CHAD G. ROSE

2452 Wiggins Hall, Department of Mechanical Engineering, Auburn University, 36849
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Assistant Professor with experience designing robotic devices for neuro-rehabilitation and assistance and creating hands-on engineering education mechatronic curricula seeking to build a highly collaborative research program.

EDUCATION

Rice University- Houston, Texas, GPA 3.84
   PhD in Mechanical Engineering – *Hybrid Rigid-Soft Exoskeleton Design*   08/2018
      Committee: Marcia O'Malley (chair, advisor), Benjamin Fregly, Fathi Ghorbel, and Phil Kortum
   MS in Mechanical Engineering – *Hardware-versus Human-centric Assessment of Rehabilitation Robots*
      05/2015
      Committee: Marcia O'Malley (chair, advisor), Andrew Dick, Fathi Ghorbel, and John Clark
Auburn University- Auburn, Alabama GPA 4.0
   Bachelor of Mechanical Engineering, summa cum laude, Honors Scholar, German Minor   05/2012

ACADEMIC APPOINTMENTS

Auburn University – Assistant Professor   01/2020 - present
University of Texas at Austin – Postdoctoral Researcher advised by Ashish Deshpande   09/2018-12/2019

JOURNAL PUBLICATIONS

5. **Rose, C.G.**, Kortum, P.K., Cherukuri, S., Wool, Z.H., and O'Malley, M.K. "Examining Usability Experiences of Assistive Wearable Devices," Journal of Design Research, *(in review)*.
4. **Rose, C.G.** and O'Malley, M.K. "A Hybrid Rigid-Soft Hand Exoskeleton to Assist Functional Dexterity." IEEE Robotics and Automation Letters, Special Issue on Intelligent Human-Robot Interaction for Rehabilitation and Physical Assistance. 4.1, pgs. 73-80, 2018.
3. **Rose, C.G.**, Pezent, E., Kann, C.K., and O'Malley, M.K. "Assessing Wrist Movement with Robotic Devices." IEEE Transactions on Neural Systems and Rehabilitation Engineering. 26.8 pgs. 1585-1595. 2018.
2. **Rose, C.G.**, McDonald, C.G., Clark, J.P., and O'Malley, M.K. "Reflection on System Dynamics Principles Improves Student Performance in Labs with the Haptic Paddle." IEEE Transactions on Education. 61.3 pgs. 245 – 252. 2018.
1. Zeng, Y., **Rose, C.G.**, Taha, W., Duracz, A., Atkinson, K., Philippsen, R., and O'Malley, M.K. "Modeling electro-mechanical aspects of cyber-physical systems." Journal of Software Engineering for Robotics 7.1. pgs 100-119. 2016.

REFEREED CONFERENCE PROCEEDINGS

16. Britt, John E., O'Malley, M.K., and **Rose, C.G.**, "Electromyographic Classification to Control the SPAR Glove," AAC/IFAC Modeling, Estimation, and Control Conference (MECC) 2021 *(accepted)*
15. Baskaran, A., Esmatloo, P., Times, M. Deshpande, A.D., and Rose, C.G. "An Anthropomorphic Passive Instrumented Hand for Validating Wearable Robotic Systems" IEEE/ASME International Conference on Advanced Intelligent Mechatronics (AIM) July 2021.
14. Ghonasgi, K., **Rose, C.G.**, de Oliveira, A.C., Varghese, R.J., and Deshpande, A.D. "Design and Validation of a Novel Exoskeleton Hand Interface: The Eminence Grip" IEEE International Conference on Robotics and Automation 2021.
13. Ghonasgi, K., de Oliveira, A.C., Shafer, A., **Rose, C.G.,** and Deshpande, A.D. "Estimating the Effect of Robotic Intervention on Elbow Joint Motion." Proceedings of the IEEE International Conference on Robot & Human Interactive Communication (RO-MAN) 2019.
12. Yousaf, S.N., Joshi, V.S., Britt, J.E., **Rose, C.G.**, and O'Malley, M.K. "Design and Characterization of a Passive Instrumented Hand," ASME Dynamic Systems and Controls Letters (DSC-L) 2020. *(in press)*.
11. de Oliviera, A.C., **Rose, C.G.**, Warburton, K., Ogden, E.M., Whitford, B., Lee, R.K., and Deshpande, A.D. "Exploring the Capabilities of Harmony for Upper-Body Stroke Therapy," Proceedings of the IEEE International Conference on Rehabilitation Robotics (ICORR) 2019.
10. **Rose, C.G.** and O'Malley, M.K. "Design of an assistive, glove-based exoskeleton," Proceedings of the International Symposium on Wearable Robotics and Rehabilitation (WeRob), Houston, TX, 2017, pp. 3-4
9. **Rose, C.G.**, Bucki, N.L., and O'Malley, M.K. "A Ball and Beam Module for a Haptic Paddle Education Platform." Proceedings of the ASME Dynamic Systems and Controls Conference (DSCC). 2017.

