## *Yu Gu, Ph.D.,*

Interactive Robotics Laboratory (IRL)
Professor, Department of Mechanical and Aerospace Engineering
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WVU Robotics – IRL – Blog – YouTube – Google Scholar

### Highlights

- Research published in 120 papers and featured in more than 160 media stories.

- Winner of five international robotics competitions, along with a $855k cumulative prize from NASA Centennial Challenges.

- PI of 12 externally funded projects and co-PI of 10 projects, with total budget over $10M.

- A coordinator for the initiation of the WVU Robotics Program.

- Instructor for 10 (including 6 new) courses, with an average student evaluation of 4.6/5.0.

- Mentored 27 students to win 52 fellowships, scholarships, or recognitions.

### Research Interests

*Long-term goal:* improve robots' ability to function in increasingly complex environments and situations, leading to "*lifelike*" behaviors.

*Applications:* planetary exploration, robotic pollination, safety.

### Education

Ph.D. in Aerospace Engineering, WVU, Dec 2004. Advisor: Prof. Marcello R. Napolitano. Dissertation: "Design and Flight-Testing Actuator Failure Accommodation Controllers on WVU YF-22 Research UAVs."

M.S. in Control Engineering, School of Electronic Information and Electrical Engineering, Shanghai Jiao Tong University, Feb 1999. Advisor: Prof. Zhiming Wu.

B.S. in Automatic Controls, Shanghai University, Jun 1996.

## Professional Experiences

Professor, Department of Mechanical & Aerospace Engineering (MAE), WVU (2023 – present).

Adjunct Faculty, Lane Department of Computer Science and Electrical Engineering, WVU (2012 – present).

Associate Professor, Department of Mechanical & Aerospace Engineering (MAE), WVU (2017 – 2023).

Assistant Professor, MAE Department, WVU (2012 – 2017).

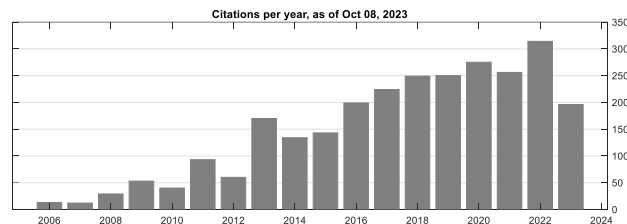Consultant, Kutta Technologies, Phoenix AZ (2008).

Research Assistant Professor, MAE Department, WVU (2005 – 2012).

## Google Scholar Profile (as of Oct. 08, 2023)

Citations:   2,769
h-index:     29
[Google Scholar](#)

**Citations per year, as of Oct 08, 2023**

## Awards and Honors

1st Place (among 104 teams from 15 countries), 2023 University Rover Challenge (URC), team faculty advisor, Jun 2023.

Researcher of the Year, 2021-2022, WVU Statler College of Engineering and Mineral Resources, Apr 2022.

6th Place, NASA Space Robotics Challenge Phase 2 Centennial Challenge ($30k + $15k prize), team member (team lead: Dr. Jason Gross), Sep 2021.

NASA Innovative Advanced Concepts (NIAC) Fellow, Apr 2019.

Big XII Faculty Fellow 2018-2019, WVU, Jun 2018.

Excellence in Research Senior Level, 2017-2018, WVU Statler College, Mar 2018.

Recognition for Mountaineer Values, WVU's 150th Anniversary Celebration, Feb 2018.

Final Challenge (*$750,000 Prize*) Winner, team leader, NASA Centennial Challenge (Sample Return Robot Challenge), Sep 2016.

Best Paper Award, Track B: Perception for Autonomous and Semi-Autonomous Systems, IEEE/ION PLANS 2016, Apr 2016.

Excellent Reviewer, AIAA Journal of Guidance, Control, and Dynamics, 2015 – 2016.

Robotics Team Recognition by NASA & US Senators in the Capital, DC, Sep 2015.

Level-2 Challenge (*$100,000*) Winner, team leader, NASA Centennial Challenge, Jun 2015.

Outstanding Researcher, 2014-2015, WVU Statler College, Mar 2015.

Level-1 Challenge Winner and Technology Achievement Award, team leader, NASA Centennial Challenge, Jun 2014.

First Place (Joe Kosmo) Award, NASA Robotic Mining Competition, team co-advisor (team advisor: Dr. Powsiri Klinkhachorn), Jun 2014.

## Publication: Journal Articles

1. Pooley, A., Gao, M., Sharma, A., Barnaby, S., Gu, Y., Gross, J., "Analysis of UAV Thermal Soaring Energy Management via Hawk-inspired Swarm Interaction," Biomimetics, 8(1), 124; Mar 2023 (IF: 3.7).

2. Kilic, C., Gu, Y., Gross, J., "Proprioceptive Slip Detection for Planetary Rovers in Perceptually Degraded Extraterrestrial Environments," Field Robotics. 2, 1754–1778. DOI: 0.55417/fr.2022054. Aug 2022.

3. Chen, Y., Yang, C., Gu, Y., Hu, B., "Influence of Mobile Robots on Human Safety Perception and System Productivity in Wholesale and Retail Trade Environments: A Pilot Study," IEEE Transactions on Human-Machine Systems, May 2022 (IF: 3.4).

4. Kilic, C., Martinez, B., Tatsch, C., Beard, J., Strader, J., Das, S., Ross, D., Gu, Y., Pereira, G., Gross, J., "NASA Space Robotics Challenge 2 Qualification Round: An Approach to Autonomous Lunar Rover Operations," IEEE Aerospace and Electronic Systems Magazine, Dec 2021 (IF: 1.6).

5. Yang, C., Strader, J., Gu, Y., "A Scalable Framework for Map Matching based Cooperative Localization," Sensors, Sep 2021 (IF: 3.6).

6. Hedrick, G., Gu, Y., "Terrain-Aware Traverse Planning for a Mars Sample Return Rover," Advanced Robotics, July 2021 (IF: 1.7).

7. Smith, T., Chen, Y., Hewitt, N., Hu, B., Gu, Y., "Socially Aware Robot Obstacle Avoidance Considering Human Intention and Preferences," Springer International Journal of Social Robotics, July 2021 (IF: 5.1).

8. Petrillo, M., Beard, J., Gu, Y., Gross, J., "Search Planning of a UAV/UGV Team with Localization Uncertainty in a Subterranean Environment," IEEE Aerospace and Electronic Systems Magazine, June 2021 (IF: 1.6).

9. Kilic, C., Ohi, N., Gu, Y., Gross, J., "Slip-Based Autonomous ZUPT through Gaussian Process to Improve Planetary Rover Proprioceptive Localization," IEEE Robotics and Automation Letters, Mar 2021 (IF: 3.7).

10. Hedrick, G., Ohi, N., Gu, Y., "Terrain-Aware Path Planning and Map Update for Mars Sample Return Mission," IEEE Robotics and Automation Letters, Jun 2020 (IF: 3.7).

11. Yang, C., Strader, J., Gu, Y., Canciani, A., Brink, K., "Cooperative UAV Navigation using Magnetic Anomaly Measurements and Limited Inter-Vehicle Ranging Information," AIAA Journal of Aerospace Information Systems, Jun 2020 (IF: 1.0).

12. Tian, P., Chao, H., Flanagan, P., Hagerott, S., Gu, Y., "Design and Evaluation of UAV Flow Angle Estimation Filters," IEEE Transactions on Aerospace and Electronic Systems, Vol.: 55, Issue: 1, Feb 2019 (IF: 4.6).

13. Gu, Y., Strader, J., Ohi, N., Harper, S., Lassak, K., Yang, C., Kogan, L., Hu, B., Gramlich, M., Kavi, R., Gross, J., "Robot Foraging: Autonomous Sample Return in a Large Outdoor Environment," IEEE Robotics and Automation Magazine, Vol.: 25, Issue: 3, Sep 2018 (IF: 4.3).

14. Gu, Y., Ohi, N., Lassak, K., Strader, J., Kogan, L., Hypes, A., Harper, S., Hu, B., Gramlich, M., Kavi, R., Watson, R., Cheng, M., Gross, J., "Cataglyphis: An Autonomous Sample Return Rover," Journal of Field Robotics, 35(2), 248-274, Mar 2018 (IF: 4.3).

15. Rhudy, M., Gu, Y., Gross, J., and Chao, H. "Onboard Wind Velocity Estimation Comparison for Unmanned Aircraft Systems," IEEE Transactions on Aerospace and Electronic Systems, Volume: 53, Issue: 1, Feb 2017 (IF: 2.7).

