

# Jacek K. Urbanek, PhD

## PERSONAL INFORMATION

Address: 2024 E. Monument Street, Suite 2-700,  
Baltimore, MD 21205  
Mobile: (410)502-3410  
E-mail: [jurbane2@jhu.edu](mailto:jurbane2@jhu.edu)  
Research group: <http://www.smart-stats.org>  
Webpage: <https://jacekurbanek.wordpress.com>

## RESEARCH INTERESTS

Wearable computing, Biostatistics, Health research, Digital signal processing, Quantification of physical activity, Data science

## ONGOING PROJECTS

- Analysis of biological signals from wearable monitors
- Big data problems in large scale observational studies on human activity
- Objective measures of social jetlag and chronotype
- Prediction of walking in the free-living environment using raw accelerometry data
- Prediction of activity types and energy expenditure based on free-living accelerometry data
- Estimation of temporal gait parameters for clinical trials
- Modeling of wearable blood glucose monitors data

## EDUCATION

### Postdoctoral Fellow

10/01/2014 – 11/24/2017

Advisor: **Ciprian Crainiceanu**  
Department of Biostatistics  
Johns Hopkins Bloomberg School of Public Health  
Johns Hopkins University  
615 N. Wolfe Street,  
Baltimore, MD 21205

### PhD

10/01/2009 – 07/12/2013

Thesis title: *Cyclostationarity analysis methods for diagnostics of machinery under varying operational conditions*  
Advisors: **Jerome Antoni, Tomasz Barszcz**  
University of Science and Technology - Krakow,  
Department of Mechanical Engineering and Robotics,  
Scientific discipline: Automatics and Robotics

### Master of Engineering

10/01/2004 – 06/30/2009

University of Science and Technology - Krakow,  
Department of Mechanical Engineering and Robotics,  
Discipline: Mechanical Engineering  
Specialization: Vibro-acoustic and Sound Engineering

### High School

09/01/1999 – 06/24/2004

Technical Scientific Departments - Czestochowa,  
Technical School of Telecommunication  
Technician of telecommunication

## WORK EXPERIENCE

11/27/2017 – current

Department of Medicine  
Division of Geriatric Medicine and Gerontology  
Johns Hopkins University School of Medicine  
2024 E. Monument Street, Suite 2-700  
Baltimore, Maryland 21205  
**Assistant Professor of Medicine**

10/01/2014 – 11/24/2017

Department of Biostatistics  
Johns Hopkins Bloomberg School of Public Health  
615 N. Wolfe Street,  
Baltimore, MD 21205  
**Postdoctoral Fellow**

10/01/2013 – 09/30/2014

Department of Biostatistics  
Richard M. Fairbanks School of Public Health and School of Medicine  
Indiana University

410 W 10th St., Suite 3000  
Indianapolis, IN 46202  
**Visiting Adjunct Faculty Member**

07/01/2008 – 06/30/2013      EC Systems Sp. z o.o.  
Lublanska street 34, 31-476 Cracow  
<http://www.ec-systems.pl>  
**Diagnostic engineer**

07/14/2006 – 09/15/2006      Savcon Engineering Ltd.  
Atherstone on Stour, Stratford-Upon-Avon  
Warwickshire, CV37 8DX  
**Intern**

#### **COLLABORATION IN RESEARCH STUDIES**

- Baltimore Longitudinal Study of Aging
- Study to Understand Fall Reduction and Vitamin D in You
- Women's Health Initiative
- National Health and Nutrition Examination Survey
- Chronic Kidney Disease in Children
- Developmental Cohort Study

#### **RESEARCH GRANTS PARTICIPATION**

08/01/2016 – present      **The Kidney Disease in Children Data Management and Analysis Center (KIDMAC)**  
National Institute of Diabetes and Digestion  
PI: Munoz A

09/01/14 – present      **Statistical Methods for Biosignals with Varying Domains**  
NIH National Heart, Lung, and Blood Institute (NHLBI)  
PI: Crainiceanu C

07/07/2017 – 07/31/2017      **Statistical methods for large and complex databases of ultra-high-dimensional**  
University of Pennsylvania  
PI: Crainiceanu C