8. **Rose, C.G.**, Kann, C., Deshpande, A.D., and O'Malley, M.K. "Estimating Anatomical Wrist Joint Motion with a Robotic Exoskeleton." Proceedings of the IEEE International Conference on Rehabilitation Robotics (ICORR). pgs. 1437-1442. 2017.
7. Pezent, M.E., **Rose, C.G.**, and O'Malley, M.K. "Design and Characterization of the OpenWrist: A Robotic Wrist Exoskeleton for Coordinated Hand-Wrist Rehabilitation." Proceedings of the IEEE International Conference on Rehabilitation Robotics (ICORR). pgs. 720-725. 2017.
6. Pehlivan, A.U., Losey, D.P., **Rose, C.G.**, and O'Malley, M.K. "Maintaining Subject Engagement during Robotic Rehabilitation with a Minimal Assist-as-Needed (mAAN) Controller." Proceedings of the IEEE International Conference on Rehabilitation Robotics (ICORR). pgs. 62-67. 2017.
5. **Rose, C.G.**, Sergi, F., Yun, Y., Madden, K., Deshpande, A.D., and O'Malley, M.K. "Characterization of a hand-wrist exoskeleton, READAPT, via kinematic analysis of redundant pointing tasks." Proceedings of the IEEE International Conference on Rehabilitation Robotics (ICORR). pgs. 205-210. 2015.
4. French, J.A., **Rose, C.G.**, and O'Malley, M.K. "System Characterization of MAHI Exo-II: A Robotic Exoskeleton for Upper Extremity Rehabilitation". Proceedings of the ASME Dynamic Systems and Controls Conference (DSCC). 2014.
3. **Rose, C.G.**, French, J.A., and O'Malley, M.K. "Design and characterization of a haptic paddle for dynamics education." Proceedings of the IEEE Haptics Symposium (HAPTICS). pgs. 265-270. 2014.
2. Zeng, Y. **Rose, C.G.**, Brauner, P. Taha, W. Masood, J. Philippsen, R. O'Malley, M.K. and Cartwright, R. "Modeling Basic Aspects of Cyber-Physical Systems, Part II." Proceedings of the International Workshop on Domain-Specific Languages and models for ROBotic systems (DSLRob). pgs. 550-557. 2013.
1. Pehlivan, A.U., **Rose, C.G.** and O'Malley, M.K. "System Characterization of RiceWrist-S: a Forearm-Wrist Exoskeleton for Upper Extremity Rehabilitation." Proceedings of the IEEE International Conference on Rehabilitation Robotics (ICORR). pgs. 1437-1442. 2013.

PRESENTATIONS AND POSTERS

Co-Chair, IEEE Intelligent Robots and Systems (IROS) 2020 session "Exoskeletons: Control II"

Poster, "Design and Validation of a Sensorized Physical Human-Robot Interface for Distributed Force Measurement." In IROS 2020 Workshop on Ergonomic Human-Robot Collaboration: Opportunities and Challenges. IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS). October 30, 2020.

Poster, "Glove based exoskeleton for SCI rehabilitation" Mission Connect Symposium, Houston, TX. 12/17.

Poster, "Towards a next generation of wearable robotic devices for human-oriented assistance and therapy" Workshop at International Conference on Rehabilitation Robotics (ICORR) London, UK. 07/17.

Organizer and Presenter, "Haptics in Education" Workshop at World Haptics, Munich, Germany, 06/17

Poster and Demo, "A Ball and Beam Module for a Haptic Paddle Education Platform" World Haptics, Munich, Germany. 06/17.

Poster, "Glove-based exoskeleton for SCI rehabilitation" ASU Rehabilitation Robotics Workshop, Tempe, AZ. 02/17.