16. Chao, H, Gu, Y., Gross, J., Rhudy, M., and Napolitano, M., "Flight-Test Evaluation of Navigation Information in Wide-Field Optical Flow," AIAA Journal of Aerospace Information Systems, doi: 10.2514/1.I010482, Nov 2016 (IF: 1.4).

17. Mandal, T., and Gu, Y., "Analysis of Pilot-Induced-Oscillation and Pilot Vehicle System Stability Using UAS Flight Experiments," Aerospace, 2016, 3(4), 42; doi: 10.3390/aerospace3040042, Nov 2016.

18. Gross, J., Watson, R., D'Urso, S., and Gu, Y., "Flight-Test Evaluation of Kinematic Precise Point Positioning of Small UAVs," International Journal of Aerospace Engineering, Volume 2016, Article ID 1259893, 2016.

19. Rice, C., Gu, Y., Chao, H., Larrabee, T., Gururajan, S., Napolitano, M., Mandal T., and Rhudy M., "Autonomous Close Formation Flight Control with Fixed Wing and Quadrotor Test Beds," International Journal of Aerospace Engineering, Volume 2016, Article ID 9517654, 2016.

20. Gross, J., Gu, Y., and Rhudy, M., "Fixed-Wing UAV Attitude Estimation using Single Antenna GPS Signal Strength Measurements," Aerospace, 3(2), 14; doi:10.3390/aerospace3020014, May 2016.

21. Gu, Y., Gross, J., Rhudy, M., and Lassak, K, "A Fault-Tolerant Multiple Sensor Fusion Approach Applied to UAV Attitude Estimation," International Journal of Aerospace Engineering, Vol. 2016, Article ID 6217428, 2016.

22. Rhudy, M., Fravolini, M.L., Gu, Y., Napolitano, M., Gururajan, S., and Chao H., "Aircraft Model Independent Airspeed Estimation without Pitot Tube Measurements," IEEE Transactions on Aerospace and Electronic Systems, 51(3):1980-95, Jul 2015.

23. Rhudy, M., Gu, Y., Chao, H., and Gross, J., "Unmanned Aerial Vehicle Navigation Using Wide-Field Optical Flow and Inertial Sensors," Journal of Robotics, Volume 2015, Article ID 251379, Oct 2015.

24. Gross, J., Gu, Y., and Rhudy, M., "Robust UAV Relative Navigation with DGPS, INS, and Peer-to-Peer Radio Ranging," IEEE Transactions on Automation Science and Engineering, Volume 12, Issue 3, Jan 2015.

25. Chao, H., Gu, Y., and Napolitano, M., "A Survey of Optical Flow Techniques for Robotics Navigation Applications," Journal of Intelligent & Robotic Systems, Volume 73, Issue 1-4, pp 361-372, 2014.

26. Rhudy, M., and Gu, Y., "Online Stochastic Convergence Analysis of the Kalman Filter," International Journal of Stochastic Analysis, vol. 2013, Article ID 240295, 9 pages, 2013. doi:10.1155/2013/240295.

27. Rhudy, M., Gu, Y., and Napolitano, M., "An Analytical Approach for Comparing Linearization Methods in EKF and UKF," International Journal of Advanced Robotic Systems, Vol. 10, No. 208, 2013.

28. Rhudy, M., Gu, Y., Gross, J., Gururajan, S., and Napolitano, M., "Sensitivity Analysis of Extended and Unscented Kalman Filters for Attitude Estimation," AIAA Journal of Aerospace Information Systems, Vol. 10, No. 3, pp. 131-143, Mar 2013.

29. Gross, J., Gu, Y., Rhudy, M., Gururajan, S., and Napolitano, M., "Flight Test Evaluation of Sensor Fusion Algorithms for Attitude Estimation," IEEE Transactions on Aerospace and Electronic Systems, vol.48, no.3, pp.2128-2139, Jul 2012.

30. Rhudy, M., Gu, Y., Gross, J., and Napolitano, M., "Evaluation of Matrix Square Root Operations for UKF within a UAV-Based GPS/INS Sensor Fusion Application," International Journal of Navigation and Observation, Article ID 416828, oi:10.1155/2011/416828, 2011.

31. Sagoo, G. K., Gururajan, S., Seanor, B., Napolitano, M., Perhinschi, M., Gu, Y., Campa, G., "Evaluation of a Fault Tolerant Scheme in a 6-DOF Motion Flight Simulator", AIAA Journal of Aerospace Computing, Information and Communication, doi: 10.2514/1.42299, Vol. 7, No. 2, 2010.

32. Mammarella, M., Campa, G., Napolitano, M., Fravolini, M., Perhinschi, M., and Gu, Y., "Machine Vision / GPS Integration Using EKF for the UAV Aerial Refueling Problem," IEEE Transactions on Systems, Man, and Cybernetics, Part C: Applications and Reviews, Vol. 38, No. 6, pp.791-801, Nov 2008.

33. Campa, G., Gu, Y., Seanor, B., Napolitano, M., Pollini, L., and Fravolini, M., "Design and Flight Testing of Nonlinear Formation Control Laws," Control Engineering Practice, Vol. 15, No. 9, pp 1077-1092, Sep 2007.

34. Gu, Y., Seanor, B., Campa, G., Napolitano, M., Rowe, L., Gururajan, S., Perhinschi, M.G., and Wan, S., "Design and Flight Testing Evaluation Of Formation Control Laws," IEEE Transactions on Control Systems Technology, Vol.14, No. 6, pp. 1105-1112, Nov 2006.

35. Campa, G., Fravolini, M.L., Seanor, B., Napolitano, M., Del Gobbo, D., Gu, Y., and Gururajan, S., "On-Line Learning Neural Networks for Sensor Validation for the Flight Control System of a B777 Research Aircraft Model," International Journal of Robust and Non-Linear Control, Vol. 12, pp. 987-1007, Sep 2002.

36. Gu, Y., Wu, Z.M., and Jiang, Z.P., "The Rebuilding Process of Hybrid RAID," Micro Computer Systems (in Chinese), Vol. 15, No. 2, pp. 44-46, Feb 1999.

## Publication: Refereed Conference Proceedings

37. Smith, T., Butts, M., Adkins, N., Gu, Y., "Swarm of One: Bottom-up Emergence of Stable Robot Bodies from Identical Cells," IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2023, Oct 2023.

38. Mera-Trujillo, M., Patel, S., Gu, Y., Doretto, G. "Self-supervised Interest Point Detection and Description for Fisheye and Perspective Images," IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) (pp. 6497-6506), Jun 2023.

39. Tatsch, C., Bredu, J., Covell, D., Tulu, I., Gu, Y., "Rhino: An Autonomous Robot for Mapping Underground Mine Environments," IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM). Jun 2023.

40. Jacobs, S, Gu, Y., "Autonomous Soaring Simulation and Glider System Development Presentation format: Poster Presentation," 2023 International Conference on Unmanned Aircraft Systems (ICUAS). Jun 2023.

41. Rahman, IM, White, S., Crockett, K., Gu, Y., Dutra, DAA, Pereira G., "Imitating Swarm Behaviors by Learning Agent-Level Controllers," 2023 American Control Conference (ACC). May 2023.

42. Yerebakan, M. O., Chen, Y., Tatsch, C. A., Gu, Y., Hu, B., "Factors that Affect Acceptance of Agricultural Related Robotic or Wearable Technology by Agricultural Stakeholders: A Pilot Survey," 2022 IEEE 3rd International Conference on Human-Machine Systems (ICHMS) (pp. 1-6). IEEE. Nov 2022.

43. Smith, T., Gutierrez, E., Bredu, J., Gu, Y., Gross, J., "Cooperative Localization of Swarm Robots using Adaptive Boid's Rules," Proceedings of ION GNSS+, (pp. 2927-2940), Sep 2022.

44. Curtis, R., Dooty, E.N., Raisa, S.A., Gross, J., Gu, Y., "Human-Swarm Interaction Robotics as Context for Training Diverse Undergraduate Researchers," 2022 ASEE Annual Conference & Exposition, Aug 2022.

45. Chen, Y., Smith, T., Hewitt, N., Gu, Y., Hu, B., "Effects of Human Personal Space on the Robot Obstacle Avoidance Behavior: A Human-in-the-loop Assessment," In Proceedings of the Human Factors and Ergonomics Society Annual Meeting, Sep 2021.