09/29/2015 – 09/28/2016      **Support Services for the Actiheart Project**  
National Institute on Aging  
PI: Crainiceanu C

09/15/2015 – 09/14/2016      **Multiple Approaches to Analysis of Wrist-Worn Accelerometers**  
National Institute on Aging  
PI: Crainiceanu C

09/29/2015 – 06/30/2016      **Statistical Methods for Biosignals with Varying Domains**  
National Heart, Lung, and Blood Institute  
PI: Crainiceanu C

06/23/2013 – 06/23/2015      **Development of novel signal processing methods for analysis of vibro-acoustical signals generated by rotor machinery under extremely varying operational conditions**  
Polish Ministry of Science and Higher Education  
**Principal Investigator**

12/15/2011 – 12/15/2013      **Cyclostationarity methods for analysis of signal sources operating under varying regime,**  
Polish National Science Center  
**Principal Investigator**

05/01/2009 – 05/01/2011      **Development of automated methods for condition monitoring of wind turbines,**  
Polish Ministry of Science and Higher Education  
PI: Barszcz T

02/01/2008 – 07/31/2009      **System for diagnostics of stator windings,**  
European Union "Technology Initiative "  
PI: Barszcz T

07/01/2008 – 08/31/2009

**Diagnostic Center for industrial machinery,**  
European Union "Technology Initiative",  
PI: Barszcz T

#### TEACHING ACTIVITIES

10/01/2012 – 12/15/2012	Lectures – <b>Maintenance of Mechatronic Devices</b> Co-lecturer in Polish and English
10/01/2011 – 02/15/2012	Lectures – <b>Maintenance of Mechatronic Devices</b> Co-lecturer in Polish and English
10/01/2010 – 02/15/2012	Seminars – <b>Maintenance of Mechatronic Devices</b> Teaching in Polish and English
10/01/2009 – 02/15/2011	PC Lab – <b>Monitoring Systems in Automatics and Robotics – LabView</b> Teaching in Polish and English

#### INVITED TALKS

1. Objective quantification of human activity using wearable accelerometers - Challenges and Opportunities, Center on Aging and Health Biostatistical Meeting, November 2017, Baltimore, MD
2. Analyzing raw activity data to determine stride-to-stride gait variability, Invited symposium speaker, IAGG 2017, San Francisco, CA
3. Statistical modeling of circadian rhythms of physical activity, Invited symposium speaker and organizer, International Conference on Ambulatory Monitoring of Physical Activity and Movement, June 2017, Bethesda, MD
4. Moderator of the panel discussion on remote data collection, Symposium on Ancillary Studies in the CKiD and CIRC studies, November 2016, Crystal City, VA
5. Objective quantification of human activity using wearable devices, IDEAS meeting for the Sandra Eskenazi Center for Brain Care Innovation, March 2016, Indianapolis, IN
6. Accelerometry-based detection and identification of walking in observational studies, Biostatistics Grand Rounds, September 2015, Bloomberg School of Public Health, Johns Hopkins University
7. Analyzing raw accelerometer output: challenges in detecting walking, Invited Symposium: The Impact of Accelerometer Wear Location in Studies of Older Adults, ICAMPAM 2015, Limerick, Ireland
8. Automatic detection and quantification of walking using wearable accelerometry devices. How reliable are the fitness monitors?, September, 2014, Regenstrief Institute, Indianapolis, IN
9. Automatic Detection and Quantification of Walking Using Wearable Accelerometry Devices, Invited Workshop: Assessing Daily Activity in Old Age: Unraveling the Complexity of Monitors, Measures, and Methods, GSA 2014 Conference, Washington, DC
10. Automatic Detection and Quantification of Walking using Wearable Accelerometry Devices, May, 2014, Laboratory of Neuro Imaging Institute of Neuroimaging and Informatics, Keck School of Medicine of USC, Los Angeles, CA
11. Pre-Processing of the Longitudinal Structural Brain Imaging Data: A Case Study, Contributed session, March, 2014, ENAR 2014, Baltimore, MD
12. Pre-processing of structural MRI data, December, 2014, PennSIVE, Department of Biostatistics and Epidemiology, Center for Clinical Epidemiology and Biostatistics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA
13. Where machine vibrations meet human brain dynamics, October, 2013, SMART, Department of Biostatistics, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD
14. Where machine vibrations meet human brain dynamics, May, 2013, Indiana University School of Medicine, Department of Biostatistics, Indianapolis, IN

