# Veera Venkata Ram Murali University of Nebraska-Lincoln, Lincoln, NE - 68502 Krishna Rao Muvva

Curriculum Vitae

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## Areas of Interest

Aerial Robotics, Uncrewed Aerial Systems, Robot Learning, and Machine Vision

## Education

2019-Present Ph.D. in Computer Science, University of Nebraska - Lincoln, Lincoln, USA

Specialization: Aerial Robotics, Autonomous UAVs, and Deep Learning

Advisors : Dr. Marilyn Wolf, and Dr. Santosh Pitla

2022-Present M.S. in Agriculture & Biological Systems Engineering, University of Nebraska -Lincoln, Lincoln, USA

**Specialization**: Autonomous UAVs, and Agriculture UAVs

Advisors: Dr. Santosh Pitla, and Dr. Marilyn Wolf

2019 M.S. in Computer Science, Mississippi State University, Starkville, USA

Specialization: Artificial Intelligence, Robotics, and Augmented Reality Advisors: Dr. Edward Swan, Dr. Yang Zhao, and Dr. Song Zhang

2015 B.Tech in Computer Science & Engineering, Rajiv Gandhi University of Knowledge Technologies, Nuzvid, India

Certificates

2021 Part 107 (UAS) Remote Pilot, Lincoln, Nebraska

# Employment

2016 **Developer**, TreeSignature, Worked as a software developer for a e-commerce company, which was a startup then

2015-2016 Scientific Trainee, Inter University Center for Astronomy and Astrophysics, Worked for processing images taken by Astrosat, which is a space observatory

#### Research

2019-Present Research Assistant, University of Nebraska - Lincoln Advisors - Dr. Wolf, Dr. Pitla

> My research focuses on implementing learning based perception and control for aerial robots, where traditional perception and controller could not offer better solutions. , The following are the main projects I have been involved with for my dissertation

> Learn to Track, Implemented an adaptive CNN-based perception system integrated with control for multirotors, enabling dynamic filter selection to balance latency and accuracy. Combined traditional and reinforcement learning-based control techniques to optimize performance in a UAS-UAS tracking scenario. This approach demonstrated improved tracking accuracy, energy efficiency, and resource optimization compared to baseline methods.

Learn to Localize, Developed a cooperative localization system for GNSS-disrupted environments, addressing challenges in canopy-covered and urban areas. The system integrates CNNs for visual processing and RNNs for temporal dependencies, fusing data from onboard sensors (IMU, barometer, camera) with machine-to-machine communication. This approach enhances localization accuracy and enables robust multi-UAV navigation in close proximity.

**Learn to Evade**, Developed a unified approach for simultaneous trajectory tracking and obstacle avoidance, combining obstacle-aware MPC and deep reinforcement learning-based control strategies. Inspired by biological prey, the camera system provides extensive field coverage, while energy-efficient sensor fusion optimizes resource usage. This approach ensures seamless and efficient UAV navigation in dynamic environments.

**Learn to Endure**, Explored the integration of model-based and model-free control for fixed-wing UAVs to address challenges posed by turbulence. Leveraging established physics for model-based control and data-driven techniques for unpredictable conditions, the project aims to develop a resilient and comprehensive control strategy for UAV operations in turbulent environments.

2017-2019 **Research Assistant**, *Center for Advanced Vehicular Systems*, Mississippi State University Advisors - Dr. Edward Swan, Dr. Yang Zhao, Dr. Song Zhang

Removing broiler mortality using vision based robot arm, This project is about to implement a robot which can remove the dead birds in broiler house and put those in dumpster. I worked for the machine vision part of this project to detect dead chickens in the poultry house, it was published in ASABE.

**Robot Control with Reinforcement Learning**, A physical robot is trained with Q-learning in an augmented reality world. This work is published in IEEE

**Egg Detector**, A CNN based egg detector was implemented to identify the eggs in the given video feed

**Robots for navigation in poultry house**, Ground robots were implemented and programmed to navigate in the poultry house. SuperDroid chassis was used

**Depth Perception in Augmented Reality**, A subject analysis study was conducted to understand the depth perception in augmented reality. The study was conducted using HoloLens. This project was supervised by Dr. Swan. This work is published in IEEE VR and IEEE ISMAR.