46. Hedrick, G., Covell, D., Gu, Y., "In-Situ Terrain Analysis for Planetary Rovers," International Society for Terrain-Vehicle Systems (ISTVS) 20th International and 9th Americas Conference, 2021.

47. Chen, Y., Yang, C., Song, B., Gonzalez, N., Gu, Y., Hu, B., "Effects of Autonomous Mobile Robots on Human Mental Workload and System Productivity in Smart Warehouses: A Preliminary Study," Human Factors and Ergonomics Society's 2020 International Annual Meeting, Oct 2020.

48. Dhanaraj, N., Hewitt, N., Edmonds-Estes, C., Jarman, R., Seo, J., Gunner, H., Hatfield, A., Johnson, T., Yifru, L., Maffeo, J., Pereira, G., Gross, J., Gu, Y., "Advanced Platform for Interactive Swarm Robotics (APIS): A Human-Swarm Interaction Research Testbed," 2019 International Conference on Advanced Robotics (ICAR), Belo Horizonte, Brazil, Dec 2019.

49. Strader, J., Nguyen, J., Tatsch, C., Du, Y., Lassak, K., Buzzo, B., Watson, R., Cerbone, H., Ohi, N., Yang, C., Gu, Y., "Flower Interaction Subsystem for a Precision Pollination Robot," IROS 2019, Macau, China, Nov 2019.

50. Kilic, C., Gross, J., Ohi, N., Watson, R., Strader, J., Swiger, T., Harper, S., Gu, Y., "Improved Planetary Rover Inertial Navigation and Wheel Odometry Performance through Periodic Use of Zero-Type Constraints," IROS 2019, Macau, China, Nov 2019.

51. Gross, J., De Petrillo, M., Beard, J., Nichols, H.,Swiger, T.,Watson, R., Kirk, C., Kilic, C., Hikes, J., Upton, E., Ross, D., Russell, M., Gu, Y., Griffin, C., "Field Testing of a UAV-UGV Team for GNSS-Denied Navigation in Subterranean Environments," ION GNSS+ Conference, Miami, FL, Sep 2019.

52. Yang, C., Watson, R., Gross, J., Gu, Y., "Localization Algorithm Design and Evaluation for an Autonomous Pollination Robot," ION GNSS+ Conference, Miami, FL, Sep 2019.

53. Rhudy, M., Gross, J. Gu, Y., "Stochastic Wind Modeling and Estimation for Unmanned Aircraft Systems," AIAA Aviation 2019 Forum (p. 3111), Dallas, TX, Jun 2019.

54. Ohi, N., Lassak, K., Watson, R., Strader, J., Du, Y., Yang, C., Hedrick, G., Nguyen, J., Harper, S., Reynolds, D., Kilic, C., Hikes, J., Mills, S., Castle, C., Buzzo, B., Waterland, N., Gross, J., Park, Y., Li, X., Gu, Y., "Design of an Autonomous Precision Pollination Robot," IROS 2018, Madrid, Spain, Oct 2018.

55. Yang, C., Strader, J., Gu, Y., Hypes, A., Canciani, A., Brink, K., "Cooperative UAV Navigation using Inter-Vehicle Ranging and Magnetic Anomaly Measurements," 2018 AIAA SciTech Guidance, Navigation, and Control (GNC) Conference, Kissimmee, FL, Jan 2018.

56. Rhudy, M., Gross, J., Gu, Y., "Determination of Stochastic Wind Speed Model Parameters Using Allan Deviation Approach," AIAA Aviation Forum, Denver, CO., Jun 2017.

57. Tian, P., He, A., Chao, H., Zheng, Z., Gu, Y., "Wake Encounter Simulation and Flight Validation with UAV Close Formation Flight," AIAA SciTech GNC Conference, Dallas, TX, Jan 2017.

58. Strader, J., Harper, S., Gu, Y., "Aircraft Instrumentation and Computer Vision-Aided Flight Analysis of Local Air Flow," AIAA Aviation 2016, Washington DC, Jun 2016.

59. He, A., Tian, P., Zheng, Z., Chao, H., Gu, Y., "A Study on Wake Turbulence Encounter during UAV Formation Flight Using Coupled Aerodynamics/Flight Dynamics Simulation," AIAA Atmospheric and Space Environment Conference, Washington DC, Jun 2016.

60. Strader, J., Gu, Y., Gross, J., De Petrillo, M., Hardy, J., "Cooperative Relative Localization for Moving UAVs with Single Link Range Measurements," IEEE/ION PLANS, Savannah, Georgia, Apr 2016. *Best Paper Award*, Track B: Perception for Autonomous and Semi-Autonomous Systems.

61. Hardy, J., Strader, J., Gross, J., Gu, Y., Cabezas, R., Keck, M., Douglas, J., Taylor, C., "Unmanned Aerial Vehicle Relative Navigation in GPS Denied Environments," IEEE/ION PLANS, Savannah, Georgia, Apr 2016.

62. Mandal, T., Gu, Y., "Online Pilot Model Parameter Estimation Using Sub-Scale Aircraft Flight Data," Invited, AIAA SciTech, San Diego, CA, Jan 2016.

63. Lassak, K., Gu, Y., "Real-Time Extended Kalman Filter Stability Indicator," Invited, AIAA SciTech, San Diego, CA, Jan 2016.

64. Tian, P., Chao, H., Gu, Y., Hagerott, S., "UAV Flight Test Evaluation of Fusion Algorithms for Estimation of Angle of Attack and Sideslip Angle" AIAA SciTech, San Diego, CA, Jan 2016.

65. Gross, J., Keesee, A., Christian, J., Gu, Y., Scime, E., Komjathy, A., Lightsey, E.G., Pollock, C., "The CuSPED Mission: CubeSat for GNSS Sounding of the Ionosphere-Plasmasphere Electron Density," AIAA SciTech, San Diego, CA, Jan 2016.

66. Chao, H., Gu, Y., Tian, P., Zheng, C., Napolitano, M., "Wake Vortex Detection with UAV Cose Formation Flight," AIAA Atmospheric Flight Mechanics Conference (AFM), Kissimmee, FL, Jan 2015.

67. Rhudy, M., Chao, H., Gu, Y., "Wide-Field Optical Flow Aided Inertial Navigation for Unmanned Aerial Vehicles," 2014 IEEE/RSJ IROS, Chicago, Sep 2014.

68. Rice, C., Gu, Y., Chao, H., Larrabee, T., Gururajan, S., Napolitano, M., Mandal, T., Rhudy, M., "Control Performance Analysis for Autonomous Close Formation Flight Experiments," International Conference on Unmanned Aircraft Systems (ICUAS), Orlando, FL, May 2014.

69. Rhudy, M., Gu, Y., Chao, H., "Wind Field Velocity and Acceleration Estimation Using a Small UAV," AIAA Modeling and Simulation Technologies Conference (MST), Atlanta, GA, Jun 2014.

70. Larrabee, T., Chao, H., Rhudy, M., Gu, Y., and Napolitano, M., "Wind Field Estimation in UAV Formation Flight," American Control Conference (ACC), Portland, OR, Jun 2014.

71. Mandal, T., and Gu, Y., "Pilot-Vehicle System Modeling Using Sub-Scale Flight Experiments," Invited, AIAA GNC Conference, Washington DC, Jan 2014.

72. Rhudy, M., Gu, Y., and Napolitano, M.R., "Relaxation of Stability Requirements for Extended Kalman Filter Stability within GPS/INS Attitude Estimation," Invited, AIAA GNC Conference, Washington DC, Jan 2014.

73. Rhudy, M., Gu, Y., and Napolitano, M., "UAV Attitude, Heading, and Wind Estimation Using GPS/INS and an Air Data System," AIAA GNC Conference, Boston, MA, Aug 2013.

74. Rhudy, M., Gu, Y., and Napolitano, M., "Low-Cost Loosely-Coupled Dual GPS/INS for Attitude Estimation with Application to a Small UAV," AIAA GNC Conference, Boston, MA, Aug 2013.

75. Rhudy, M., Gu, Y., and Napolitano, M., "Does the Unscented Kalman Filter Converge Faster than the Extended Kalman Filter? A Counter Example," AIAA GNC Conference, Boston, MA, Aug 2013.

76. Lassak, K., Rhudy, M., and Gu, Y., "On-Line Orientation Calibration of Inertial Measurement Unit Pairs using Unmanned Aerial Vehicle Flight Data," AIAA GNC Conference, Boston, MA, Aug 2013.

