

# Shivayogi V. Hiremath

## Curriculum Vitae

January, 2016

Assistant Professor  
Department of Physical Therapy  
Temple University  
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### Research Interests:

Personal Health Informatics, Rehabilitation Engineering, Assistive Technology, Health and Physical Activity, Machine Learning, Neural Engineering, and Brain-Computer Interfaces

### Education:

#### **University of Pittsburgh, Pittsburgh, PA, USA**

School of Health and Rehabilitation Science

PhD in Rehabilitation Science (July 2013)

Dissertation title: *Physical activity monitoring system for manual wheelchair users.* (Advisor: Dan Ding)

#### **University of Pittsburgh, Pittsburgh, PA, USA**

School of Health and Rehabilitation Science

MS in Rehabilitation Science and Technology (August 2009)

Thesis title: *Evaluation of accelerometer-based activity monitors to assess energy expenditure of manual wheelchairs users with spinal cord injury.* (Advisor: Dan Ding)

#### **Visveswaraiah Technological University, India**

M. S. Ramaiah Institute of Technology, Bengaluru

Bachelor of Engineering in Electrical and Electronics (June 2005)

Thesis title: *Probabilistic methodologies for mobile robot navigation.*

### Professional Appointments and Research Experience:

#### **University of Pittsburgh, Pittsburgh, PA, USA**

Post-Doctoral Fellow (August 2013 – December 2015)

Human Rehabilitation and Neural Engineering Laboratory, Department of Physical Medicine and Rehabilitation

Cortical Control of Neuroprosthetic Arm: The project involved design, execution

and management of experiments aimed at developing novel cortical interfaces using cortical surface recording techniques for controlling advanced prosthetics arms and other assistive devices. (Mentors: Wei Wang, Michael L. Boninger)

**University of Pittsburgh, Pittsburgh, PA, USA**

Graduate Student Researcher (September 2007 – July 2013)

Human Engineering Research Laboratories, Department of Rehabilitation Science and Technology

Physical Activity Monitors for Manual Wheelchair Users: The project involved research and development of physical activity monitors to assess energy expenditure in manual wheelchair users with spinal cord injury during varying modes and intensities of physical activity. (Mentors: Dan Ding, Rory Cooper)

**BodyMedia, Inc., Pittsburgh, PA, USA**

Visiting Researcher (June 2008 - July 2013)

Informatics Group

Data Modeling: The project involved validating and developing new models to estimate energy expenditure for SenseWear activity monitor among manual wheelchair users. (Mentor: Jonathan Farrington)

**Systemantics India Pvt. Ltd., Bengaluru, India**

Project Engineer (October 2005 - June 2007)

The projects involved working on robotics and industrial automation.

**Spastics Society of Karnataka, Bengaluru, India**

Visiting Researcher (June 2005 - December 2005)

Built a low cost hand held device for augmentative and alternative communication for a child with cerebral palsy.

**Centre for Artificial Intelligence and Robotics, Bengaluru, India**

Research Assistant (March 2005 – June 2005)

The project evaluated probabilistic methodologies for mobile robot navigation.

**Indian Institute of Science, Bengaluru, India**

Mass Spectroscopy Laboratory (June 2002-March 2005)

Research Experience for Undergraduate Student

Worked on various projects including an inverted pendulum and investigation of using a buck regulator to energize the field of a synchronous motor. (Mentor: A. G. Menon)

**Honors/Awards/Special Recognition:**

- NSF Smart and Connected Health Aspiring Investigators workshop, 2015.
- Training in Grantsmanship for Rehabilitation Research Workshop. Chapel Hill, NC, 2014.
- **Winning Papers** in Rehabilitation Engineering and Assistive Technology Society of North America's Annual Conferences, Student Scientific Paper

Competition (2013, 2011, 2010).