#### MEMBERSHIPS

- The International Society for the Measurement of Physical Behaviour
- The International Biometric Society
- Gerontological Society of America

#### AWARDS AND HONORS

1. Best research poster presentation – 3rd Annual Johns Hopkins University Sleep and Circadian research day 2017, Baltimore, MD
2. First place in the postdoctoral poster competition - 9th Annual Research on Aging Showcase 2016, Baltimore, MD
3. Best poster award – ENAR 2015, Miami, FL
4. Best paper award - The 4th International Conference on Condition Monitoring of Machinery in Non-Stationary Operations (CMMN0'2014), Lyon, France
5. Best PhD student AGH Rector's award, 2012
6. First position in the ranking of PhD students of Lesser Poland Province in the project „Doctus – Małopolski fundusz stypendialny dla doktorantów”, 2010/2011
7. First place in Wladyslaw Bogusz contest – Polish Acoustic Association, 2009

#### EXTENDED VISITS TO OTHER DEPARTMENTS

05/06/2013 – 06/03/2013	<b>Department of Biostatistics,</b> Richard M. Fairbanks School of Public Health and School of Medicine, Indiana University, Indianapolis, USA
03/01/2012 – 05/31/2012	<b>Laboratoire de Vibration et d'Acoustique,</b> INSA Lyon, France
03/10/2011 – 05/05/2011	<b>Laboratoire Roberval Département de Génie Mécanique,</b> Université de Technologie de Compiègne (UTC), France

**EDITORIAL ACTIVITIES****Statistical editor for:** Sleep**Referee for:** Journals of Gerontology, Mechanical Systems and Signal Processing, Applied Acoustics, Measurement, PLOS ONE, Measurement Science and Technology, Metrology and Measurement Systems, Diagnostyka, Probabilistic Engineering Mechanics, Sensors, IAGG**SELECTED PEER-REVIEWED PUBLICATIONS****Wearable Computing and Health Research:**

1. **Urbanek, J**, Harezlak, J, Glynn, NW, Harris, T, Crainiceanu, C, Zipunnikov, V, Stride variability measures derived from wrist-and hip-worn accelerometers, *Gait & Posture* 52 (2017) 217–223
2. Straczekiewicz, M, **Urbanek, J**, Fadel, W, Crainiceanu, C, Harezlak, J, Automatic car driving detection using raw accelerometry data, *Physiological Measurement*, 2016 Sep 21;37(10):1757-1769
3. Varma, V., Day, D., Leroux, A., Di, J., **Urbanek, J.**, Xiao, L., Zipunnikov, V., Re-evaluating the effect of age on physical activity over the lifespan, *Preventive Medicine* (2017), 101, 102-108
4. **Urbanek, J**, Zipunnikov, V, Harris, T, Crainiceanu, C, Harezlak, J, Glynn, NW, Validation of gait characteristics extracted from raw accelerometry during walking against measures of physical function, mobility, fatigability, and fitness, *The Journals of Gerontology: Medical Sciences* (In Press) arXiv: 1612.06313
5. Varma V., Dey D., Leroux A., Di J., **Urbanek J.**, Xiao L., Zipunnikov V., Total volume of physical activity: TAC, TLAC or TAC( $\lambda$ ), *Preventive Medicine*, 2017, , ISSN 0091-7435, <https://doi.org/10.1016/j.ypmed.2017.10.028>
6. **Urbanek, J.**, Spira, A., Di, J., Leroux, A., Crainiceanu, C., Zipunnikov, V., Epidemiology of Objectively Measured Bedtime and Chronotype in the US adolescents and adults: NHANES 2003-2006 (arXiv:1706.05416), *Chronobiology International* (In press)
7. **Urbanek, J**, Zipunnikov, V, Harris, T, Fadel, W, Glynn, N, Crainiceanu, C, Harezlak J, Prediction of sustained harmonic walking in the free-living environment using raw accelerometry data. *Physiological Measurement* (In press)
8. Zipunnikov, V., Dey, D., Leroux, A., Di, J., **Urbanek, J.**, Schrack, J., Crainiceanu, C., Total physical activity and its circadian allocation are independent predictors of mortality in NHANES 2003-2006, *Plos One* (Revise and Resubmit)
9. Karas, M., Bai, J., Strączekiewicz, M., Harezlak, J., Glynn, NW., Harris T., Zipunnikov, V., Crainiceanu, C., **Urbanek, J.**, Accelerometry data in health research: challenges and opportunities. Review and examples (<https://www.biorxiv.org/content/early/2018/03/05/276154>)