77. Mandal, T., Gu, Y., Chao, H., and Rhudy, M., "Flight Data Analysis of Pilot-Induced-Oscillations of a Remotely Piloted Aircraft," AIAA GNC Conference, Boston, MA, Aug 2013.

78. Larrabee, T., Chao, H., Mandal, T., Gururajan, S., Gu, Y., and Napolitano, M., "Design, Simulation, and Flight Test Validation of a UAV Ground Control Station for Aviation Safety Research and Pilot Modeling," AIAA GNC Conference, Boston, MA, Aug 2013.

79. Gu, Y., Gururajan, S., Seanor, B., Chao, H., and Napolitano, M., "Building Better Tools: Experimental UAV Research at West Virginia University," Invited, 2013 ACC, Washington, DC, Jun 2013.

80. Chao, H., Gu, Y., Gross, J., Guo, G., Fravolini, M.L., and Napolitano, M., "A Comparative Study of Optical Flow and Traditional Sensors in UAV Navigation," 2013 ACC, Washington, DC, Jun 2013.

81. Chao, H., Gu, Y., Napolitano, M., "A Survey of Optical Flow Techniques for UAV Navigation Applications," 2013 ICUAS, Atlanta, GA, May 2013.

82. Tancredi, D., Gu, Y., Chao, H., "Fault Tolerant Formation Flight Control Using Different Adaptation Techniques," Invited, 2013 ICUAS, Atlanta, GA, May 2013.

83. Rhudy, M., Gu, Y., and Napolitano, M., "Relaxation of Initial Error and Noise Bounds for Stability of GPS/INS Attitude Estimation," AIAA GNC Conference, Minneapolis, MN, Aug 2012.

84. Rhudy, M., Gross, J., Gu, Y., and Napolitano, M., "Fusion of GPS and Redundant IMU Data for Attitude Estimation," AIAA GNC Conference, Minneapolis, MN, Aug 2012.

85. Guerra, M., Rhudy, M., Gu, Y., Seanor, B., and Napolitano, M., "Mobile Ground Control Station Development for Fault Tolerant UAV Research," AIAA GNC Conference, Minneapolis, MN, Aug 2012.

86. Vassiliadis, D., Gu, Y., and Pisano, D.J., "Ionospheric Rocket Payload Development: Project and Course," the ASEE Annual Conference, San Antonio, TX, Jun 2012.

87. Gururajan, S., McGrail, A., Gu, Y., Seanor, B., Napolitano, M., Prucz, J., and Phillips, K., "Identification of Aerodynamic Parameters for a Small UAV from Flight Data," the 52nd Israel Annual Conference on Aerospace Sciences, Technion-I.I.T, Haifa, Israel, Mar 2012.

88. Gururajan, S., Gu, Y., Seanor, B., Prucz, J., Napolitano, M., "Evolution of the Flight Testing Program at West Virginia University in Support of Flight Control Research," the 52nd Israel Annual Conference on Aerospace Sciences, Technion-I.I.T, Haifa, Israel, Mar 2012.

89. Rhudy, M., Gu, Y., Gross, J., and Napolitano, M., "Sensitivity Analysis of EKF and UKF in GPS/INS Sensor Fusion," 2011 AIAA GNC Conference, Portland, OR, Aug 2011.

90. Merceruio, Z., Phillips, K., Gu, Y., Gururajan, S., and Napolitano, M., "Aerodynamic and Thrust Force Modeling for a Propulsion Assisted Control Aircraft Test Bed," 2011 AIAA AFM Conference, Portland, OR, Aug 2011.

91. Gross, J., Gu, Y., Rhudy, M., Barchesky, F., and Napolitano, M., "On-line Modeling and Calibration of Low-Cost Navigation Sensors," 2011 AIAA MST Conference, Portland, OR, Aug 2011.

92. Barchesky, F., Gross, J., Gu, Y., Rhudy, M., Gururajan, S., and Napolitano, M., "Development of a GPS/INS Sensor Fusion Simulation Environment Using Flight Data," 2011 AIAA MST Conference, Portland, OR, Aug 2011.

93. Tancredi, D., Gu, Y., Phillips, K., Gururajan, S., and Napolitano, M., "Development of Adaptive Control Laws for Actuator Fault Accommodation," 2010 AIAA GNC Conference, Control ID#: 814102, Toronto, Ontario, Canada, Aug 2010.

94. Gross, J., Gu, Y., Gururajan, S., Seanor B., and Napolitano, M., "A Comparison of Extended Kalman Filter, Sigma-Point Kalman Filter, and Particle Filter in GPS/INS Sensor Fusion," 2010 AIAA GNC Conference, Control ID#: 810271, Toronto, Ontario, Canada, Aug 2010.

95. Gross, J., Gu, Y., and Napolitano, M., "A Systematic Approach for Extended Kalman Filter Tuning and Low-Cost Inertial Sensor Calibration within a GPS/INS Application," 2010 AIAA GNC Conference, Control ID#: 810796, Toronto, Ontario, Canada, Aug 2010.

96. Phillips, K., Gururajan, S., Campa, G., Seanor, B., Gu, Y., and Napolitano, M., "Nonlinear Aircraft Model Identification and Validation for a Fault-Tolerant Flight Control System," 2010 AIAA AFM Conference, Control ID#: 809261, Toronto, Ontario, Canada, Aug 2010.

97. Gross, J., Gu, Y., Seanor, B., Gururajan, S., and Napolitano, M., "Advanced Research Integrated Avionics (ARIA) System for Fault-Tolerant Flight Research," 2009 AIAA GNC Conference, AIAA-2009-5659, Chicago, Illinois, Aug 2009.

98. Phillips, K., Campa, G., Gururajan, S., Seanor, B., Napolitano, M., Gu, Y., and Fravolini, M., "Parameter Identification for Application Within a Fault-Tolerant Flight Control System," 2009 AIAA AFM Conference, AIAA-2009-5723, Chicago, Illinois, Aug 2009.

99. Gu, Y., Seanor, B., Gururajan, S., and Napolitano, M., "Integrated Avionics System for Research UAVs," 2008 AIAA GNC Conference, AIAA 2008-7490, Honolulu, HI, Aug 2008.

100. Gu, Y., Sagoo, G. K., Seanor, B., Campa, G., Fravolini, M., and Napolitano, M., "Curvature-Velocity-Orientation Method for UAV Collision Avoidance," 2008 AIAA GNC Conference, AIAA 2008-6628, Honolulu, HI, Aug 2008.

101. Jarrell, J., Gu, Y., Seanor, B, and Napolitano, M., "Aircraft Attitude, Position, and Velocity Determination Using Sensor Fusion," 2008 AIAA GNC Conference, AIAA 2008-7422, Honolulu, HI, Aug 2008.

102. Effland, J., Seanor, B., Gu, Y., and Napolitano, M., "Application of Machine Vision in Unmanned Aerial Systems for Autonomous Target Tracking," 2008 AIAA GNC Conference, AIAA 2008-7251, Honolulu, HI, Aug 2008.

103. Campa, G., Mammarella, M., Cukic, B., Gu, Y., Napolitano, M., and Fuller, E., "Calculation of Bounding Sets for Neural Network Based Adaptive Control Systems," 2008 AIAA GNC Conference, AIAA 2008-6778, Honolulu, HI, Aug 2008.

104. Mammarella, M., Campa, G., Fravolini, M.L., Gu, Y., Seanor, B., and Napolitano, M., "A Comparison of Optical Flow algorithms for Real Time Aircraft Guidance and Navigation," 2008 AIAA GNC Conference, AIAA 2008-7494, Honolulu, HI, Aug 2008.

105. Sagoo1, G.K., Gururajan, S., Napolitano, M., Perhinschi, M., Gu, Y., Seanor, B., and Campa, G., "Pilot-in-the-Loop Assessment of Neurally Augmented Dynamic Inversion Based Fault Tolerant Control Laws in a Motion-Based Flight Simulator," 2008 AIAA MST Conference, AIAA 2008-6843, Honolulu, HI, Aug 2008.

106. Perhinschi, M.G., Napolitano, M.R., Campa, G., Seanor, B., Gururajan. S., and Gu, Y., "Development of Fault-Tolerant Flight Control Laws for the WVU YF-22 Model Aircraft," Proceedings of the AIAA GNC Conference, AIAA 2007-6511, Hilton Head, SC, Aug 2007.