Poster, "Glove based exoskeleton for SCI rehabilitation" Mission Connect Symposium, Houston, TX. 12/16.

Presenter, "Haptic Paddle for Dynamics Education" at NSF Center for Mobile Hands-On STEM, 05/16.

Poster, "Glove based exoskeleton for SCI rehabilitation" Mission Connect Symposium, Houston, TX. 12/15.

Poster, "RiceWrist-S Design Modification and System Characterization" Mission Connect Symposium, Houston TX, 12/13.

INVITED TALKS

"Reflection on System Dynamics Principles Improves Student Performance in Labs with the Haptic Paddle" Rice University Center for Teaching Excellence, 09/18/2017.

"Glove-based Exoskeleton for Rehabilitation" Mission Connect Review of Science, 04/20/2018.

PAST AND CURRENT FUNDING

DOD STTR Phase II: "RODEO: Roll Over Detection for Equipment Transporter Operation"
- PI, Proposal in Response to Topic Number A20B-T006 "Virtual Off-Road Simulator for Teams of Bots and Autonomous/Conventional Wheeled/Tracked Vehicles"
- **Awarded,** $237k direct costs

Mission Connect, a project of the TIRR Foundation (Grant 017-114)
- Grant proposed evaluation and validation of assistive glove prototype device via clinical measures.
- Led writing of all proposal documentation.

- **Awarded,** $60k direct costs

Rice University InterDepartmental Excellence Award (IDEA)
- Grant proposed collaboration between robotics, medical anthropology, and psychology to overcome obstacles to developing an effective hand assistive device.
- Led the organization of grant submission and writing of Project Description.
- **Awarded,** $75k direct costs

Mission Connect, a project of the TIRR Foundation (Grant 015-103)
- Grant proposed purchase of actuator suite for the glove-based exoskeleton development project.
- Led writing of all proposal documentation.
- **Awarded,** $10k direct costs

NASA Space Technology Research Fellowship (NSTRF-NNX13AM70H)
- Led writing to support the design of an assistive exoskeleton to replace function in impaired individuals.
- **Awarded,** $225k direct costs

MENTORSHIP EXPERIENCE

Avinash Baskaran, BS BME University of Texas at Austin 2020, Sensorized Mannequin for Wearables Validation
Keeshan Patel, BS ECE University of Texas at Austin 2020, Hand Exoskeleton Simulation with Trainable Gestures
John Britt, MS ME Rice University 2020, Wearable Sensing and Intent Detection
Tiffani Tjandra, BS ME Rice University 2019, Design of Passive Finger Extension Wearables
Mikaela Juzswik, BS ME Rice University 2018, Design of Instrumented Finger Testbed
Claudia Kann, BS ME Rice University 2017, Robotic Assessment of the Wrist Joint
Nathan Bucki, BS ME Rice University 2017, Design of a Haptic Ball and Beam Module
Jared Elinger, BS ME Rice University 2016, Design of Haptic Paddle for Dynamics Education

TEACHING EXPERIENCE

Instructor, MECH 5970/6970 (Special Topics in Mechanical Engineering: Applied Mechatronics) at Auburn University (Spring '21)
Instructor, MECH 3140 (System Dynamics and Control) at Auburn University (Spring '20, Fall '20)
Technical Advisor, MECH 4240 (Senior Design) at Auburn University (Fall '20, Spring '21)
Technical Advisor, ME 366K (Senior Design) at University of Texas (Spring '19)
Guest Lecturer, MECH 488 (Introduction to Robotics) at Rice University (Spring `18)
Guest Lecturer, MECH 343 (Modeling Dynamic Systems) at Rice University (Fall `17)
Lead Teaching Assistant for MECH 343 (Modeling Dynamic Systems) Lab at Rice University (Fall `13, `14)
Teaching Assistant for MECH 420 (Fundamentals of Control Systems) at Rice University (Spring `13, `14, `16)
Teaching Assistant for MECH 488 (Design of Mechatronic Systems) at Rice University (Spring `15)
Teaching Assistant for MECH 343 (Modeling Dynamic Systems) Lab at Rice University (Fall `12)

