Ryan S. McGinnis, PhD

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CURRENT POSITION

Assistant Professor, Dept. Electrical and Biomedical Engineering Director, M-Sense Research Group	University of Vermont	August 2017-Present
Co-Founder	AllostaTech	March 2018-Present
Scientific Advisor	Impellia	July 2018-Present

EDUCATION

University of Michigan, Post-Doctoral Training — Ann Arbor, MI — April 2013-November 2014
School of Kinesiology; Department of Mechanical Engineering
Kinesiology Mentors: Scott G. McLean, PhD; Grant C. Goulet, PhD
Mechanical Engineering Mentor: Noel C. Perkins, PhD

University of Michigan, PhD, MSE — Ann Arbor, MI — September 2009-April 2013
Mechanical Engineering
Dissertation: Advancing Applications of IMUs in Sports Training and Biomechanics
Chair: Noel C. Perkins, PhD
Committee: James Ashton-Miller, PhD; Arthur D. Kuo, PhD; Scott G. McLean, PhD; Mont Hubbard, PhD

Lafayette College, BS — Easton, PA — September 2005-May 2009
Mechanical Engineering (Summa Cum Laude with Honors)

Study Abroad at Jacobs University — Bremen, Germany — January 2007-May 2007
Thesis: Golf Club Deflection Characteristics as a Function of the Swing Hub Path
Advisor: Steven M. Nesbit, PhD

RESEARCH AND PUBLICATIONS

I. Manuscripts in Preparation (student mentees underlined)

1. Cain, SM, **McGinnis, RS**, Davidson, SP, Vitali, RV, Perkins, NC, McLean, SG. A simple IMU-based method for quantifying gait: algorithm development and comparisons to motion capture and instrumented treadmill data. Gait and Posture: In Preparation.
2. Cain, SM, **McGinnis, RS**, Davidson, SP, Vitali, RV, Perkins, NC, McLean, SG. Accurate gait event detection using foot-mounted inertial measurement units. Journal of Biomechanics: In Preparation.

II. Peer Reviewed Journal Articles (appeared or submitted, student mentees underlined)

R1. Jortberg, E, Silva, I, Bhatkar, V, **McGinnis, RS**, Sen-Gupta, E, Morey, B, Pindado, J, Wright, J, Bianchi, M. A novel adhesive biosensor system for detecting respiration, cardiac, and limb movement signals during sleep: validation with polysomnography. Nature and Science of Sleep: Under Review.

R2. Sun, R, **McGinnis, RS**, Sosnoff, JJ. Novel Technology for Mobility and Balance Tracking in Patients with Multiple Sclerosis: A Systematic Review. Expert Reviews in Neurotherapeutics: Under Review.

R3. **McGinnis, RS**, McGinnis, EW, Hruschak, J, Lopez-Duran, NL, Fitzgerald, K, Rosenblum, K, Muzik, M. Rapid Detection of Internalizing Diagnosis in Young Children Enabled by Wearable Sensors and Machine Learning. PLoS One: Under Review.

R4. **McGinnis, RS**, DiCristofaro, S, Sen-Gupta, E, Mahadevan, N, Weed, L, Adamowicz, L, Silva I, Jortberg, E, Wright, J, Murphy, B, McGrane, B, Raj, M, Ceruolo, M, Pindado, JA, Ghaffari, R, Patel, S. Feasibility of a Novel, Conformal, Wearable Sensor System for Longitudinal Patient Monitoring. Journal of Sensors:

Under Review.

R5. Gurchiek, RD, Rupasinghe, H, Lasanthi W, **McGinnis, RS**, Arnholt, AT. Sprint Assessment using Machine Learning and a Wearable Accelerometer. Journal of Applied Biomechanics: Under Review.

R6. Gurchiek, RD, **McGinnis, RS**, McBride, JM, Needle, A, van Werkhoven, H. An Adaptive Filtering Algorithm to Estimate Sprint Velocity Using a Single Inertial Sensor. Journal of Sports Engineering: Under Review.

R7. Nesbit, SM, Milanovich, M, **McGinnis, RS**. The Effects of Bat Inertial Properties on Female Softball Swing Mechanics and Bat Performance. Journal of Sports Science and Medicine: Under Review.

R8. **McGinnis, RS**, McGinnis, EW, Hruschak, J, Ip, K, Morlen, D, Lawler, J, Lopez-Duran, NL, Fitzgerald, K, Rosenblum, KL, Muzik, M. Wearable Sensors Detect Childhood Internalizing Disorders During Mood Induction Task. PLoS One: (2018) 13, e0195598.

R9. Sun, R, Moon, Y, **McGinnis, RS**, Seagers, K, Motl, RW, Sheth, N, Wright, JA, Ghaffari, R, Sosnoff, JJ. Assessment of postural sway in individuals with multiple sclerosis using a novel wearable inertial sensor. Digital Biomarkers: (2018) 2, 1-10.

R10. Gurchiek, RD, **McGinnis, RS**, McBride, JM, Needle, A, van Werkhoven, H. Use of a Single Inertial Sensor to Estimate 3-Dimensional Ground Reaction Force during Accelerative Running Tasks. Journal of Biomechanics: (2017) 61, 263-268.

R11. **McGinnis, RS**, McGinnis, EW, Muzik, M, Hruschak, J, Lopex-Duran, NL, Perkins, NC, Fitzgerald, K, Rosenblum, K. Movements indicate threat response phases in children at-risk for anxiety. IEEE Journal of Biomedical and Health Informatics: (2017) 21, 1460-1465.

R12. Vitali, RV, Cain, SM, **McGinnis, RS**, Zaferiou, A, Ojeda L, Davidson, SP, Perkins, NC. Method for Estimating Three-Dimensional Knee Rotations Using Two Inertial Measurement Units. Sensors: (2017) 17, 1970.