107. Gu, Y., Seanor, B., Campa, G., Napolitano, M., Rowe, L., and Gururajan, S., "Autonomous Formation Flight: Hardware Development," 14th Mediterranean Conference on Control and Automation, pp.1-6, Ancona, Italy, Jun 2006.

108. Seanor, B., Gu, Y., Napolitano, M., Campa, G., Gururajan, S., and Rowe, L., "3 Aircraft Formation Flight Experiment," 14th Mediterranean Conference on Control and Automation, Ancona, Italy, Jun 2006.

109. Perhinschi, M., Napolitano, M., Campa, G., Seanor, B., Gururajan, S., Gu, Y., "Design and Flight Testing of Intelligent Flight Control Laws for the WVU YF-22 Model Aircraft," AIAA GNC Conference, AIAA-2005-6445, San Francisco, California, Aug 2005.

110. Campa, G., Seanor, B., Gu, Y., and Napolitano, M., "NLDI Guidance Control Laws for Close Formation Flight," ACC, vol. 4, pp. 2972-2977, Portland, OR, Jun 2005.

111. Seanor, B., Campa, G., Gu, Y., Napolitano, M., Rowe, L., and Perhinschi, M., "Formation Flight Test Results for UAV Research Aircraft Models," AIAA 1st Intelligent Systems Technical Conference, AIAA 2004-6251, Chicago, IL, Sep 2004.

112. Wan, S., Campa, G., Napolitano, M., Seanor, B., and Gu, Y., "Design of Formation Control Laws for Research Aircraft Models," AIAA GNC Conference, AIAA 2003-5730, Austin, TX, Aug 2003.

113. Wan, S., Campa, G., Gu, Y., Seanor, B., Gururajan, S., and Napolitano, M., "Development of Formation Control Laws for the WVU YF-22 Aircraft Models," ACC, ACC03-AIAA0041, Denver, CO, Jun 2003.

114. Tang, H.M., Wang, F.Y, and Gu, Y. "A Sliding-Mode Variable-Structure Control Method on Automatic Ship Steering," Control Theory & Application (in Chinese), Vol.13, Sup.1, Oct 1996.

## Publication: Book Chapters

115. Gu, Y., Gross, J., Barchesky, F., Chao, H., and Napolitano, M., "Avionic Design for a Sub-Scale Fault Tolerant Flight Control Test-Bed," Chapter 21, Recent Advances in Aircraft Technology, ISBN: 978-953-51-0150-5, pp. 499-522, 2012.

116. Gu, Y., Campa, G., Seanor, B., Gururajan, S., and Napolitano, M., "Autonomous Formation Flight – Design and Experiments," Chapter 12, Aerial Vehicles, ISBN 978-953-7619-41-1, pp. 233-256, Jan 2009.

## Publication: Others

117. Jacobs, S., Butts, R.M., Gu, Y., Baheri, A., Pereira, G., "A Framework for Controlling Multi-Robot Systems Using Bayesian Optimization and Linear Combination of Vectors", arXiv:2203.12416, Mar 2022.

118. Mills, S. A., Gu, Y., Gross, J., Li, X., Park, Y. L., & Waterland, N. L. Evaluation of an Autonomous Robotic Pollinator. American Society for Horticultural Science Annual Conference. August 10-14, 2020.

119. Watson, R., Ohi, N., Harper, S., Kilic, C., Yang, C., Hikes, J., De Petrillo, M., Strader, J., Hedrick, G., Nichols, H., Upton, E., Kirk, C., Hendricks, K., Reynolds, D., Darr,, J., Bredu, J., Langnese, E. , Gu, Y., Gross, J. "A Rover and Drone Team for Subterranean Environments: System Design Overview," Robotics Science & Systems (RSS) Workshop on Challenges and Opportunities for Resilient Collective Intelligence in Subterranean Environments, Pittsburgh, PA, June 30, 2018.

120. AIAA Intelligent Systems Technical Committee (main contributors: Gu Y., Wan Y., Tschan., C., Yucel A., Nguyen N., Lacher A., Atkins E., Adolf F.M., Casbeer D., Cook S.), "Recommendations for Intelligent Systems Development in Aerospace," AIAA Opinion Paper, Dec 2017.

121. Gu Y., "Unmanned Aerial Vehicle as a Versatile Research Tool," Editorial, Journal of Aeronautics & Aerospace Engineering, vol.1, iss.4, doi:10.4172/2168-9792.1000e112, 2012.

122. Gu, Y., Campa, G., Innocenti, M., "Formation Flight Control," Editorial, International Journal of Aerospace Engineering, Volume 2011, Article ID 798981, doi:10.1155/2011/798981, 2011.

## External Research Grants

Twenty-two projects with total budget of $10.3M ($4.9M as PI and $5.4M as co-PI/Co-I), not including NASA Challenge Prizes ($0.9M), and industry/equipment/internal grants ($0.6M).

| Title: | P-003: OrBNaV - Orbiter-assisted Balloon Navigation for Venus Exploration | Project Period: | 08/16/2023 –08/15/2024 |
|---|---|---|---|
| Sponsor: | NASA EPSCoR R3 | | |
| Role: | Co-I | Budget: | $99,967 |
| Title: | Design Guidelines for Assessment of Pillar Stability in Underground Room & Pillar Mines from Autonomous Robotic Inspections | Project Period: | 12/01/2022 –11/30/2024 |
| Sponsor: | Alpha Foundation | | |
| Role: | Co-PI | Budget: | $569,149 |
| Title: | Collaborative Research: NRI: Reducing Falling Risk in Robot-Assisted Retail Environments | Project Period: | 08/01/2022 –07/31/2025 |
| Sponsor: | NSF, National Robotics Initiative | | |
| Role: | PI | Budget: | $382,796 |
| Title: | Collaborative Research: NRI: StickBug – an Effective Co-Robot for Precision Pollination | Project Period: | 11/01/2021 –10/30/2025 |
| Sponsor: | USDA/NIFA, National Robotics Initiative (reviewed by NSF Panel) | | |
| Role: | PI (*Proposal*) | Budget: | $750,361 |
| Title: | Data Security Challenges for Multi-Agent Cooperative Robotic Systems | Project Period: | 08/12/2021 –05/11/2023 |
| Sponsor: | Kinnami Software Corporation (AF STTR) | | |
| Role: | Co-PI | Budget: | $225,000 |
| Title: | Cooperative Energy-aware Navigation of Hybrid Airships in the Atmosphere of Venus | Project Period: | 06/01/2021 –05/31/2023 |
| Sponsor: | NASA EPSCoR R3 | | |
| Role: | Co-I | Budget: | $99,999 |
| Title: | Autonomous Robotics Early Warning System for Underground Stone Mining Safety | Project Period: | 09/01/2019 –04/30/2023 |
| Sponsor: | Alpha Foundation | | |
| Role: | Co-PI | Budget: | $749,968 |
| Title: | REU Site: Undergraduate Robotics Research in Human-Swarm Interaction | Project Period: | 03/01/2019 –02/28/2023 |
| Sponsor: | National Science Foundation | | |
| Role: | PI (*Proposal*) | Budget: | $303,310 |
| Title: | Autonomous Navigation of Small UAV/UGV Teams in Underground Tunnels | Project Period: | 02/15/2018 –8/14/2023 |
| Sponsor: | DoD | | |
| Role: | Co-PI | Budget: | $599,688 |
| Title: | Center for Cognitive Computing (C3): A Multidisciplinary Research Center for Excellence | Project Period: | 01/01/2018 –12/31/2023 |
| Sponsor: | West Virginia Division of Science and Research | | |
| Role: | Co-PI | Budget: | $1,295,866 |
| Title: | Fast Traversing Autonomous Rover for Mars Sample Collection | Project Period: | 09/16/2017 –09/15/2022 |
| Sponsor: | NASA EPSCoR | | |
| Role: | Science-PI | Budget: | $1,125,000 |
| Title: | Precision Pollination Robot | Project Period: | 11/15/2016 –02/14/2021 |
| Sponsor: | USDA National Robotics Initiative (reviewed by NSF Panel) | | |
| Role: | PI | Budget: | $1,065,010 |
| Title: | Micro-Probes Propelled and Powered by Planetary Atmospheric Electricity (MP4AE) | Project Period: | 05/15/2019 –8/14/2020 |
| Sponsor: | NASA Innovative Advanced Concepts (NIAC), **6%** acceptance rate | | |
| Role: | PI, NIAC Fellow | Budget: | $124,997 |
| Title: | Cooperative UAV Navigation using Inter-Vehicle Range and Bearing Measurements | Project Period: | 01/01/2016 –12/31/2017 |
| Sponsor: | Air Force Research Lab | | |
| Role: | PI | Budget: | $104,302 |