## Teaching

Spring 2025 **Applied Robotics in Ag and Natural Environments**, *Co-Instructor*, Biology Systems Engineering, University of Nebraska - Lincoln

Responsibilities, Responsible for teaching Aerial Robotics part of the class (Teaching includes UAV sensors, actuators, Robot Operating Systems (MAVROS), and Control Theory (Feedback Control, PID, MPC). ), and conducting labs

Fall 2024 **Embedded Control Systems for Ag Applications**, *Teaching Assistant*, Biology Systems Engineering, University of Nebraska - Lincoln

**Responsibilities**, Responsible for teaching part of the class (Teaching includes Sensors, Controls, Robot Operating Systems, and Drone Programming etc. ), conducting labs, and grading the home works

Fall 2023 **Embedded Control Systems for Ag Applications**, *Teaching Assistant*, Biology Systems Engineering, University of Nebraska - Lincoln

**Responsibilities**, Responsible for teaching part of the class (Teaching includes Sensors, Controls, Robot Operating Systems, and Drone Programming etc. ), conducting labs, and grading the home works

- Spring 2020 **Data Structures & Algorithms**, *Teaching Assistant*, School of Computing, University of Nebraska Lincoln
  - **Responsibilities**, Responsible for grading the home works, designing final exam, and holding TA hours to answer the questions of students, Class capacity: 60 Students
  - Fall 2019 Data Structures & Algorithms, Teaching Assistant, School of Computing, University of Nebraska Lincoln
    - **Responsibilities**, Responsible for grading the home works, and holding TA hours to answer the questions of students, Class capacity: 60 Students

## **Publications**

#### **Peer-Reviewed Conference Publications**

- [C12] Muvva V.V.R.M.K.R., Yogesh Chawla, Kunjan Theodore Joseph, Santosh Pitla, and Marilyn Wolf, 'Cooperative Localization of UAVs in Multi-Robot Systems Using Deep Learning-Based Detection', AIAA Scitech 2025.
- [C11] Muvva V.V.R.M.K.R., Kunjan Theodore Joseph, Marilyn Wolf, and, Santosh Pitla, 'Reliable AI for UAVs Through Control/Perception Co-Design', In International Conference on Dynamic Data Driven Applications Systems (DDDAS), Springer, 2024. (To appear).
- [C10] Muvva V.V.R.M.K.R., Kunjan Theodore Joseph, CheeTown Liew, Santosh Pitla, and Marilyn Wolf, 'Enhancing Fixed-Wing UAS Autonomy: A ROS2 Package for XPlane', In 2024 IEEE/AIAA 43rd Digital Avionics Systems Conference (DASC), IEEE, 2024.
- [C9] Muvva V.V.R.M.K.R., Kunjan Theodore Joseph, Kruttidipta Samal, Marilyn Wolf and Santosh Pitla, 'Adaptive Perception Control for Aerial Robots with Twin Delayed DDPG', In 2024 Design, Automation & Test in Europe Conference & Exhibition (DATE), pp. 1-6. IEEE, 2024.
- [C8] Muvva V.V.R.M.K.R., Kruttidipta Samal, Justin Bradley and Marilyn Wolf, 'A Closed Loop Perception Subsystem for small Unmanned Aerial Systems', AIAA Scitech 2023, p.2673, AIAA 2023.
- [C7] Muvva V.V.R.M.K.R., Guoming Li, and Marilyn Wolf, 'Autonomous UAV Landing on a Moving UAV using MachineLearning', AIAA Scitech 2022 p.0789, AIAA 2022.
- [C6] Farzana Alam Khan, Muvva V.V.R.M.K.R., Dennis Wu, Mohammed Safayet Arefin, Nate Phillips, and J. Edward Swan. 'Measuring the Perceived Three-Dimensional Location of Virtual Objects in Optical See-Through Augmented Reality.' In 2021 IEEE International Symposium on Mixed and Augmented Reality (ISMAR), pp. 109-117. IEEE, 2021.
- [C5] Muvva V.V.R.M.K.R., Justin M. Bradley, Marilyn Wolf, and Taylor Johnson, 'Assuring Learning-Enabled Components in Small Unmanned Aircraft Systems', AIAA Scitech 2021 Forum, p. 0994.2021.
- [C4] Muvva V.V.R.M.K.R., Yang Zhao, Pratik Parajuli, Song Zhang, Tom Tabler, 'Automatic Identification of Broiler Mortality using Image Processing Technology' 10th International Livestock Environmental Symposium, ASABE, Omaha, NE, September 2018.
- [C3] Muvva V.V.R.M.K.R., Naresh Adhikari, Amritha Ghimire, 'Towards Training an Agent in Augmented Reality World with Reinforcement Learning' International Conference on Control, Automation, and Systmes, IEEE - Robotics and Automation Society, Jeju, Korea, October 2017.
- [C2] Muvva V.V.R.M.K.R. 'A Collaborative Filtering Recommender System with Randomized Learning Rate and Regularized Parameter' presented at International Conference on Current Trends in Advanced Computing, IEEE, Bangalore, India, March 2016.