- **Honorable Mentions** in Rehabilitation Engineering and Assistive Technology Society of North America Annual Conferences, Student Scientific Paper Competition (2015, 2014, 2010, 2008).
- **Thomas O'Connor PhD Student Award** for 2012, Dept. of Rehabilitation Science and Technology, University of Pittsburgh.
- **First Place**, Perfect Pitch Competition, Quality of Life Technology Engineering Research Center, National Science Foundation Engineering Research Center, 2012.
- The **Ernest Bors Award** for Scientific Development awarded by the American Paraplegia Society, USA, 2011.
- **First Place**, Elevator Pitch Competition along with Soleh Udin Al Ayubi, Research Symposium, Quality of Life Technology Engineering Research Center, 2011.
- **Best Achiever** for the year 2005 from Electrical and Electronics Department, M. S. Ramaiah Institute of Technology, Bangalore, India, 2005.
- Awarded **Second Place** in Student Scientific Paper Competition in “INFLUX 2005” conducted by M. S. Ramaiah Institute of Technology, Bangalore, India, 2005.
- **Best Paper** in SYNCHRO 2003, National Level Technical Symposium conducted by Sri Muthukumar Institute of Technology, Chennai, India, 2003

#### Research Funding:

- Principle Investigator (Paralyzed Veterans of America Research Foundation Fellowship Grant), *Use of Sensory Inputs for Brain-Computer Interface Training*. (67%, 2015-16).
- Pitt Principle Investigator, Lead Carnegie Mellon University (PI: Jodi Forlizzi) (Google, Inc.), *Shared Attention in Human-Robot Collaboration*. (10%, 2014-15).
- Principle Investigator (Mary E. Switzer Research Fellowship from National Institute on Disability and Rehabilitation Research, U.S. Department of Education), *Development of a physical activity monitor system for manual wheelchair users*. (100%, 2011-12).

#### Publications:

##### Peer Reviewed Journal Proceedings

- **Hiremath, S.V.**, Chen, W., Wang, W., Foldes, S., Yang, Y., Tyler-Kabara, E.C, Collinger, J.L., Boninger, M.L. *Brain Computer Interface Learning for Systems Based on Electroencephalography and Intracortical Microelectrode Arrays*. *Frontiers in Integrative Neuroscience*, 9:40. 2015.
- **Hiremath, S.V.**, Intille, S.S., Kelleher, A., Cooper, R.A., Ding D. *Detection of physical activities using a physical activity monitor system for wheelchair users*. *Medical Engineering & Physics*. 37(1) 68-76: 2015.
- Tsang, K., **Hiremath, S.V.**, Ding, D., *Evaluation of Custom Energy Expenditure Models for the SenseWear Armband in Manual Wheelchair*

Users. *Journal of Rehabilitation Research and Development*, 52 (7), 793-804, 2015.

- Sindall P, Lenton JP, Malone L, Douglas S, Cooper RA, **Hiremath S**, Tolfrey K, Goosey-Tolfrey V. Effect of low-Compression balls on wheelchair tennis match-play. *International Journal of Sports Medicine*, 35 (5), 424-431: 2014.
- **Hiremath, S.V.**, Ding, D., Cooper, R.A. *Development and evaluation of a gyroscope based wheel rotation monitor for manual wheelchair users*. *Journal of Spinal Cord Medicine*, 36 (4), 347-356: 2013.
- **Hiremath, S.V.**, Ding, D., Farrington, J., Vyas, N., and Cooper, R.A. *Physical activity classification utilizing SenseWear activity monitor in manual wheelchair users with spinal cord injury*, *Journal of Spinal Cord*, 51 (9), 705-709: 2013.
- **Hiremath, S.V.**, Ding, D., Farrington, J., Cooper, R.A. *Predicting energy expenditure of manual wheelchair users with spinal cord injury using a multi-sensor based activity monitor*, *Archives of Physical Medicine and Rehabilitation*, 93 (11), 1937-1943: 2012.
- **Hiremath, S.V.** and Ding, D., *Evaluation of activity monitors in manual wheelchair users with paraplegia*, *Journal of Spinal Cord Medicine*. 34(1), 110-117: 2011.