| Title: | Enabling Moving Target Hand-off in GPS-Denied Environments | Project Period: | 05/15/2015 –02/14/2016 |
|---|---|---|---|
| Sponsor: | Air Force STTR (Through STR) | | |
| Role: | Co-PI | Budget: | $149,844 |
| Title: | Cooperative Gust Sensing and Suppression for Aircraft Formation Flight – Phase II | Project Period: | 03/16/2014 –09/15/2016 |
| Sponsor: | NASA LEARN (Leading Edge Aeronautics Research for NASA) | | |
| Role: | PI | Budget: | $350,000 |
| Title: | Cooperative Gust Sensing and Suppression for Aircraft Formation Flight | Project Period: | 01/01/2013 –12/31/2013 |
| Sponsor: | NASA LEARN | | |
| Role: | Co-I | Budget: | $200,000 |
| Title: | Verification and Validation of Autonomous Flight in an Unstructured and GPS-Degraded Environment | Project Period: | 01/01/2013 –12/31/2013 |
| Sponsor: | NASA IV&V | | |
| Role: | PI | Budget: | $44,500 |
| Title: | Validation Tools for an Information Fusion based Integrated Flight Safety Monitor | Project Period: | 10/01/2012 –03/30/2016 |
| Sponsor: | NASA VSST (Vehicle Systems Safety Technologies) | | |
| Role: | PI | Budget: | $500,000 |
| Title: | Aviation Safety Research and Development | Project Period: | 10/01/2010 –12/31/2012 |
| Sponsor: | NASA Langley | | |
| Role: | Co-I | Budget: | $1,500,000 |
| Title: | Development of Remote Sensing Capabilities for Highway Applications – Phase II | Project Period: | 12/01/2009 – 11/30/2010 |
| Sponsor: | Mid-Atlantic Universities Transportation Center (MAUTC) WV Department of Transportation/WV Division of Highway (DOH) | | |
| Role: | PI | Budget: | $88,716 |
| Title: | Evaluation of Remote Sensing Aerial Systems in Existing Transportation Practices | Project Period: | 12/22/2008 – 12/21/2009 |
| Sponsor: | MAUTC, WV DOH | | |
| Role: | PI | Budget: | $167,422 |

## Industry, Equipment, and Internal Grants

"Decision-Making under Second-Order Uncertainties – A Robot Foraging Case Study," $15,000, Sponsor: WVU Research Office Program to Stimulate Competitive Research (PSCoR), 2023-2024.

"Enhancing Hands-on Distance Learning in Rural K-12 Schools Using Telepresence Robots," $227,963, Congressionally Directed Spending (CDS) project, Sponsor: USDA DLT, 2022-2025.

"SmartAg WV," $131,000, Sponsor: WVU Provost Office. Part of a 7-person team that won the second place of 10 teams during the 2021 WVU Academic Innovation Summit. 2021-2022.

"Bottom-up Co-design for Soft Robotics," $30,000, Sponsor: NASA WV Space Grant Consortium, 2021 – 2022.

"Sensor Fusion and Navigation Project," $5,000 + 10 copies of MATLAB license, Sponsor: Mathworks, 2013 – 2015.

"Development of an Undergraduate Course in Mobile Robotics," $20,000, Sponsors: NASA WV Space Grant Consortium, Statler College of Engineering and Mineral Resources, MAE Department, LCSEE Department, 2013 – 2014.

"Multiple Model Adaptive Motion Planner (M-MAP)," $14,979, Sponsor: WVU Senate Grants, 2010 – 2011.

"OpeRA – Open Research Aircraft," $30,000, Sponsor: NASA WV Space Grant Consortium, 2010 – 2011.

"Sensor Fusion and Calibration for UAV Navigation," $20,000, Sponsor: NASA WV EPSCoR, 2010 – 2011.

"A Test Bed for Propulsion Assisted Flight Control," $30,000, Sponsor: NASA WV Space Grant Consortium, 2009 – 2010.

"Data Analysis for Kutta's Personal Flight Data Recorder with Display" $5,000, Sponsor: Kutta Technologies, 2008 – 2009.

"Development of a Small, Ultra Low Cost, and Flexible UAV Test-bed," $20,000, Sponsor: NASA WV Space Grant Consortium, 2006 – 2007.


## Teaching

*Note*: Student Evaluation of Instruction (SEI) numbers below are averages of all questions.

Capstone Design – Robotics Section, MAE 471/371/271, CpE 480, new course development, F2017 (class size: 26, SEI: 4.5/5.0), F2018 (class size: 24, SEI: 4.8/5.0), F2019 (class size: 42, SEI: 4.6/5.0), F2020 (class size: 36, SEI 4.7/5.0), F2021 (class size: 38, SEI 4.7/5.0), F2022 (class size: 54, SEI 4.7/5.0), F2023 (class size: 44) + many volunteers.

Mobile Robotics, MAE 412, CpE 412, new course development, F2013, (class size: 18, SEI: 4.7/5.0), F2014 (class size: 18, SEI: 4.7/5.0), S2017 (class size: 24, SEI: 4.6/5.0), F2018 (class size: 24, SEI: 4.8/5.0), F2019 (class size: 26, SEI: 4.7/5.0), F2020 (class size: 29, SEI 4.5/5.0), F2021 (class size: 33, SEI 4.4/5.0), F2022 (class size: 40, SEI 4.6/5.0), F2023 (class size: 40).

Engineering Systems Design – Robotics Section, MAE 472/371/271, CpE 481, new course development, S2018, (class size: 20, SEI: 4.7/5.0), S2019, (class size: 22, SEI: 4.8/5.0), S2020 (class size: 30, SEI: 4.8/5.0), S2021 (class size: 13, SEI: 4.6/5.0), S2022 (class size: 25, SEI: 4.8/5), S2023 (class size: 33, SEI: 4.7) + many volunteers.

Autonomous Robot Systems, MAE 593B, new course development, S2019, (class size: 14, SEI: 4.8/5.0).

Planetary Rover Design, MAE 493J/593K, CpE 493N/591F, new course development (with co-instructor Dr. Klinkhachorn), S2014 (class size: 24, SEI: 4.8/5.0), S2015 (class size: 28, SEI: 4.9/5.0), S2016 (class size: 20, SEI: 5.0/5.0).

Mechatronics (plus labs), MAE 211, instructor, S2013, (class size: 84, SEI: 3.7/5.0), F2015, (class size: 144, SEI: 3.8/5.0), F2016 (class size: 141, SEI: 4.2/5.0).

Advanced Mechatronics (with labs), MAE 411, co-instructor with Dr. Sergio Tamayo and Mr. Matthew Rhudy, Summer, 2011 (class size: 8).

Automatic Controls, MAE 460, instructor, Summer, 2010, (class size: 9, SEI: 4.8/5.0).

Sounding Rocket Payload Development (RockSat), PHYS 493S, co-instructor with Dr. Vassiliadis and Dr. Pisano, S2010 (class size: 10), F2009 (as a project).

Instrumentation Engineering, MAE 663, new course development, S2008, (class size: 18, SEI: 4.0/5.0).

## Research Professor and Post-Doc Advised

Dr. Ali Baheri, Research Assistant Professor, 2019 – 2021.

## Graduate Students

*Committee Chair, Research Advisor:*

      Nathaniel Pearson, Ph.D. student.
      John Little, M.S. student (thesis).
      Trevor Smith, Ph.D. student.
      Ronald Butts, M.S. student (thesis).
      Mathew Collins, M.S. student (thesis).
      Heath Cottrill, M.S. student (thesis).
      Madhav Rijal, Ph.D. student.
      Jared Beard, M.S. (thesis), 2020, Ph.D. candidate.
      Christopher Tatsch, M.S. (thesis), 2020, Ph.D. candidate.
      Stephen Jacobs, M.S. student, 2023, employer: SpaceX.
      Jonas Amoama Bredu, M.S. (thesis), 2022, employer: MC Dean.
      Nicholas Ohi, Ph.D., 2022, employer: CACI/NASA JSC
      Dylan Covell, M.S. (thesis), 2022, employer: Carnegie Robotics.
      Chizhao Yang, Ph.D., 2021, employer: O-Net Communication.
      Jared Strader, MS (thesis), 2016, Ph.D., 2021, employer: MIT.
      Benjamin Buzzo, M.S. (thesis), 2021, employer: Oceaneering.
      Gabrielle Hedrick, Ph.D., 2020, employer: MITRE.
      Jennifer Nguyen, M.S. (thesis), 2020, employer: Open Robotics.
      Kyle Lassak, Ph.D., 2020, employer: Astrobotic.
      Conner Castle, M.S. (thesis), 2019, employer: Honeybee Robotics, Gecko Robotics.
      Scott Harper, MS (thesis), 2018, employer: 4D Tech Solutions.
      Tanmay Mandal, Ph.D., 2016, employer: Airbus, Amazon, LTA Research.
      Alexander Hypes, M.S. student, 2016, employer: Oculus, Facebook.
      Yaohui Ding, MS, 2015, employer: University of Arizona.
      Trevor Caplinger, MS (thesis), 2015, employer: NAVAIR.
      Caleb Rice, MS, 2015, employer: NAVAIR.
      Matthew Rhudy, Ph.D., 2013, employer: Penn State University, Reading.
      Zach Merceruio, MS (thesis), 2011, employer: JHU Applied Physics Laboratory.