[C1] Duvvuri D.N., Muvva V.V.R.M.K.R. 'A Novel Method To Achieve Optimization in Facial Expression Recognition Using HMM' presented at International Conference on Signal Processing And Communication Engineering, IEEE, Guntur, India, January 2015.

#### **Peer-Reviewed Workshop Publications**

- [W2] Muvva V.V.R.M.K.R., Martin Rapp, Joerg Henkel, Hussam Amrouch, and Marilyn Wolf, 'On the Effectiveness of Quantization and Pruning on the Performance of FPGAs-based NN Temperature Estimation'. In 2021 ACM/IEEE 3rd Workshop on Machine Learning for CAD (MLCAD), pp. 1-7. IEEE, 2021.
- [W1] Farzana Alam Khan, Muvva V.V.R.M.K.R., Dennis Wu, Mohammed Safayet Arefin, Nate Phillips, and J. Edward Swan. 'A Method for Measuring the Perceived Location of Virtual Content in Optical See Through Augmented Reality.' In 2021 IEEE Conference on Virtual Reality and 3D User Interfaces Abstracts and Workshops (VRW), pp. 657-658. IEEE, 2021.

#### Other Peer-Reviewed Presentations without Publications

- [O2] Veera Venkata Ram Murali Krishna Rao Muvva, Kunjan Theodore Joseph, and Santosh Pitla. 'Obstacle Aware Flight Planning with Optimal Control for UAV to Track Dynamic Trajectory' Workshop on Present and Future of Agricultural Robotics and Technologies: Academic and Industry Perspectives at International Conference on Intelligent Robots and Systems (IROS), 2023.
- [O1] Kunjan Theodore Joseph, Ankita Kalra, Veera Venkata Ram Murali Krishna Rao Muvva, Amlan Balabantaray, Shaswati Behera, and, CheeTown Liew. 'CottonHusker: Deep learning enabled robot for real-time automated cotton picking.' Workshop on Agricultural Robotics for a Sustainable Future at International Conference on Intelligent Robots and Systems (IROS), 2023.