#### **Peer Reviewed Journal Proceedings [In Preparation]**

- **Hiremath, S.V.**, Wongsirikul, N., Socharoentum, M., Forlizzi, J., Ding, D. *User evaluation of a physical activity monitor system for manual wheelchair users*, To be submitted to the Disability and Rehabilitation: Assistive Technology.
- **Hiremath, S.V.**, Hogaboom, N.S., Oyster, M.L., and Boninger, M.L. *Longitudinal prediction of mobility status and quality of life scores in individuals with traumatic spinal cord injury*. To be submitted to the Archives of Physical Medicine and Rehabilitation.
- Crytzer, T. M., Polfuss, M., Dicianno, B.E., **Hiremath, S.V.**, Ding, D., and Dunn, E. *Energy expenditure measurement utilizing activity monitors in individuals with cerebral palsy, spina bifida, and spinal cord injury: a review of the literature*. To be submitted to the Journal of Pediatric Rehabilitation Medicine.

#### **Peer Reviewed Conference Proceedings**

- Tsang, K., **Hiremath, S.V.**, and Ding, D., *Measuring Energy Expenditure in Manual Wheelchair Users with an ActiGraph based Activity Monitor*, Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) Annual Conference, Denver, CO, 2015.
- **Hiremath, S.V.**, Yang, G., Mankodiya, K. *Wearable Internet of Things: concept, architectural components and promises for person-centered healthcare*. MOBIHEALTH 2014, Athens, Greece, 2014.
- Tsang, K., **Hiremath, S.V.**, and Ding, D., *Evaluating the energy expenditure prediction models for manual wheelchair users with spinal cord injuries*, Rehabilitation Engineering and Assistive Technology Society of North

- America (RESNA) Annual Conference, Indianapolis, IN, 2014.
- **Hiremath, S.V.**, Ding, D., Okonkwo, C., Hannan, M., and Cooper, R.A., *Validation of a gyroscope based wheel rotation monitor for manual wheelchair users*, RESNA Annual Conference, Seattle, WA, 2013.
  - Ding, D., Soleh, A., **Hiremath, S.V.**, and Parmanto, B., *Physical activity monitoring and sharing platform for manual wheelchair users*, in 2012 Annual International Conference of the IEEE Engineering in Medicine and Biology Society (IEEE EMBC), San Diego, CA, 2012.
  - **Hiremath, S.V.** and Ding, D., *Quantifying physical activity using an ActiGraph in manual wheelchair users with spinal cord injury*, in RESNA Annual Conference, Baltimore, MD, 2012.
  - **Hiremath, S.V.** and Ding, D., *Regression equations for RT3 activity monitors to estimate energy expenditure in manual wheelchair users*, in 2011 Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Boston, MA, 2011.
  - Ding, D., **Hiremath, S.V.**, Chung, Y., and Cooper, R.A., *Detection of wheelchair user activities using wearable sensors*. Proceedings of the 6th international conference on Universal access in human-computer interaction: context diversity, pp: 145-152, Orlando, FL, 2011.
  - **Hiremath, S.V.** and Ding, D., *Predicting energy expenditure of manual wheelchair users using a wearable device*, in RESNA Annual Conference, Toronto, Canada, 2011.
  - Lin, J.T., Ding, D., **Hiremath, S.V.**, Koontz, A., and Cooper, R., *Cross-slope and surface type influence on manual wheelchair propulsion symmetry*, in RESNA Annual Conference, Toronto, Canada, 2011.
  - **Hiremath, S.V.** and Ding, D., *Physical activity classification utilizing activity monitors in manual wheelchair users with SCI*, Biomedical Engineering Society Annual Meeting, Austin, TX, 2010.
  - **Hiremath, S.V.** and Ding, D., *Evaluation of activity monitors in estimating energy expenditure in manual wheelchair users*, in RESNA Annual Conference, Las Vegas, NV, 2010.
  - Chung, Y., **Hiremath, S.V.** and Ding, D., *Activity classification of manual wheelchair users with wearable sensors*, in RESNA Annual Conference, Las Vegas, NV, 2010.
  - Chacon, A., **Hiremath, S.V.** and Ding, D., *Evaluation of the RT3 tri-axial accelerometer to measure physical activity in manual wheelchair users with spinal cord injury*, in RESNA Annual Conference, Las Vegas, NV, 2010.
  - Lin, J.T., Ding, D., **Hiremath, S.V.**, Koontz, A., and Cooper, R., *Impact of cross slope and surface type on wheelchair propulsion*, in RESNA Annual Conference, Las Vegas, NV, 2010.
  - **Hiremath, S.V.** and Ding, D., *Evaluation of activity monitors to estimate energy expenditure in manual wheelchair users*, in IEEE EMBC Annual Conference, Minneapolis, 2009.
  - Ding, D., **Hiremath, S.V.** and Kelleher, A., *Using SenseWear® armband to evaluate energy expenditure in manual wheelchair users*, in 4th International State-of-the-art Congress Rehabilitation: Mobility, Exercise & Sports,

