to implement linear quadratic integral controller on a single board computer.
- Pilot remotely controlled quad-copter during the trial phase and field deployment phase.

TEACHING ACCOMPLISHMENTS

Course Descriptions - University of Nebraska - Lincoln, Undergraduate

TA for CSCE 101L: Fundamentals of Computing. This lab sessions-based course is designed to introduce the basics of computer programming for undergraduates whose major is not computer science. The emphasis is on variables, data structures, conditional statements, and functions. Responsibilities included conducting introductory lectures, designing lab sessions, and grading lab sessions.
(Term: Fall 2021, Student Count: 14)

Course Descriptions - North Dakota State University, Undergraduate

TA for CSCI 160: Computer Science 1. This lab session-based course introduces Microsoft tools to freshman and sophomore students. The focus is on Microsoft Word, Excel, and PowerPoint. Responsibilities included conducting lectures, helping students to complete lab assignments, and grading the lab sessions.
(Terms: Spring 2015 | Fall 2015 | Fall 2016, Student Count: 30)

Mentorship Experience

- University of Nebraska-Lincoln   Summer 2019

  Mentored one undergraduate student under the Research Experiences for Undergraduates (REU) and one visiting undergraduate student under the collaboration between the University of Nebraska Lincoln - Yachay Tech University (Ecuador) over the summer of 2019. Topics included research methods, Robot Operating Systems (ROS), multi-copter construction, multi-copter flight operations, multi-drone deployment, and consensus algorithms.

- University of Nebraska-Lincoln   Summer 2022

  Mentored two undergraduate students under the Research Experiences for Undergraduates (REU) over the summer of 2022. Topics included research methods, Robot Operating System (ROS), Docker-based code distribution on multi-agents, multi-copter construction, multi-copter flight operations, multi-drone deployment, and designing multi-purpose landing gear for multi-copters.

- Brookhaven National Lab   Summer 2023

    Mentored one undergraduate student under the Research Experiences for Undergraduates (REU) over the summer of 2023. Topics Robot Operating System 2 (ROS2), Moveit2 robotic arm control library, path planning for robotic arms, and testing of robotic systems.

OTHER ACCOMPLISHMENTS

Academic and Project Awards

- Graduate Student Teaching Fellowship   2021-2022

    Recipient of the competitive scholarship to participate in the Graduate Student Teaching Fellowship program by the College Of Engineering at UNL. The program focuses on evidence-based teaching methods for graduate students who are currently teaching at the post-secondary level.

- Georgia Tech Internet of Things summer school   2018

    Recipient of a scholarship to attend the summer school organized by Georgia Institute of Technology on the Internet of Things.

- TrafficMate: Innovative Android OS-based software for mobile phones that uses the accelerometer and the GPS sensors on the mobile device to identify & inform traffic congestion   2012

    Runners up, National Best Quality Software Awards, Sri Lanka, 2012.
    Country Representation, World Summit Awards, UAE, 2012.
    Country Representation Asia Pacific Information and Communications Technology Award, Brunei, 2012.

Outreach and Teamwork

- NIMBUS Lab representation   2018 - 2019

    Represented the NIMBUS Lab at the UNL Hour of Code Interactive Tech Fair to educate the participants on the importance of robotics and demonstrate how the research at the NIMBUS Lab provides robotic solutions to manage prescribed fires, monitor critically challenged wetlands, and bring user-specific robots through human-robot interaction.

- Volunteer at SL2college   2013 - 2015

    SL2college is a global community that provides free advice and guidance to Sri Lankan students. SL2college was envisioned in 2005 with the primary goal of helping Sri Lankan students access relevant information that would assist them in making informed decisions about their education goals overseas.