#### **Awards**

- Graduate Student Travel Award, University of Nebraska Lincoln, for AUVSI XPONEN-TIAL - 2025
- Graduate Student Travel Award, University of Nebraska Lincoln, for AIAA 2025
- Splinter's Fellowship Award, University of Nebraska Lincoln, 2024
- Conference Fund, School of Computing, University of Nebraska Lincoln, for AIAA -2022
- Chancellor's Fellowship Award, University of Nebraska Lincoln, 2019
- Student Research Travel Award, Mississippi State University, for IELSX 2018
- Conference Fund, Dept of Computer Science & Engineering, Mississippi State University, for ICCAS - 2017

#### **Achievements**

- Accepted for Design, Automation, and Test in Europe (DATE) PhD Forum, 2025
- Got selected for the Nebraska I-Corps (Great Lakes region of NSF I-Corps) program
- Got selected for American Institute of Aeronautics and Astronautics (AIAA) Idea Challenge, AIAA SciTech, 2025
- Got selected for CPS Rising Stars Workshop (36 members got selected out of 220 applicants) awarded and sponsored by National Science Foundation (NSF), ACM SIGBED, & University of Vriginia, 2024

- 2nd place in Division Speech Contests, District 24, Toastmasters, 2024
- o 1st place in Area Speech Contests, District 24, Toastmasters, 2024
- Triple Crown Achievement, Toastmaters, 2023
- 1st place (Team) in Advanced Robotics Competition , ASABE Robotics Competition, 2022
- 3rd place in Most Educational Level Achievements, Toastmaters, 2021
- Triple Crown Achievement, Toastmaters, 2021
- Triple Crown Achievement, Toastmaters, 2021
- Outstanding member, Toastmasters, 2020
- Triple Crown Achievement, Toastmaters, 2020
- Selected for RGUKT 6 year integrated B.Tech course among all the SSC pass students in our state.
- Got 4th rank in the ranking system of SYSS, whose aim is to identify the rural background merit students.

## Media Coverage

- Research Shows How Al-Driven Systems Enhance Drone Functionality, Featured in Commercial UAV News, Dec 2024.
- O UNL Robotics Team, Featured in ASABE Nebraska section newsletter, Aug 2022.
- Student robotics team takes first at international competition, Featured in Bits and Bytes (UNL School of Computing News), Aug 2022.
- Student robotics team takes first at international competition, Featured in UNL News, Aug 2022.
- Spotlight on a Toastmaster, Featured in Double Dozen (District 24 Toastmasters News Letter), October 2021.
- Improving Virtual Reality, Featured in Mississippi State University's State Spotlight, January 2019.

## Leadership

#### **AIAA**

- Member of American Institute of Aeronautics and Astronautics (AIAA) ncrewed and Autonomous Systems Integration Committee (UASIC), May 2025 - Present
- Friend of American Institute of Aeronautics and Astronautics (AIAA) Intelligent Systems
   Technical Committee (ISTC), Jan 2024 Present

#### IEEE

- IEEE Nebraska Computers Chapter Chair, Jan 2024 Present
- o IEEE Nebraska Computers Chapter Vice Chair, Jan 2021 Dec 2023
- Judge, Nebraska High School State Robotics Championship, 2022
- Judge, Greater Nebraska Science and Engineering Fair (GNSEF), 2021

#### **Toastmasters**

- O Division Director, Division C District 24, Jul 2022- Jun 2023
- President, EC Speakers Toastmasters, Jul 2022 Jun 2023
- O Silent Auction & Raffle Chair, District 24 Toastmasters Conference, 2023
- O Area Director, C23 District 24, Jul 2021 Jun 2022

- O President, Capitol Voices Club, Jul 2021 Jun 2022
- O President, Strictly Speaking Club, Jul 2021 Jun 2022
- Promotions and Advertising Lead, District 24 Toastmasters Conference, 2022
- Judge, Area Speech Contest, District 24 Toastmasters, 2022
- O Co-Contest Chair, Area C21 & C23 Speech contest, 2022
- Vice President (Public Relations), Lincoln Toastmasters Club, Jul 2021 Sep 2021
- Co-Contest Chair, Area C21 & C24 Speech contest, 2021
- O Area Director, C24 District 24, Jul 2020 Jun 2021
- O Vice President (Education), Capitol Voices Club, Jul 2020 Jun 2021
- Vice President (Education), Strictly Speaking Club, Jul 2020 Jun 2021
- O Vice President (Membership), Capitol Voices Club, Nov 2019 Jun 2020