Amsterdam, 2009.

- **Hiremath, S.V.**, Ding, D. and Koontz, A., *Estimating temporal parameters of wheelchair propulsion based on hand acceleration*, in RESNA Annual Conference, Washington, DC, 2008.

#### Peer Reviewed Abstracts

- **Hiremath, S. V.**, Tyler-Kabara, E. C., Wheeler, J. J., Moran, D. W., Gaunt, R. A., Collinger, J. L., Foldes, S. T., Weber, D. J., Chen, W., Boninger, M. L., Wang, W., *Human Perception of Electrical Stimulation on the Cortical Surface of Somatosensory Cortex*, Neuroscience 2015, Chicago, IL.
- **Hiremath, S. V.**, Tyler-Kabara, E. C., Wheeler, J. J., Moran, D. W., Gaunt, R. A., Collinger, J. L., Foldes, S. T., Weber, D. J., Chen, W., Boninger, M. L., Wang, W., *Use of Cortical Surface Stimulation Toward Restoration of Reliable Sensation in Human*, 2015 American Congress of Rehabilitation Medicine Annual Conference, Dallas, TX.
- **Hiremath, S.V.**, Intille, S.S., Cooper, R.A., and Ding, D. *Quantifying energy expenditure of wheelchair-based physical activities in free-living environments*. Wireless Health 2014.
- **Hiremath, S.V.**, Degenhart, A., Yang, Y., Collinger, J.L., Foldes, S., Tyler-Kabara, E.C., Weber, D.J., Gaunt, R., Boninger, M.L., and Wang, W. *Activation of the human primary motor cortex by sensory inputs in individuals with limb paralysis and implications for brain computer interfaces*. Neuroscience 2014.
- **Hiremath, S.V.**, Degenhart, A., Yang, Y., Collinger, J.L., Foldes, S., Tyler-Kabara, E.C., Weber, D.J., Gaunt, R., Boninger, M.L., Wang, W. *Use of sensory inputs to train brain computer interface decoders in individuals with limb paralysis*. Neural Interfaces Conference 2014.
- Degenhart, A., **Hiremath, S.V.**, Yang, Y., Foldes, S., Collinger, J.L., Boninger, M.L., Weber, D.J., Schwartz, A., Tyler-Kabara, E.C., and Wang, W. *Remapping cortical modulation for brain-machine interfaces: a somatotopy-based approach in individuals with upper-limb paralysis*. Neural Interfaces Conference 2014.
- **Hiremath, S.V.**, Ding, D., Goosey-Tolfrey, V., Malone, L.A., Lenton, J., Sindall, P. and Cooper, R.A. *Validation and testing of a wheel rotation datalogger for quantifying activity in manual wheelchair users*, North American Federation of Adapted Physical Activity 2012 Conference, Birmingham, AL.
- **Hiremath, S.V.**, Ding, D. *Evaluation of a physical activity monitoring system for manual wheelchair users*. International Seating Symposium 2013, Nashville, TN.