**Vibro-acoustics and Signal Processing:**

10. **Urbanek, J**, Barszcz, T, Strączekiewicz, M, Jablonski A, Normalization of vibration signals generated under highly varying speed and load with application to signal separation, *Mechanical Systems and Signal Processing* 82, 13-31, 2017
11. **Urbanek, J**, Barszcz, T, Jablonski, A, Application of angular–temporal spectrum to exploratory analysis of generalized angular–temporal deterministic signals, *Applied Acoustics* 109, 27-36, 2016
12. **Urbanek, J**, Barszcz, T, Antoni, J, Integrated modulation intensity distribution as a practical tool for condition monitoring, *Applied Acoustics*, 77, 184-194, 2014
13. Zimroz, R, Bartelmus, W, Barszcz, T, **Urbanek, J**, Diagnostics of bearings in presence of strong operating conditions non-stationarities - A procedure of load-dependent features processing with application to wind turbine bearings, *Mechanical Systems and Signal Processing*, 2013
14. **Urbanek, J**, Barszcz, T, Antoni, J, Time - frequency approach to extraction of selected second-order cyclostationary vibration components for varying operational conditions, *Measurement*, 46, 4, 1454-1463, 2013
15. **Urbanek, J**, Barszcz, T, Antoni, J, A two-step procedure for estimation of instantaneous rotational speed with large fluctuations, *Mechanical Systems and Signal Processing*, 38, 1, 96-102, 2013
16. **Urbanek, J**, Antoni, J, Barszcz, T. Detection of signal component modulations using modulation intensity distribution, *Mechanical Systems and Signal Processing*, 28, 399-413, 2012
17. **Urbanek, J**, Barszcz, T, Zimroz, R, Antoni, J, Application of averaged instantaneous power spectrum for diagnostics of machinery operating under non-stationary operational conditions, *Measurement*, 45, 7, 1782-1791, 2012
18. **Urbanek, J**, Barszcz, T; Uhl, T; Staszewski, WJ; Beck, SBM; Schmidt, B; Leak detection in gas pipelines using wavelet-based filtering, *Structural Health Monitoring*, 11, 4, 405-412, 2012
19. Straczekiewicz, M, **Urbanek, J**, Barszcz, T. Three-dimensional representation of diagnostic features in application to wind turbines, *Diagnostyka*, 16-Sep., 2012
20. Zimroz, R, **Urbanek, J**, Barszcz, T, Bartelmus, W, Millioz, F, Martin, N, Measurement of instantaneous shaft speed by advanced vibration signal processing-application to wind turbine gearbox, *Metrology and Measurement Systems*, 18, 4, 701-712, 2011
21. **Urbanek, J**, Barszcz, T, Sawalhi, N, Randall, R, Comparison of amplitude-based and phase-based methods for speed tracking in application to wind turbines, *Metrology and Measurement Systems*, 18, 2, 295-304, 2011

**Books:**

22. Barszcz T, **Urbanek J**, Monitoring and diagnostics of rotating machinery: practical handbook of vibro-diagnostics (In Polish), 2008, ISBN 978-83-7204-747-2

**Engineering journals:**

23. **Urbanek J**, Mechanical Vibrations as the Source of Information (In Polish), Służby Utrzymania Ruchu 1/2011, ISSN: 1896-0677
24. **Urbanek J**, Method for Detection of Mechanical Overloads in Turbosets (In Polish), Służby Utrzymania Ruchu 6/2010, ISSN: 1896-0677
25. **Szumilas Ł, Urbanek J**, Diagnostic Center – Modern Trends in Maintenance and Reliability (In Polish), Służby Utrzymania Ruchu 2/2010, ISSN: 1896-0677