R13. **McGinnis, RS**, Mahadevan, N, Moon, Y, Seagers, K, Sheth, N, DiCristofaro, S, Silva I, Jortberg, E, Wright, J, Ceruolo, M, Pindado, JA, Ghaffari, R, Patel, S. A Machine Learning Approach for Gait Speed Estimation using Skin-mounted Wearable Sensors: From Healthy Controls to Individuals with Multiple Sclerosis. PLoS One: (2017) 12, e0178366.

R14. Moon, Y, **McGinnis, RS**, Motl, RW, Seagers, K, Sheth, N, Wright, J, Ghaffari, R, Sosnoff, JS. Monitoring of Gait in Multiple Sclerosis with Novel Wearable Motion Sensors. PLoS One: (2017) 2, e0171346.

R15. **McGinnis, RS**, Hough, J, Perkins, NC. Accuracy of wearable sensors for estimating joint reactions. ASME Journal of Computational and Nonlinear Dynamics: (2017) 12, 041010.

R16. **McGinnis, RS**, Cain, SM, Davidson, SP, Vitali, RV, Perkins, NC, McLean, SG. Inertial Sensor and Cluster Analysis for Discriminating Agility Run Technique and Quantifying Changes across Load. Biomedical Signal Processing and Control: (2017) 32, 150-156.

R17. Davidson, SP, Cain, SM, **McGinnis, RS**, Vitali, RV, Perkins, NC, McLean, SG. Quantifying Warfighter Performance in a Target Acquisition and Aiming Task using Wireless Inertial Sensors. Journal of Applied Ergonomics: (2016) 56, 27-33.

R18. Cain SM, **McGinnis RS**, Davidson SP, Vitali RV, Perkins NC, McLean SG. Quantifying performance and effects of load carriage during a challenging balancing task using an array of wireless inertial sensors. Gait & Posture: (2016) 43, 65-69.

R19. **McGinnis, RS**, Cain, SM, Davidson, SP, Vitali, RV, Perkins, NC, McLean, SG. Quantifying the Effects of Load Carriage and Fatigue under Load on Sacral Kinematics during Countermovement Vertical Jump with IMU-based Method. Journal of Sports Engineering: (2016) 19, 21-34.

R20. Whiteside, D, **McGinnis, RS**, Deneweth, JM, Zernicke, RF, Goulet, GC. Ball flight kinematics, variability and pitching success in elite baseball. Scandinavian journal of medicine & science in sports: (2016) 26, 256-265.

R21. **McGinnis, RS**, Cain, SM, Tao, S, Whiteside, D, Goulet, GC, Gardner, EC, Bedi, A, Perkins, NC. Validation of a Novel IMU-based Three-dimensional Hip Angle Measurement in Diagnostic Tests for Femoroacetabular Impingement. IEEE Transactions on Biomedical Engineering: (2015) 62, 1503-1513.

R22. Nesbit, SM, **McGinnis, RS**. Kinetic Constrained Golf Swing Optimization. Journal of Sports Science and Medicine: (2014) 13, 859–873.

R23. **McGinnis, RS**, Perkins, NC. Inertial Sensor Based Method for Identifying Ball Joint Center of Rotation.

Journal of Biomechanics: (2013) 46, 2546-2549.

R24. **McGinnis, RS**, Perkins, NC. A Highly Miniaturized, Wireless Inertial Measurement Unit for Characterizing the Dynamics of Pitched Baseballs and Softballs. Sensors: (2012) 12, 11933-11945.

R25. **McGinnis, RS**, Perkins, NC, King, KW. Reconstructing Free-flight Angular Velocity from Miniaturized Wireless Accelerometer. ASME Journal of Applied Mechanics: (2012) 79, 041013:1–041013:9.

R26. King, KW, Hough, J, **McGinnis, RS**, Perkins, NC. A New Technology for Resolving the Dynamics of a Swinging Bat, Journal of Sports Engineering: (2012) 15, 41-52.

R27. Nesbit, SM, **McGinnis, RS**. Biomechanical Study of the Golf Swing Using a Full Body Computer Model, Journal of Applied Golf Research: (2011) http://thejagr.com/issue/issue-1-spring-2011/article/biomechanical-study-of-the-golf-swing-using-a-full-body-computer-model1.

R28. King, KW, Perkins, NC, Churchill, H, **McGinnis, RS**, Doss, R, Hickland, R. Bowling Ball Dynamics Revealed by Miniature Wireless MEMS Inertial Measurement Unit, Journal of Sports Engineering: (2010) 13, 95-104.

R29. **McGinnis, RS**, Nesbit, SM. Golf Club Deflection Characteristics as a Function of the Swing Hub Path, Open Sports Sciences Journal: (2010) 3, 155-164.

R30. Nesbit, SM, **McGinnis, RS**. Kinematic Analysis of the Golf Swing Hub Path and its Role in Golfer/Club Kinetic Transfers. Journal of Sports Science and Medicine: (2009) 8, 235 - 246.

III. Peer Reviewed Conference Articles/Abstracts (student mentees underlined)

R1. Adamowicz, L, **McGinnis, RS**. Unscented Kalman Filter For Estimating Knee Joint Flexion Axis Using Wearable Sensors. BMES 2018: Under Review.

R2. Adamowicz, L, **McGinnis, RS**. Using Gyroscopic Measurements to Compare Spinal Twisting Angles Experienced During Walking, Running, and Cross-Country Skiing. BMES 2018: Under Review.

R3. Weed, L, Robinson, J, Goodwin, LB, **McGinnis, RS**. Open-Source Wearable Sensor Based Method Feasible for Tracking Steps in Patients Recovering from Stroke. BMES 2018: Under Review.