#### Book Chapters

- Cooper, R.A., McCue, M., Schein, R.M., Cooper, R., Sporer, M.L., Dodson, M.B., Reinsfelder, A.M., Yeager, A.F., Jinks, A., LoPresti, E., McClure, L., Wang, H., Collinger, J.L., **Hiremath, S.**, Ding, D., Lewis, A., *Assistive technology for people with traumatic brain injuries*. In Nathan Zasler,

Douglas Katz, Ross Zafonte, David B. Arciniegas, M. Ross Bullock, Jeffrey S. Kreutzer (Eds.). *Brain Injury Medicine: Principles and Practice*, Second Edition. New York: Demos Medical Publishing; 2012, 1178-1201.

- **Hiremath, S.V.**, Cooper, R.A., Pelleschi, T.L., and Cooper, R., (In Press). *Wheeled mobility devices*. In G.F. Harris, F. Rauch, and P. Smith (Eds.). *Transitional Care in Osteogenesis Imperfecta: Advances in Biology, Technology, and Clinical Practice*. Chicago: Shriners Press.

#### **Consumer Magazine**

- **Hiremath, S.V.** *How much physical activity do you do?* Paraplegia News, October 2012, Paralyzed Veterans of America.

#### **Presentations:**

##### **Refereed Conferences**

- *Evaluating the energy expenditure prediction models for manual wheelchair users with spinal cord injuries* (2014) in RESNA 2014 Annual Conference, Indianapolis, IN, 2014.
- *Validation of a gyroscope based wheel rotation monitor for manual wheelchair users* (2013) RESNA 2013 Annual Conference, Seattle, WA, 2013.
- *Predicting energy expenditure of manual wheelchair users using a wearable device* (2011) in RESNA 2011 Annual Conference, Toronto, Canada.
- *Evaluation of Activity Monitors in Manual Wheelchair Users with Paraplegia* (2011) in Annual Meeting of the Academy of Spinal Cord Injury Professionals, Las Vegas, NV.
- *Evaluation of Activity Monitors in Estimating Energy Expenditure in Manual Wheelchair Users* (2010) in RESNA 2010 Annual Conference, Las Vegas, NV.
- *Physical Activity Classification utilizing Activity Monitors in Manual Wheelchair Users with SCI* (2010) in Biomedical Engineering Society Annual Meeting, Austin, TX.

##### **Invited Presentations**

- *Quantifying Physical Activity and Neural Basis of Movement towards Improving Quality of Life in Individuals with Disabilities* at Department of Physical Therapy, Temple University, 01/2015, Host: Dr. Emily Keshner.
- *Physical Activity Monitor System for Manual Wheelchair Users* at IEEE Engineering in Medicine & Biology Society of Pittsburgh Lecture, 12/2014.
- *Quantifying intentional and actual movements towards improving quality of life of individuals with disabilities* at Personal Robotics Laboratory, Carnegie Mellon University, 07/2014, Host: Dr. Siddhartha Srinivasa.
- *Development and Evaluation of Physical Activity Monitors for Manual Wheelchair Users* in Human Rehabilitation and Neural Engineering Laboratory, University of Pittsburgh, 02/2013, Host: Dr. Wei Wang.

### **Other presentations**

- **Hiremath, S.V.** and Biradar, A.B., *Gas detection using fuzzy logic for TGS-823*, in INFLUX 2005 conducted by M. S. Ramaiah Institute of Technology, Bangalore, India, 2005.
- **Hiremath, S.V.** and Biradar, A.B., *Fuzzy logic motor control to minimize reactive power intake in a synchronous motor*, in SYNCHRO 2003, National Level Technical Symposium conducted by Sri Muthukumaran Institute of Technology, Chennai, India, 2003.