#### Grants

- Helping co-authors for the grant writing of Design and Control of Bio-Inspired Flapping-Wing Robots for Autonomous Operations in Dynamic Environments, under writing - NSF
- Helped co-authors for the grant writing of In-Situ Perception and Energy-aware,
   Coordinated Weed Treatment with Uncrewed Swarms (InSPECTS), under review
   NSF
- Helped co-authors for the grant writing of Context-Aware Federated Learning for Ag-Inspired Aerial and Ground Swarms (FLAIR), under review - NSF
- Helped co-authors for the grant writing of Metafarm A Digital Twin In Support Of Field Autonomy For Ground And Aerial Agricultural Robots, under review - USDA

## Services

#### Conference Organization

Member of 2025 IEEE Digital Avionics Systems Conference Technical Committee

## Journals / Magazine Paper Reviewer

- IEEE Transactions on Automation Science and Engineering (T-ASE)
- IEEE Computer
- Multidisciplinary Digital Publishing Institute (MDPI)
- Journal of American Society of Agricultural and Biological Engineers
- Computers and Electronics in Agriculture

## Conferences Paper Reviewer

- American Institute of Aeronautics and Astronautics (AIAA) Scitech Intelligent Systems
   Sessions Best Paper Selection, 2025
- IEEE International Conference on Unmanned Aircraft Systems (ICUAS), 2025
- IEEE / AIAA Digital Avionics Systems Conference (DASC), 2025
- American Institute of Aeronautics and Astronautics (AIAA) Scitech forum, 2023, 2022
- o IEEE International Symposium on Mixed and Augmented Reality, 2019, 2024
- o IEEE Conference on Virtual Reality and 3D User Interfaces, 2018

#### **Toastmasters**

Club Mentor, Ameritas Toastmasters, Nov 2023 - Present

## **Talks**

- O"Cooperative Localization of UAVs in Multi-Robot Systems Using Deep Learning-Based Detection", UNL Graduate Symposium, University of Nebraska-Lincoln, February 2025.
- "Towards Co-Design of Perception and Control for UAS-UAS Tracking", UNL Graduate Symposium, University of Nebraska-Lincoln, February 2022.
- o"Towards Co-Design of Deep learning based perception and Feedback Control", UNL Autonomous Agent Workshop, University of Nebraska-Lincoln, March 2021.

#### Selected Toastmasters Talks

- o"Learn to Fly: Enabling Deep Learning based perception and Control in Aerial Robotics", Capitol Voices, Lincoln, February 2023.
- o"Autonomous UAV to UAV Landing", Capitol Voices, Lincoln, December 2021.
- o"Implementing UAS-UAS Tracking with Deep Learning", Strictly Speaking, Lincoln, October 2020.
- o"Towards Co-Design of Perception & Control for UAS-UAS Tracking", EC Speakers, Lincoln, September 2020.
- "Automatic Broiler Mortality Identification using Computer Vision", Lincoln Toastmasters, Lincoln, March 2020.
- o"Artificial Intelligence: A Friend or Foe?", Capitol Voices, Lincoln, November 2019.