R4. Kasser, SL, Ahern, K, Triquet, T, Hindsdale, K, **McGinnis, RS**. Effects of Cognitive Motor Interference on the Neural Control System Underlying Mobility in Adults with Multiple Sclerosis. Annual Meeting of the Consortium of Multiple Sclerosis Centers 2018: Under Review.

R5. **McGinnis, RS**, McGinnis, EW, Hruschak, J, Lopex-Duran, NL, Fitzgerald, K, Rosenblum, K, Muzik, M. Rapid Anxiety and Depression Diagnosis in Young Children Enabled by Wearable Sensors and Machine Learning. Conference for the IEEE Engineering in Medicine and Biology Society EMBC'18: Accepted.

R6. Gurchiek, RD, Rupasinghe, H, Lasanthi W, **McGinnis, RS**, Arnholt, AT. Sprint Assessment using Machine Learning and a Wearable Accelerometer. Gait and Clinical Movement Analysis Society 2018: Accepted.

R7. **McGinnis, RS**, McGinnis, EW, Hruschak, J, Lopex-Duran, NL, Fitzgerald, K, Rosenblum, K, Muzik, M. Wearable Sensors and Machine Learning Diagnose Anxiety and Depression in Young Children. IEEE Conference on Biomedical and Health Informatics 2018: Las Vegas, NV, March 2018.

R8. **McGinnis, RS**, Redrado, JB, Choquette, RH, Beynnon, BD, Slauterbeck, JR, Tourville, TW, Toth, MJ. Wearable Sensors Capture Differences in Muscle Activity and Gait Patterns During Daily Activity in Patients Recovering from ACL Reconstruction. IEEE Conference on Body Sensor Networks 2018: Las Vegas, NV, March 2018.

R9. Weed, L, **McGinnis, RS**. Validation of Gait Analysis Pro App for 10m Walk Test. BMES 2017: Phoenix, AZ, October 2017.

R10. Gurchiek, RD, **McGinnis, RS**, McBride, JM, Needle, A, van Werkhoven, H. The Use of a Single Inertial Sensor to Estimate 3-Dimensional Ground Reaction Force during Accelerative Running Tasks. 41st Annual Meeting of the American Society of Biomechanics: Boulder, CO, August 2017.

R11. Gurchiek, RD, **McGinnis, RS**, McBride, JM, Needle, A, van Werkhoven, H. An Adaptive Filtering Algorithm to Estimate Sprint Velocity Using a Single Inertial Sensor. 41st Annual Meeting of the American Society of Biomechanics: Boulder, CO, August 2017.

R12. **McGinnis, RS**, DiCristofaro, S, Mahadevan, N, Sen-Gupta, E, Silva I, Jortberg, E, Wright, J, Ghaffari, R, Aranyosi, AJ, Patel, S. Longitudinal Data from Wearable Sensor System Suggests Movement Improves Standing Posture. 41st Annual Meeting of the American Society of Biomechanics: Boulder, CO, August 2017.

R13. **McGinnis, RS**, McGinnis, EW. Active Learning in Biomechanics Using Wearable Sensors: A Case Study From The University Of Vermont. 41st Annual Meeting of the American Society of Biomechanics: Boulder, CO, August 2017.

R14. **McGinnis, RS**, DiCristofaro, S, Sen-Gupta, E, Mahadevan, N, Silva I, Jortberg, E, Wright, J, Murphy, B, McGrane, B, Raj, M, Ceruolo, M, Pindado, JA, Ghaffari, R, Patel, S. Longitudinal Posture and Activity Tracking in the Home Enabled by Machine Learning and a Conformal, Wearable Sensor System. SB^3C 2017: Tucson, AZ, June 2017.

R15. Sun, R, Moon, Y, **McGinnis, RS**, Seagers, K, Motl, RW, Sheth, N, Wright, JA, Ghaffari, R, Sosnoff, JJ. A Soft, Flexible Skin-Mounted Sensor for Monitoring Balance Deficits in People with Multiple Sclerosis. 2017 CMSC Annual Meeting: New Orleans, LA, May 2017.

R16. Johnson, AM, Etter, JE, Petrillo, CJ, Chen, W, Nuzzolo, J, **McGinnis, RS**. Wearable Sensors Show That Talking, Not Texting, Impairs Postural Control. 43rd Annual Northeast Bioengineering Conference: New Jersey Institute of Technology, March 2017.

R17. Moon, Y, **McGinnis, RS**, Seagers, K, Motl, RW, Sheth, N, Wright, J, Ghaffari, R, Sosnoff, JS. Monitoring Gait in Multiple Sclerosis with Novel Wearable Motion Sensors. 2016 American Congress of Rehabilitation Medicine Annual Conference: Chicago, IL, October 2016.

R18. Silva, I, **McGinnis, RS**, Patel, S, DiCristofaro, S, Mahadevan, N, Jortberg, E, Ceruolo, M, Pindado, J. Development and cloud deployment of machine learning models for heartbeat classification on data from wearable devices. 3rd International Conference on Predictive Applications and APIs (PAPIs '16): Boston, MA, October 2016.

R19. **McGinnis, RS**, Patel, S, Silva, I, Mahadevan, N, DiCristofaro, S, Jortberg, E, Ceruolo, M, Aranyosi, AJ. Skin Mounted Accelerometer System for Measuring Knee Range of Motion. Conference for the IEEE Engineering in Medicine and Biology Society EMBC'16: Orlando, FL, August 2016.

R20. Patel, S, **McGinnis, RS**, Silva, I, DiCristofaro, S, Mahadevan, N, Jortberg, E, Franco, J, Martin, A, Raj, M, McGrane, B, DePetrillo, P, Aranyosi, AJ, Ceruolo, M, Pindado, J, Ghaffari, R. A wearable computing platform for the development and deployment of cloud-based machine learning models for health monitoring. Conference for the IEEE Engineering in Medicine and Biology Society EMBC'16: Orlando, FL, August 2016.