### **Service:**

#### **Grant Reviewer**

- Paralyzed Veterans of America: Fellowships, Clinical/Development pilot grants (2015)

#### **Journal and Conference Reviewer**

- Archives of Physical Medicine and Rehabilitation (2012-Present)
- BioMed Research International (2014)
- Journal of Neuroengineering and Rehabilitation (2014)
- Human Robot Interaction 2015 (2014)
- Journal of Sports Sciences (2013-15)
- Medicine & Science in Sports & Exercise (2013)
- IEEE Transactions on Neural Systems & Rehabilitation Engineering (2012-13, 15)
- Journal of Rehabilitation Research & Development (2011-12)
- Assistive Technology Journal (2010-11)
- Advances in Physiotherapy (2010-11)
- IEEE Transactions on Signal Processing (2009-10)
- Medical Engineering & Physics (2015)
- IEEE International Symposium on Robot and Human Interactive Communication (2013)
- Annual RESNA Conference (2009, 2010, 2012)
- ACM/IEEE International Conference on Human-Robot Interaction (2015)

#### **University Service**

- Vice-Chairman, IEEE Engineering in Medicine and Biology Society, Pittsburgh Section, 2013-15.
- Graduate student recruitment, Dept. of Bioengineering, University of Pittsburgh (2014).
- Quality of Life Technology ERC: served as the Co-chair (2011-2013), Industry Chair (2008-10) and the Education and Outreach Chair (2010-11) for the Student Leadership Council, University of Pittsburgh and Carnegie Mellon University.
- President, ANKUR Indian Graduate Student Association, University of Pittsburgh, 2008-09.
- Vice-Chairman, M. S. Ramaiah Institute of Technology IEEE Student Branch, 2004-05.



## **Research Mentoring and Teaching Experience**

**Research Mentoring:** Mentored graduate and undergraduate students working on research projects at the Human Rehabilitation and Neural Engineering Laboratory.

- Undergraduate student: Zachary Wool (2014- Present)
- Physician Scientist Training Program: Dongning Zhang (2014)

**Research Mentoring:** Mentored graduate and undergraduate students who were part of the American Student Placement in Rehabilitation Engineering and Quality of Life Technology research programs.

- Graduate students: Kalai Tsang (2013-Present), Natthasit Wongsirikul (2012-2014), Sasa Tripathy (2011), Megha Dhawan (2009)
- Undergraduate students: Matthew Hannan (2012-13), Christopher Okonkwo (2012), Josh Davis (2011), Alix Cave (2010), David Berlin (2010), Adriana Chacon (2009)

**Teaching Assistant:** Department of Rehabilitation Science and Technology, University of Pittsburgh

- HRS2704: Fundamentals of Rehabilitation Engineering and Assistive Technology; Fall 2008
- HRS2901: Introduction to Research Methodology; Spring 2009 and Fall 2010

### **Guest Lecturer**

- Department of Bioengineering, University of Pittsburgh, *Wheelchair biomechanics* in BIOENG 1630: Biomechanics 1; Spring 2013 and Spring 2014.
- Dept. of Electrical, Computer, & Biomedical Engineering, University of Rhode Island, Kingston, RI, *Clinical Brain-Computer Interfaces* in BME468: Neural Engineering; Spring 2015

## **Doctoral/Master's Committees:**

### **Master's Thesis Committee**

- Natthasit Wongsirikul (08/2012-07/2014)

## **Professional Societies Affiliation**

### **Senior Member**

- Institute of Electrical and Electronics Engineers (IEEE)
- Engineering in Medicine and Biology Society (IEEE-EMBS)

### **Member**

- American Congress of Rehabilitation Medicine (ACRM)
- Rehabilitation Engineering and Assistive Technology Society of North America (RESNA)