*Committee Member, Research Co-Advisor:*

      Eric Swanson, M.S. student, expected graduation: 2023.
      Daniele Tancredi, MS (thesis), 2011, employer: MathWorks, Inc.
      Frank Barchesky, MS (thesis), 2011, employer: AAR Corp.
      Jason Gross, Ph.D., 2011, employer: JPL, West Virginia University.
      Jason Jarrell, MS (thesis), 2007, employer: Northrop Grumman Corporation.

*Committee Member:*

      Eduardo Gutierrez Lopez (M.S., 2022); Jeremy Rathjen (M.S., 2022); Olawoye Uthman (M.S., 2022); Richard Licata (Ph.D., 2022); Kieren Samarakoon (M.S., 2022); Matteo De Petrillo (Ph.D., 2021); Cagri Kilic (Ph.D., 2021); Marwan Alkhweldi (Ph.D., 2021); Nicholas Sia (M.S., 2021), Derek Ross (M.S., 2021); Danylo Shapovalov (M.S., 2020); Stanislav Pidhorskyi (Ph.D., 2020); Matthew Boots (Ph.D., 2019); Ryan Watson (Ph.D.,

2019); Andrew Rhodes (Ph.D., 2019); Yixin Du (Ph.D., 2019); Jacob Hikes (M.S., 2018); Shane Haught (M.S., 2018); Shannen Daly (M.S., 2018); Sean Lantto (M.S., 2018); Victor Sivaneri (Ph.D., 2018); Nathan Tehrani (M.S., 2017); Lisa Kogan (M.S., 2017); Lylia Benhacine (M.S., 2017); Qian Mou (M.S., 2016); Ryan Watson (M.S., 2016); Jeremy Hardy (M.S., 2016); Wei Qi (Ph.D., 2016); Lei Jiang (Ph.D., 2015); Katie Rabidoux (Ph.D., 2015); Jennifer N. Wilburn, (Ph.D., 2013); Trenton Larrabee, (M.S., 2013); Brenton Wilburn, (M.S., 2010); Josh Effland, (M.S., 2007).

*Visiting Students:*
Paolo Roberto Di Gregorio (2016); Matteo De Petrillo (2015).


## Undergraduate Researchers

*WVU Students:* Marc Gramlich, Jared Strader, Ryan Watson, Alexander Gray, Scott Harper, Jared Leggett, Nicholas Ohi, Lucas Behrens, Joey Licata, Anthony Donzella, Dylan Reynolds, Conner Castle, Matthew Gramlich, Jonas Amoama Bredu, Mo Buzzo, Jared Beard, Kiki Yaw Sarpong, Dylan Covell, Quinton Fleming, Kate Digon, Jada Williams, Christopher Brindle, Henry Cerbone (high school), Tucker Johnson, Henry Vos, Alexandra Collins, Lunet Yifru, Trevor Smith, Karan "Kermit" Sah, Giovanni Molin, Gabe Bobbitt, Ibrahim Rahman (high school), Stephen Jacobs, Spencer Regnier, Nathaniel Pearson, Ronald Butts, Tyler Cook, Tyler Wolf, Andy Chu, Andrew Sarver, Riley McAllister, Nathan Adkins, Shawn Li (high school), Izaak Whetsell, Dre' Hodges, Jalen Beeman.

*REU Students:* Nathan Hewitt, Neel Dhanaraj, Julietta Maffeo, Aleks Hatfield, Rachel Jarman, Jeongwoo Seo, Casey Edmonds-Estes, Henry Gunner, Dillan Wilson, David Rubel, Di'Quan Ishmon, John Little, Shelby Hacker, Daniel Villarreal, Ibrahim Rahman, Sarah Alderman, Stanford White, Max Gao, Adam Pooley, Arushi Sharma, Sachi Barnaby, Katelyn Crockett.


## Student Achievements

NSF Graduate Research Fellowship: Nicholas Ohi (2016), Trevor Smith (2022).

Order of Augusta (WVU's most prestigious student honor): Nicholas Ohi (2016).

Ruby Distinguished Doctoral Fellowship (3-year): Jared Beard (2020).

Arlen G. and Louise Stone Swiger Fellowship (3-year): Jared Strader (2016).

Benjamin M. Statler Ph.D. Fellowship (3-year): Gabrielle Hedrick (2017), Madhav Rijal (2022).

Outstanding Merit Fellowship for Continuing Doctoral Students: Chizhao Yang (2018).

Staler College Ph.D. Recruitment Award: Madhav Rijal (2021), Nathaniel Pearson (2022).

WVU Undergraduate research Symposium Winner, Science & Technology category: Trevor Smith (2021).

WVU and West Virginia Student Employee of the Year: Scott Harper (2016).

NASA WV SGC Graduate Fellowship: Jason Gross, Matthew Rhudy, Zach Merceruio, Caleb Rice, Alexander Hypes, Scott Harper (twice), Jennifer Nguyen (twice), Jared Strader, Nicholas Ohi (three times), Conner Castle, Mo Buzzo, Jared Beard (twice), Ronald Butts, Nathaniel Pearson, Stephen Jacobs, John Little, Heath Cottrill.

NASA WV SGC Undergraduate Fellowship: Marc Gramlich, Scott Harper, Jared Strader, Alexandra Augsberger, Colin Osborn, Cameron Wilson, Tucker Johnson, Chad Hite, Stephen Jacobs.

WVU Summer Undergraduate Research Experiences (SURE): Conner Castle, Benjamin Buzzo, Spencer Regnier, Tyler Cook.

JPL Visiting Student Research Program (JVSRP): Scott Harper, Jared Strader, Gabrielle Hedrick, Nicholas Ohi, Jared Beard, Jennifer Nguyen.


## Professional Societies

Senior Member, American Institute of Aeronautics and Astronautics (AIAA).

Member, Institute of Electrical and Electronics Engineers (IEEE)
Robotics and Automation; Aerospace and Electronic Systems; Control Systems.


## Professional Services

Technical Editor, IEEE/ASME Transaction on Mechatronics, 2020 - Present.

Associate Editor, 2024, 2023, 2022, 2021 International Conference on Robotics and Automation (ICRA).

Associate Editor, 2023, 2022, 2021, 2020, 2019 IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM).

Associate Editor, 2023, 2019 International Conference on Advanced Robotics (ICAR).

Panel Reviewer, National Science Foundation, 2022(1), 2021(1), 2020 (1), 2019 (2), 2018 (2), 2017 (2).

Panel Reviewer, USDA/NIFA, 2019.

Contributor, US Robotics Roadmap, 2020 Edition.

Member, AIAA Intelligent Systems Technical Committee (ISTC), 2016-2018.
Chair, AIAA ISTC Roadmap Sub-Committee, 2016-2018.
Moderator, Space Robotics Breakout Session, Intelligent Systems Workshop, 2017.
Moderator, Robotics Breakout Session, Intelligent Systems Workshop, 2016.

Advisory Board, Mechatronics Engineering Technology at California University of Pennsylvania, 2014.

Editorial Board, Journal of Aeronautics & Aerospace Engineering, 2012-2014.

Lead Guest Editor, Special Issue on Formation Flight Control, International Journal of Aerospace Engineering, August 01, 2011.

Session Co-Chair, Autonomous System Collision Avoidance, 2008 AIAA GNC Conference.