R21. **McGinnis, RS**, McGinnis, EW, Fitzgerald, K, Muzik, M, Perkins, NC, Rosenblum, KL. Startle Response as a Biomarker for Mental Health Risk in Preschoolers. Grand Rounds at the University of Michigan, Psychiatry Department symposium: Can we predict risk of developing a mental illness? Ann Arbor, MI, November 2015.

R22. **McGinnis RS**, Cain SM, McLean SG, Davidson SP, Vitali RV, Perkins NC. Inertial Sensor and Cluster Analysis for Discriminating Agility Run Technique. 9th IFAC Symposium on Biological and Medical Systems. Berlin, September 2015.

R23. **McGinnis RS**, Cain SM, Davidson SP, Vitali RV, McLean SG, Perkins NC. Wearable Inertial Sensor for Agility Run Performance Assessment. ASME IDETC/CIE 2015. Boston, MA, August 2015.

R24. McLean SG, Cain SM, **McGinnis RS**, Davidson SP, Vitali RV, Perkins NC. Quantifying Field-Based Warfighter Performance via a Body-Worn Array of Wireless Inertial Sensors. American Society of Biomechanics. Columbus, OH, August 2015.

R25. Cain SM, **McGinnis RS**, Davidson SP, Vitali RV, McLean SG, Perkins NC. Quantifying Performance and Effects of Load Carriage During Completion a Window Obstacle Using an Array of Wireless Inertial Sensors. American Society of Biomechanics. Columbus, OH, August 2015.

R26. Deneweth, J, **McGinnis, RS**, Zernicke, R, Goulet, G. Individual-specific determinants of successful adaptation to minimal and maximal running shoes. Footwear Biomechanics Symposium. Liverpool, UK, July 2015.

R27. Davidson SP, **McGinnis RS**, Vitali RV, Cain SM, Perkins NC, McLean SG. Validating Inertial Measurement Units as a Method for Determining Rifle Aiming Performance. International Society of Biomechanics. Glasgow, Scotland, July 2015.

R28. Cain SM, **McGinnis RS**, Davidson SP, Vitali RV, McLean SG, Perkins NC. Quantifying Performance and Effects of Load Carriage during a Challenging Balancing Task using an Array of Wireless Inertial Measurement Units. International Society of Biomechanics. Glasgow, Scotland, July 2015.

R29. **McGinnis, RS**, Cain, SM, Davidson, SP, Vitali, RV, McLean, SG, Perkins, NC. Validation of Complementary Filter Based IMU Data Fusion for Tracking Torso Angle and Rifle Orientation. 2014 ASME International Mechanical Engineering Congress and Exposition, November 14-20, Montreal, QC.

R30. Fox, A, Davidson, S, **McGinnis, R**, Cain, S, Saunders, N, & McLean, S. Exploring the use of wireless inertial measurement units for biomechanical analysis of side-step cutting manoeuvres. 2014 Australian Conference of Science and Medicine in Sport, October 15-18, Canberra, Australia.

R31. Cain, SM, **McGinnis, RS**, Davidson, SP, Vitali, RV, Perkins, NC, McLean, SG. Using Inertial Measurement Units to Quantify Gait Performance. Dynamic Walking 2014, June 10-13, Zurich, Switzerland.

R32. Whiteside, D, **McGinnis, RS**, Deneweth, JM, Holstad, R, Martini, DN, Zernicke, RF, & Goulet, GC. Relating ball flight characteristics, variability in release location and game success in elite baseball pitchers. XIX Annual Congress of the European College of Sport Science, July 2-5, 2014, Amsterdam, Netherlands.

R33. **McGinnis, RS**, Cain, SM, Davidson, SP, Vitali, RV, McLean, SG, Perkins, NC. Validation of IMU-based Method for Tracking Warfighter Torso Angle during Up-down Maneuver. 7th World Congress of Biomechanics, July 6-11, 2014, Boston, MA.

R34. **McGinnis, RS**, Cain, SM, Davidson, SP, Vitali, RV, McLean, SG, Perkins, NC. Validation of IMU-based Method for Tracking Warfighter Motion during Jumping Maneuver. 7th World Congress of Biomechanics, July 6-11, 2014, Boston, MA.

R35. Cain, SM, **McGinnis, RS**, Davidson, SP, Vitali, RV, McLean, SG, Perkins, NC. An IMU-based method for quantifying gait: algorithm development and comparisons to motion capture and instrumented treadmill data. 7th World Congress of Biomechanics, July 6-11, 2014, Boston, MA.

R36. Davidson, SP, **McGinnis, RS**, Cain, SM, Vitali, RV, McLean, SG, Perkins, NC. Validating Inertial Measurement Units as a Method for Determining Rifle Aiming Performance. 7th World Congress of Biomechanics, July 6-11, 2014, Boston, MA.

R37. Vitali, RV, **McGinnis, RS**, Cain, SM, Davidson, SP, McLean, SG, Perkins, NC. Quantifying Rifle Aiming Dynamics with an Inertial Measurement Unit. 7th World Congress of Biomechanics, July 6-11, 2014, Boston, MA.

R38. Fox, A, Cain, SM, **McGinnis, RS**, Davidson, SP, Vitali, RV, Perkins, NC, McLean, SG. Ability of body worn inertial measurement units to detect changes in performance during a loaded step-up task. American Society of Biomechanics 2014 Midwest Regional Meeting, March 4-5, Akron, OH.