RESEARCH EXPERIENCE

Postdoctoral Research in ReNeu Robotics Lab at University of Texas at Austin, advised by Dr. Ashish Deshpande (09/2018-present)
- *Supervised pre-clinical studies of novel bimanual upper extremity exoskeleton on post-stroke neurorehabilitation in collaboration with St. David's Neuroscience & Spine Institute.*
- *Validate novel, ergonomic attachment mechanisms for use in upper extremity exoskeletons.*
- *Lead interdisciplinary team extending autonomous agent machine learning techniques (curriculum learning) to human motor learning through human-robot interaction mediated by exoskeleton.*

Graduate Research in Mechatronics and Haptic Interfaces Lab at Rice University, advised by Dr. Marcia O'Malley (08/12-08/18)
- *Developed assistive glove-based exoskeletons as framework to investigate assistive technologies for post-spinal cord injury augmentation, soft sensing and actuation, and user interface and intent detection for intuitive control.*
- *Designed and validated exoskeletons to provide high-intensity training required to rehabilitate motor function, and the sensitive, accurate measurements needed to track motor function recovery.*
- *Collaboration with University of Texas, TIRR Memorial Hermann Hospital, and TRACLabs designing arm exoskeletons.*

- *Designed hands-on laboratory hardware platform, the Haptic Paddle, to support the development of reflective curriculum for Dynamics, Mechatronics, and Controls courses.*

NASA Space Technology Research Fellow in Wearable Robotics Lab at Johnson Space Center, Houston, TX, advised by Roger Rovekamp and Jonathan Rogers (05/14-07/14, 01/16-08/16, 05/17-07/17)

- *Designed and prototyped soft glove-based exoskeletons towards space and assistive applications*

Graduate Research in the Effective Modeling Group at Halmstad University, Halmstad, Sweden, advised by Dr. Walid Taha (06/13-07/13)

- *Modeled and simulated a wrist exoskeleton as a case study in the development of a domain-specific language for cyber-physical systems, motivating the support of partial differentiation for Lagrangian dynamic modelling.*

HONORS and AWARDS

NASA Space Technology Research Fellowship (NSTRF, 2013-2016)
NSF Graduate Research Fellowship Program (GRFP) Honorable Mention (2013)
ASME Plant Engineering and Maintenance Technical Chapter Scholarship Award (2018)
Texas Space Grant Consortium Fellow (2013-2016)
Alabama Space Grant Consortium Scholar (2012)
Auburn Undergraduate Research Fellowship (2011-2012)
Auburn Presidential Scholarship (2008-2012)

INVITED REVIEWS

#	Publication	Type
10	ASME Journal of Mechanisms and Robotics	Journal
6	IEEE Transactions on Neural Systems & Rehabilitation Engineering	Journal
6	IEEE Robotics and Automation Letters (RA-L)	Journal
5	IEEE Transactions on Haptics	Journal
4	Cambridge University Press Wearable Technologies	Journal
3	IEEE Transactions on Mechatronics	Journal
2	Frontiers in Robotics and AI	Journal
2	IEEE Transactions on Human-Machine Systems	Journal
1	IEEE Access	Journal
1	Elsevier Current Opinion in Biomedical Engineering	Journal
1	SAGE Journal of Rehabilitation and Assistive Technologies Engineering *(RATE)*	Journal
1	IEEE Transactions on Robotics	Journal
1	Springer Journal of Intelligent and Robotic Systems	Journal
1	ASME Journal of Biomechanical Engineering	Journal
1	IEEE Journal of Translational Engineering in Health and Medicine	Journal
1	Elsevier Journal of Biomechanics	Journal
8	ASME Dynamic Systems and Controls Conference (DSCC)	Conf.
2	IEEE International Conference on Robotics and Automation (ICRA)	Conf.
2	IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)	Conf.
1	IEEE International Conference on Rehabilitation Robotics (ICORR)	Conf.
1	IEEE RAS/EMBS International Conference on Biomedical Robotics and Biomechatronics (BioRob)	Conf.
1	EHS Eurohaptics Conference	Conf.
1	IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)	Conf.
1	IFAC Modeling, Estimation, and Control Conference (MECC)	Conf.

OUTREACH ACTIVITIES

Faculty Advisor, Auburn Robotic Mining Challenge Team (Fall '20 -)
Alabama State VEX Robotics Championship 2020 – Judge
Auburn University Council of Engineering Graduate Students 2020 Finish in Five pitch competition -Judge
Regeneron International Science and Engineering Fair (ISEF) April 1, 2021 - Best of Field Judge