Reviewer – Proposal, American Association for the Advancement of Science (AAAS), Canada Foundation for Innovation, Center for Connected Multimodal Mobility ($C^2M^2$), Georgia National Science Foundation, Israeli Ministry of Science and Technology, Kentucky Science & Engineering Foundation, US National Science Foundation, NASA EPSCoR, New York Space Grant, USDA/NIFA, National Institute for Occupational Safety and Health (NIOSH), Research North Dakota, WVU Senate Grant, WVU PSCoR.

Reviewer – Journal, ACM Transactions on Cyber-Physical Systems, Aerospace Science and Technology, AIAA Journal of Guidance, Control, and Dynamics, Aircraft Engineering and Aerospace Technology, Automatica, Electronics, Control Engineering Practice, Engineering, Engineering Applications of Artificial Intelligence, Field Robotics, IEEE Robotics and Automation Letters, IEEE Robotics and Automation Magazine, IEEE Transactions on Aerospace and Electronic System, IEEE Transactions on Control Systems Technology, IEEE Transactions on Intelligent Transportation Systems, IEEE Transactions on Robotics, IEEE Transactions of Vehicular Technology, IEEE Sensors Journal, IEICE Electronics Express, International Journal of Advanced Robotic Systems, International Journal of Aerospace Engineering, International Journal of Control, Journal of Aerospace Engineering, Journal of Control Science and Engineering, Journal of Real-Time Image Processing, Nature Food, Robotics, Robotics and Autonomous Systems, Sensors.

Reviewer – Conference, AIAA Guidance, Navigation and Control Conference, American Control Conference, International Conference on Advanced Intelligent Mechatronics, International Conference on Automation Science and Engineering, International Conference on Intelligent Robots and Systems (IROS), International Conference on Robotics and Automation (ICRA), International Conference on Unmanned Aircraft Systems, Israel Annual Conference on Aerospace Sciences, Mediterranean Conference on Control and Automation, Robotics: Science and Systems (RSS).

## Leadership Roles in Building WVU Robotics Program

Gained visibility and reputation through winning NASA Centennial Challenges.

Established WVU Robotics Achievement undergraduate Fellowship (with part of NASA Prize)

Proposed multiple robotics faculty positions and served on 10 faculty search committees.

Developed and offered five new robotics courses.

Proposed and co-developed a college-wide robotics seminar series.

Facilitated the development of a central website (*https://robotics.wvu.edu*), promotional videos, a recruitment eBook, a shared test facility, and a robot museum.

Directed an NSF-funded REU Site on human-swarm interaction.

Advising the student robotics club and competition teams.

## Presentations (Selected)

University of Colorado Boulder, ME Dept., Boulder, CO, Mar 2023.

NASA Ames Research Center, Mountain View, CA, Aug 2022.

Saint Francis University Engineering, Loretto, PA, Nov 2021.

West Virginia State Univ., Keynote, CNSM Research Symposium, Institute, WV, Apr 2021.

Saint Louis University, St. Louis, MO, Feb 2021.

National Institute for Occupational Safety and Health (NIOSH), Morgantown, WV, Oct 2019.

Rutgers University, MAE Dept., New Brunswick, NJ, Apr 2019.

University of Virginia, MAE Dept., Charlottesville, VA, Apr 2019.

NASA Marshall Space Flight Center, Huntsville, AL, Nov 2018.

University of Alabama, ECE Dept., Tuscaloosa, AL, Nov 2018.

NASA's IV&V Facility, Fairmont, WV, Nov 2018.

University of Texas at Austin, CS Dept., Austin, TX, Sep 2018.

Worcester Polytechnic Institute, Robotics Engineering, Worcester, MA, Apr 2018.

NASA Jet Propulsion Laboratory GDGPS Group, Pasadena, CA, Dec 2017.

NASA Johnson Space Center, Houston, TX, Dec 2017.

University of Rochester, ECE Dept., Rochester, NY, Oct 2017.

NASA Jet Propulsion Laboratory Robotics Section, Pasadena, CA, Nov 2016.

Air Force Research Laboratory, Eglin, FL, Jan 2016.

University of Kansas, AE Dept., Lawrence, KS, Sep 2015.

NASA Jet Propulsion Laboratory Mars Program Formulation Office, Pasadena, CA, Jul 2015.

USDA National Institute of Food and Agriculture, Washington, DC, Dec 2014.

NASA Ames Research Center, Mountain View, CA, Mar 2014.

Shanghai Jiao-Tong University, Shanghai, China, Jul 2012.

NASA Dryden Flight Research Center, Edwards, CA, Jan 2012.

NASA Langley Research Center, Hampton, VA, Jan 2012.

NASA Integrated Resilient Aircraft Control (IRAC) Workshop, Chicago, IL, Aug 2009.

National Radio Astronomy Observatory (NRAO), Green Bank, WV, Oct 2008.

Turner-Fairbank Highway Research Center, McLean, VA, Apr 2007.

## Media Coverages (Selected)

*Articles:*

- Scientific American, "Robotic bees could support vertical farms today and astronauts tomorrow," July 2023.
- IEEE Spectrum Robotics Blog (13 times), "Video Friday, Jul, Apr 2023, Jul (2), Jun 2022, Mar 2019, May, Apr 2018, Nov, Aug, Apr 2017, Feb 2016, Apr 2015."
- Forbes, "How new innovations are helping prevent retail injuries," Dec 2022.
- Safety+Health Magazine, "Researchers developing robots to detect slip and fall hazards in retail spaces," Nov 2022.
- Fast Company, "When bees can't pollinate a flower, this agricultural robot steps in," Nov 2021.
- NASA, CNET, MSN, DailyMail, "NASA invests in 18 potentially revolutionary space tech concepts," Apr 2019.
- National Geographic Italia, "The pollinator robot that replaces the bees," Sep 2018.
- Wired, "This robotic pollinator is like a huge bee with wheels and an arm," May 2018.
- Fast Company, "This robot could help pollinate crops if we kill all the bees," May 2018.
- Fruit Grower News, cover story, "Beeline to the future, could robots replace honeybees as pollinators?" May 2017.
- NASA, "NASA reveals the unknown in 2016," Dec 2016.

- Air & Space Smithsonian Magazine, "From a Massachusetts field to the plains of Mars," Nov 2016.
- NASA, "NASA awards $750K in sample return robot challenge for autonomous technology," Sep 2016.
- The Associated Press, ABC News, The Washington Post, The New York Times, USA Today, "West Virginia University students win robotics competition," Sep 2016.
- GPS World, "Navigation progress for indoors and UAVs," Jul 2016.
- NASA, Space Daily, "Strengthening our space technology future: snapshots of success," Jan 2016.
- NASA, "NASA, U.S. Senate welcome robot challenge winners to Washington," Sep 2015.
- Aviation Week, "The week in technology, July 13-17, 2015," Jul 2015.
- Computer World, "NASA's robot event challenges, robots, engineers," Jun 2015.
- NASA, NASDAQ, Aerospace & Defense News, "NASA awards $100,000 to winning team of robot challenge," Jun 2015.
- The Associated Press, "WVU team gets $100,000 from NASA in robotics challenge," Jun 2015.
- NASA's Technology Innovation e-zine, "A week in the park," Apr 2015.

*Interviewed as a Subject Matter Expert:*

- CNN, "With bees in short supply, soap bubbles could assist with pollination, study finds," Jun 2020.
- AAAS Science, "Drone-delivered soap bubbles could help pollinate flowers," Jun 2020.

*Television, Radio, and Online Video:*

- BBC Earth Lab, "Are robot bees the future?" Apr 2023.
- NASA 360, "NASA competition winners develop AI for future rovers," Nov 2019. "NASA Challenge winners develop robots for earth and rovers for space," Aug 2019. "As bees die NASA-inspired robot could fill the pollination void," Aug 2019. "Rover reloaded," Sep 2015. "Rise of the rovers," Sep 2014.
- Planetary Radio, the Planetary Society, "Space innovations so incredible, they just might work," Oct 2019.
- J-WAVE, live radio interview about robotic pollination, Nov 2018.
- Discovery Channel Canada, Daily Planet, on robotics Easter egg hunt, Apr 2017.
- NASA, "What happened this year @ NASA," Dec 2015, Dec 2016.
- NASA, "This week @ NASA – Sept. 9, 2016, Sep. 25, 2015, Jun. 19, 2015."
- Time Warner Cable, "It ain't rocket science," Oct 2015.
- Good Morning Washington, live TV interview, Sep 2015.

## **Personal Interests**

Planetary observation, astro and nature photography (*gallery*), telescope making, blogging (*site*).