R39. **McGinnis, RS**, Hough, J, Perkins, NC. Benchmarking the Accuracy of Inertial Measurement Units for Estimating Joint Reactions. Proceedings 2013 ASME International Mechanical Engineering Congress and Exposition, San Diego, CA. IMECE2013-63303. Best paper award, ASME Bioengineering Division: Biomedical and Biotechnology Engineering

R40. Hough, J, **McGinnis, RS**, Perkins, NC. Benchmarking the Accuracy of Inertial Measurement Units for Estimating Kinetic Energy. Proceedings 2013 ASME International Mechanical Engineering Congress and Exposition, San Diego, CA. IMECE2013-63300.

R41. **McGinnis, RS**, Perkins, NC. Pitcher Training Aided by Instrumented Baseball. 9th Conference of the International Sports Engineering Association (ISEA), Lowell, MA. Published in Procedia Engineering: (2012) 34, 580-585.

R42. **McGinnis, RS**, Perkins, NC, King, KW. Miniaturized Wireless IMU Enables Low-Cost Baseball Pitching Training Aid. 35th Annual Meeting of the American Society of Biomechanics, Long Beach, CA, August 10-13, 2011.

R43. **McGinnis, RS**, Nesbit, SM. Analysis of the Swing Hub of the Golf Shot. 13th European College of Sports Science Congress, Estoril, Portugal, July 9-12, 2008.

IV. Non-Reviewed Conference Articles/Abstracts (student mentees underlined)

NR1. Weed, L, Robinson, J, Goodwin, LB, **McGinnis, RS**. Step Identification in Wearable Sensor Data from Irregular Gait in Stroke Patients. UVM Student Research Conference, Burlington, VT, April 2018.

NR2. Johnson, AM, Etter, JE, Petrillo, CJ, Chen, W, Nuzzolo, J, **McGinnis, RS**. Wearable Sensors Show That Talking, Not Texting, Impairs Postural Control. UVM Student Research Conference, Burlington, VT, April 2017.

NR3. Jednak, C, Adamowicz, L, Walton, M, Roberge, C, Redrado, JB, Parker, M, Bao, J, **McGinnis, RS**. Characterizing Walking, Jogging, and Sprinting Gait Parameters with Wearable Sensors. UVM Student Research Conference, Burlington, VT, April 2017.

NR4. Weed, L, **McGinnis, RS**. Validation of GaitAnalysisPro Mobile Application for Characterizing 10 m Walk Test. UVM Student Research Conference, Burlington, VT, April 2017.

NR5. Scism, J, **McGinnis, RS**. Wearable Sensors and Template Analysis for Automatically Detecting Jump Landings in Sport. UVM Student Research Conference, Burlington, VT, April 2017.

IV. Book Chapters

R1. Raj, M, Patel, S, Lee, CH, Ma, Y, Banks, A, **McGinnis, RS**, McGrane, B, Morey, B, Model, JB, DePetrillo, P, Sheth, N, Liu, C, Sen-Gupta, E, Klinker, L, Murphy, B, Wright, JA, Aranyosi, AJ, Mansour, M, Dorsey, RE, Slepian, M, Huang, Y, Rogers, JA, Ghaffari, R. Multifunctional Epidermal Sensor System with Ultrathin Encapsulation Packaging for Health Monitoring In *Stretchable Bioelectronics for Medical Devices and Systems:* Springer, 2016.

V. Patents (Awarded or Submitted)

R1. **McGinnis, RS**, McGinnis, EW. AI-Enabled Biofeedback App for Personalized Treatment of Panic Attacks. Disclosed to UVM Innovations December 22, 2017.

R2. **McGinnis, RS**, McGinnis, EW, Muzik, M, Rosenblum, K, Fitzgerald, K, Lopez-Duran, N, Hruschak, J. Wearable Sensors and Machine Learning for Diagnosing Anxiety and Depression in Young Children. Disclosed to UVM Innovations November 22, 2017.

R3. Raj, M, **McGinnis, RS**. Closed Loop Respiratory Monitoring System for Sleep Quality Characterization. Filed October 28, 2016.

R4. Ghaffari, R, Patel, S, Raj, M, **McGinnis, RS**. Method and System for Neuromodulation and Stimulation. US 15/286,129, Filed October 5, 2016.

R5. Pindado, JA, Ceruolo, MC, Patel, SP, **McGinnis, RS**, DePetrillo, P. Method and System for Crowd-Sourced Algorithm Development. US 15/272,816, Filed September 22, 2016.

R6. Patel, SP, **McGinnis, RS**, Prakash, A, Ghaffari, R, Raj, M, Silva, A, Jortberg, E. Automated detection and configuration of wearable devices based on on-body status, location, and/or orientation. US 15/048,576, Filed February 19, 2016.

R7. **McGinnis, RS**, Perkins, NC, Copple, BR. IMU Array for Assessing Proper Head and Torso Posture during Physical Impact in Sport. US 61/931,767, Filed January 27, 2014. PCT/US2015/012857 Filed January 26, 2015.

R8. **McGinnis, RS**, Perkins, NC. Athlete Speed Prediction Method Using Data from Attached Inertial Measurement Unit. US Patent 9,213,889, Filed March 25, 2014, Awarded December 15, 2015.

R9. **McGinnis, RS**, Perkins, NC. Ball Joint Center Locating Method Using Data from Attached Inertial Measurement Unit. US 61/694,790, Filed August 30, 2012. PCT/US2013/057303, Filed August 29, 2013, Awarded January 12, 2018.

R10. **McGinnis, RS**, Perkins, NC. Pitcher Training Apparatus and Method Using a Ball with an Embedded Inertial Measurement Unit. US Patent 9,032,794. PCT/US2013/053556, Filed August 5, 2013, Awarded May 19, 2015.