## Panelist and Moderation

#### Moderator

- Moderator for the speech "How Do We Keep the Lights On When Everyone Has Access To The Switch?" given by Wally Magda (CEO and Owner of WallyDotBiz LLC) at IEEE Nebraska webinars, Nov 2024.
- Moderator for the speech "Design Of Insect-Inspired Flying Robots and their Potential Applications." given by Matěj Karásek (Founder & Director, Flapper Drones) at IEEE Nebraska webinars, Apr 2024.
- Moderator for the speech "Overview of Commercial Applications and ROI by using Data from Autonomous small Uncrewed Aircraft Systems." given by Conor Ferguson (CEO & President, Wispr Systems) at IEEE Nebraska webinars, Apr 2023.
- Moderator for the speech "How the Social Network of Knowledge Leads to Scientific Truth" given by Dr. Edward Swan (Professor, Department of Computer Science & Engineering, Mississippi State University) at IEEE Nebraska webinars, Oct 2022.
- Moderator for the speech "Environment Mapping and Urgent Landing Planning for Low-Altitude UAS Operations" given by Dr. Ella Atkins (Head of the Dept of Aerospace & Ocean Engineering, Virigina Tech, Former Professor, Dept of Aerospace Engineering, University of Michigan Ann Arbor) at IEEE Nebraska webinars, Sep 2022.
- Moderator for the speech "Closed Loop Perception for Resource Efficient Autonomous Systems" given by Dr. Kruttidipta Samal (PostDoc, School of Computing, University of Nebraska - Lincoln) at IEEE Nebraska webinars, March 2022.
- Moderator for the speech "Towards Robust Localization and Mapping in Challenging Conditions" given by Dr. Sebastian Scherer (Associate Research Professor, Robotic Institute, Carnegie Mellon University) at IEEE Nebraska webinars, Oct 2021.

- Moderator for the speech "FPGAs: Current Offerings and Future Opportunities" given by Dr. Miriam Leeser ( Professor, Dept of Electrical and Computer Engineering, Northeaster University) at IEEE Nebraska webinars, Sep 2021.
- Moderator for Presidential and Vice President Election debate at Lincoln Toastmasters, Apr 2021.
- Moderator for panel discussion on "Leadership", Aug 2020. The panel members are 1. Claire Titus - Divsion C Director, D24 Toastmasters, 2. Stacy Carlson - CEO and Founder of Netizenly, 3. Candi Sanders - Assistant Vice President, Union Bank, 4. Kate High - Supervisor, Nebraska Dept of Health Service; Board Member, Nebraska League of Women Voters.

#### **Panelist**

- Served as panelist for the panel "How to grow hobbies", moderated by Dr. Tania Biswas, Oct 2020
- Served as panelist for the panel "Mindfullness", moderated by Dr. Kristin Malek, Jul 2020.

## Research Mentorship

O Greyson Howard, Mississippi State University, Fall 2017

## Technical Skills

Programming Python, C++, C, C#, Java

Packages PyTorch, TensorFlow, OpenCV, ROS1, ROS2, Keras, AirSim, Gazebo, ArduPilot, Solid-Works, Matlab, R, Unreal, Unity, Vuforia

Web & Server HTML, JavaScript, PhP, MySQL

Operating Windows, Linux (Ubuntu, Kubunut, Linux Mint, Fedora)
Systems

## **Memberships**

- Member of the Upsilon Pi Epsilon International Honor Society for Computing and Information Disciplines
- Student member of IEEE
- Student member of IEEE Aerospace & Electronics Systems Society
- Student member of IEEE Computer Society
- Student member of IEEE Control Systems Society
- O Student member of IEEE Robotics & Automation Society
- Student member of IEEE Young Professionals
- Member of IEEE Robotics and Automation (RAS) Technical committee on Aerial Robotics And Unmanned Aerial Vehicles
- Student Member of Association for Computing Machinery (ACM)
- Student Member of American Institute of Aeronautics and Astronautics (AIAA)
- Member of Academy of Model Aeronautics (AMA)
- O Student member of American Society of Agricultural and Biological Engineers (ASABE)
- Member of Association for Uncrewed Vehicle Systems International (AUVSI)
- Member of Air & Space Force Association (AFA)

# Extra Academic Activites

- I am also curious to write stories. One of my friends and I are working on a fantasy novel called 'Haesthiya'.
- O Active member of Capitol Voices (Toastmasters Club), Sep 2019 Present
- O Active member of E.C. Speakers ( Toastmasters Club), Jun 2020 Sep 2023
- Active member of Strictly Speaking (Advanced Toastmasters Club), Apr 2020 Sep 2022
- O Active member of Lincoln Toastmasters (Toastmasters Club), Jan 2020 Sep 2021