R11. Perkins, NC, King, KW, and **McGinnis, RS**. Apparatus and Methods for Employing Miniature IMU's for Deducing Forces and Moments on Bodies. US 13/236,728, Filed September 20, 2011.

VI. Invited Talks

I1. **McGinnis, RS,** McGinnis, EW. Wearable Sensors for Improving Mental Health Assessment in Young Children. Burlington Healthcare Innovators Show & Tell, November 2017.

I2. **McGinnis, RS**. Machine Learning with Sensor Data. Lord MicroStrain Sensing Systems, November 2017.

I3. **McGinnis, RS**. Project Based Learning in First Year Introduction to Biomedical Engineering Design. Meeting of the UVM CEMS Board of Advisors, October 2017.

I4. **McGinnis, RS**. M-Sense Group @ UVM: Research Update. Meeting of the UVM CEMS Board of Advisors, October 2017.

I5. **McGinnis, RS**. Wearable Sensors: From Furthering Fitness to Diagnosing Disease. Burlington Data

Science Meet-up, Vermont Tech Jam 2017, BTV Ignite Innovation Week 2017, October 2017.

I6. **McGinnis, RS**. Engineering at the Intersection of Wearable Technology and Improving Human Health and Performance. Meeting of the Student Chapter of BMES at the University of Vermont, April 2017.

I7. **McGinnis, RS**. The Path from Mechanical Engineering to Improving Human Health and Performance with Wearable and Mobile Technologies. Meeting of the Student Chapter of ASME at the University of Vermont, March 2017.

I8. **McGinnis, RS**. Improving Human Health and Performance with Wearable and Mobile Technologies. University of Vermont, February 2017.

I9. **McGinnis, RS**. Conservation of angular momentum: An experimental demonstration of rotation axis precession enabled by a wireless inertial measurement unit. Intermediate Dynamics, University of Michigan, Fall 2013.

I10. **McGinnis, RS**. Conservation of angular momentum: An experimental demonstration of rotation axis precession enabled by a wireless inertial measurement unit. Intermediate Dynamics, University of Michigan, Fall 2012.

VII. Other Publications/Interviews

NR1. Interviewed for UVM communications article titled "Biomedical Engineering Students Dive into Research" (2018). https://www.uvm.edu/newsstories/news/biomedical-engineering-students-dive-research

NR2. Featured speaker for the Careers in Medicine Panel: Innovation in Medicine (2017). Larner College of Medicine, University of Vermont.

NR3. Interviewed by WCAX for segment titled "Revolution in Wearable Devices Prompts New Medical Innovations" (2017). http://www.wcax.com/video?vid=452798703

NR4. Interviewed by Seven Days for article titled "How Vermont Became a Hotbed for Health Tech Companies" (2017). https://www.sevendaysvt.com/vermont/how-vermont-became-a-hotbed-for-health-tech-companies/Content?oid=9189716

NR5. **McGinnis, RS**. (2013). Advancing Applications of IMUs in Sports Training and Biomechanics. Doctoral Dissertation. Available from the University of Michigan, Ann Arbor, MI.

NR6. Interviewed for Sports Technology Pod Cast in episode titled "Instrumented Baseball Research" (2012). http://sportstechnologypodcast.com/ryanmcginnis/.

NR7. **McGinnis, RS**, Perkins, NC. (2012). Pitcher Training Aided by Instrumented Baseball. Advances in Engineering. http://advancesinengineering.com/general-engineering/pitcher-training-aided-by-instrumented-baseball/.

NR8. Perkins, NC, King, KW, **McGinnis, RS**, Hough, J. (2011). A Sporting Chance. Mechanical Engineering Magazine.

NR9. **McGinnis, RS**. (2008). Engineering a Better Golf Swing. ME Today, 10. http://www.asme.org/NewsPublicPolicy/Newsletters/METoday/Articles/Better_Golf_Swing.cfm

NR10. **McGinnis, RS**. (2008). Engineering a Better Golf Swing. http://www.lafayette.edu/news.php/view/12541

VIII. Participation in Funded Research and Grant Submissions (Successful and Pending Applications Only)

1. Title: Just-In-Time Fall Prevention: Development of an mHealth Intervention for Persons with Multiple Sclerosis
   Agency: NIH
   Role: Principal Investigator
   Year Awarded: Pending

2. Title: Wearable Sensors and Machine Learning for Tracking Biomechanical Indicators of Falls During Daily Life
   Agency: Consortium of Multiple Sclerosis Centers
   Role: Principal Investigator
   Year Awarded: Submission Invited, Award Pending

3. Title: Wearable Sensors and Machine Learning for Determining Biomechanical Indicators of Falls During Daily Life
   Agency: National Multiple Sclerosis Society
   Role: Principal Investigator
   Year Awarded: Pending

4. Title: RII Track-4: Just in Time Fall Prevention: Developing mHealth Biofeedback Interventions for Preventing Falls in Persons with Multiple Sclerosis
   Agency: NSF
   Role: Principal Investigator
   Year Awarded: Pending

5. Title: Machine Learning and Multimodal Wearable Sensor Data for Automatic Sleep Apnea Diagnosis
   Agency: Brain Matterz, Inc.
   Role: Principal Investigator
   Year Awarded: Pending

6. Title: Continuous Monitoring of Turning Technique to Identify Motor Fluctuations in Parkinson's Disease
   Agency: Pfizer, Inc.
   Role: Principal Investigator
   Year Awarded: Pending

7. Title: Development and Pilot Testing of a mHealth Intervention for Reducing Mobility Impairment in People with Parkinson's Disease
   Agency: UVM Binter Research Grant Program
   Role: Principal Investigator
   Year Awarded: 2018
   Year (Inclusive) of Project: 2018-2019

8. Title: Wearable Sensor System for Quantifying Fall Risk During Daily Life in Persons with Multiple Sclerosis
   Agency: University of Vermont Biomedical Engineering Pilot Program
   Role: Principal Investigator
   Year Awarded: 2018
   Year (Inclusive) of Project: 2018-2019

9. Title: Novel Arm Restraint for Critically Ill Patients to Reduce Immobility, Sedation, Agitation and Cognitive Impairment
   Agency: NIH
   Role: Co-Investigator
   Year Awarded: 2018
   Year (Inclusive) of Project: 2018-2020

10. Title: Assessing Feasibility of We-Panic: A Biofeedback App for Treating Panic Attacks
    Agency: University of Vermont Office of the Vice President of Research EXPRESS Program.
    Role: Principal Investigator
    Year Awarded: 2017
    Year (Inclusive) of Project: 2018

11. Title: Wearable Sensors for Tracking Fall Risk During Daily Activity in Persons with Multiple Sclerosis
    Agency: University of Vermont Movement Disorder Clinic Pilot Program
    Role: Principal Investigator

Year Awarded: 2017
Year (Inclusive) of Project: 2017-2018

12. Title: The Panic Button: A biofeedback app for panic attacks – Algorithm design and validation
    Agency: Experiment.com
    Role: Principal Investigator
    Year Awarded: 2016
    Year (Inclusive) of Project: 2016-2017

13. Title: Novel IMU Array Algorithms for Golf Club Fitting
    Agency: Insight, Ltd.
    Role: Principal Investigator
    Year Awarded: 2014
    Year (Inclusive) of Project: 2014

14. Title: IMU Array Algorithms and Technology for Field-based Warfighter Performance Assessment
    Agency: US Department of Defense
    Role: Postdoctoral Fellow
    Year Awarded: 2013
    Year (Inclusive) of Project: 2013-2015

15. Title: Instrumented Baseball Bat for Bat Testing
    Agency: Hillerich and Bradsby Co.
    Role: Graduate Student Researcher
    Year Awarded: 2012
    Year (Inclusive) of Project: 2012

16. Title: Advancing Applications of IMUs in Sports Training and Biomechanics
    Agency: NSF Graduate Research Fellowship Program
    Role: Principal Investigator
    Year Awarded: 2010
    Year (Inclusive) of Project: 2010-2013

17. Title: Prototype Instrumented Baseball Bat for Research and Development
    Agency: Rawlings/Worth
    Role: Graduate Student Researcher
    Year Awarded: 2010
    Year (Inclusive) of Project: 2010

18. Title: Developing an Instrumented Bowling Ball: New Capabilities for Player Training and Ball Design
    Agency: Ebonite International
    Role: Graduate Student Researcher
    Year Awarded: 2008
    Year (Inclusive) of Project: 2008-2009

IX. Other Research Related Activities

- Member, Executive Leadership Council for the University of Vermont Center on Aging
- Member, UVM Orthopaedic Research Committee
- Co-Chair, Northern New England Chapter of IEEE Engineering in Medicine and Biology Society
- Faculty Advisor, University of Vermont Student Chapter of IEEE Engineering in Medicine and Biology Society

- Professional Membership: IEEE – Institute of Electrical and Electronics Engineers, ASME – American Society of Mechanical Engineers, ASB – American Society of Biomechanics
- Reviewer for (Selected): PLOS One, IEEE Transactions on Neural Systems & Rehabilitation Engineering, IEEE Transactions on Biomedical Engineering, IEEE Journal of Biomedical and Health Informatics, Journal of Biomechanics, Bone and Joint Research, Biomedical Signal Processing and Control, Journal of Sports Engineering, BioMedical Engineering OnLine, BMC Sports Science, Medicine & Rehabilitation, Sports, Sensors, Biomechanics specialty area of Frontiers in Bioengineering and Biotechnology, 2015 ASME IDETC, 2013, 2014 ASME IMECE
- Conference session chair for: 2015 IFAC BMS; 2015 ASME IDETC; 2013, 2014 ASME IMECE

PREVIOUS ACADEMIC APPOINTMENTS AND POSITIONS

Lecturer — University of Vermont — August 2016-May 2017
Dept. Electrical and Biomedical Engineering
Dept. Mechanical Engineering

Responsible for creating a new program in Biomedical Engineering, developing and teaching courses in Mechanical, Electrical, and Biomedical Engineering, managing graduate student instructors and undergraduate course graders, mentoring senior capstone design project teams and student research projects, advising undergraduate students, and contributing to a biomedical teaching laboratory renovation project.

Postdoctoral Research Fellow — University of Michigan — May 2013-November 2014
School of Kinesiology; Dept. of Mechanical Engineering

Research Aims:

- Develop and validate inertial sensor based techniques for monitoring warfighter biomechanics
- Develop and validate inertial sensor based techniques for quantifying hip motion during common clinical assessments used for diagnosis of FAI and other morphological abnormalities of the pre-arthritic hip.
- Develop and validate inertial sensor based techniques for quantifying flexible golf club behavior for club fitting and skill assessment.
- Explore and quantify the relationships between baseball and softball windup and delivery kinematics, pitch release conditions, and pitcher skill and effectiveness.
- Determine how running mechanics and economy, and the potential for successful running gait adaptation, are impacted by explicit individualized morphological indices.
- Improve student engagement in Introductory Dynamics and Vibrations course using inertial sensor based concept demonstrations and projects.

Doctoral Student — University of Michigan — September 2009-April 2013
(NSF and ME Dept. Graduate Research Fellow)
Dept. of Mechanical Engineering

Research Aim: Develop and validate inertial sensor based algorithms in the following applications:

- Reconstruct free-flight angular velocity data from accelerometer measurements
- Assess dynamics of pitched baseballs and softballs for skill assessment, and training
- Quantify joint reaction forces and moments
- Identify ball-joint center of rotation in a mechanical analog to the human hip joint
- Estimate athlete speed using a single, torso-mounted inertial measurement unit

Undergraduate Research Assistant — Lafayette College — September 2009-May 2009
Dept. of Mechanical Engineering

Research Aim: Explore the relationship between hand path during the golf swing and club deformation.

EXCEL Scholar — Lafayette College — May 2008-August 2008
Dept. of Mechanical Engineering

Research Aim: Explore the relationship between hand path during the golf swing and various swing parameters.

MENTORSHIP EXPERIENCE

I. Thesis Committee Membership Experience

- Reed Gurchiek, MS, Exercise Science, Appalachian State University
- Jennifer Etter, PhD, Mechanical Engineering, University of Vermont
- Rachel Vitali, PhD, Mechanical Engineering, University of Michigan
- Casey Little, BS, Rehab and Movement Science, University of Vermont
- Chia-Chun Chao, MS, Computer Science, University of Vermont

II. Primary Research Mentorship Experience

- Graduate students:
    1. Lukas Adamowicz, MS, Mechanical Engineering, University of Vermont
    2. Daniel Berenberg, MS, Computer Science, University of Vermont

- Undergraduate students:
    1. Adam Barson, BS, Computer Science, University of Vermont
    2. Kaseya Xia, BS, Biomedical Engineering, University of Vermont
    3. Gianna Barnhart, BS, Neuroscience, University of Vermont
    4. Caroline Duksta, BS, Neuroscience, University of Vermont
    5. Sarah Hampson, BS, Biomedical Engineering, University of Vermont
    6. Jordyn Scism, BS, Biomedical Engineering, University of Vermont
    7. Javier Buñuel Redrado, BS, Electrical Engineering, Autonomous University of Barcelona
    8. Danielle Sedler, BS, Biomedical Engineering, University of Vermont
    9. Chris Erkson, BS, Biomedical Engineering, University of Vermont
    10. Chris Petrillo, BS, Mechanical Engineering, University of Vermont
    11. Steve Anderau, BS, Mechanical Engineering, University of Vermont
    12. Ali Gohlke-Schermer, BS, Mechanical Engineering, University of Vermont
    13. Jon Ferri, BS, Biomedical Engineering, University of Vermont
    14. Brett Meyer, BS, Biomedical Engineering, University of Vermont
    15. Lara Weed, BS Student, Biomedical Engineering, University of Vermont

- Junior Engineers and Student Interns while in Industry:
    1. Aida Ehyaei, PhD, Computer Science, Northeastern University
    2. Naveen Periasamy, MS, Computer Science, Northeastern University
    3. Zachary Kratochvil, BS, Neuroscience, Dartmouth
    4. Elise Jortberg, BS, Physics, Northeastern University
    5. Steve DiCristofaro, Data Science Engineer, MC10, Inc.
    6. Nikhil Mahadevan, Data Analytics Engineer, MC10, Inc.

TEACHING EXPERIENCE

UVM Courses Taught Since Fall 2016 (Course Evaluation out of 5.0 / UVM College of Engineering Average)

- ME012 – Dynamics (4.02/3.88)
- ME111 – System Dynamics (4.39/3.88)
- EE100 – Introduction to Electrical Circuits (4.36/3.88)
- BME001 – Biomedical Engineering Design Experience (3.99/3.88)
- BME081 – Biomedical Engineering Lab I (Not Evaluated)
- BME151 – Fall BME Workshop (3.28/3.88)
- BME240 – Wearable Sensing (4.5/3.88)

INDUSTRY EXPERIENCE

Research and Development Consultant — Impellia — June-August 2017
Responsible for the development and validation of computational algorithms which utilize data from an array of wearable sensors to quantify athletic injury risk and inform return to play decisions.

Algorithms Consultant — MC10, Inc. — August-October 2016
Senior Algorithms Engineer — March-August 2016
Algorithms Engineer — November 2014-March 2016
Responsible for leading an interdisciplinary team to develop and validate algorithms that utilize accelerometer, angular rate gyro, and biopotential (ECG, EMG) signals to provide actionable insights for medical applications ranging from rehab from joint replacement surgery to monitoring and treatment of neurological disorders.

Research and Development Consultant — iTrainer Golf Ltd. — July 2012-July 2016
Responsible for the development and validation of computational algorithms which utilize data from an inertial measurement unit to quantify the motion of dynamical systems including gold clubs, bowling balls, and cruise ship terminals.

Research and Development Consultant — Wilson Sporting Goods — July 2015-July 2016
Louisville Slugger — February-December 2012
Responsible for the development and validation of an inertial sensor based baseball and softball bat fitting system.

Research and Development Consultant — Ebonite International — July-October 2012
Responsible for updating existing inertial sensor based bowler analysis tool for use with the latest generation inertial sensors.

HONORS AND AWARDS

CEMS Outstanding Faculty Advisor Award (University of Vermont) — December 2017

Kroepsch-Maurice Excellence in Teaching Award Nominee (University of Vermont) — May 2017, 2018

Best Paper Award, Biomedical and Biotechnology Engineering, Dynamics and Control in Biomechanical Systems, ASME IMECE 2013 — November 2013
Benchmarking the Accuracy of Inertial Measurement Units for Estimating Joint Reactions

Ivor K. McIvor Award — March 2013
(Excellence in research and scholarship in applied mechanics - biomechanics, University of Michigan)

National Science Foundation (NSF) Graduate Research Fellow — May 2010-April 2013

Mechanical Engineering Department Graduate Research Fellow (University of Michigan) — Sept. 2009-May 2010

Carl Jr. and Deborah Anderson Mechanical Engineering Prize (Lafayette College) — April 2009