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**Marta Karas**

CONTACT INFORMATION

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PROFILE

STATISTICAL METHODS interests: methods for processing, features extraction and analysis of accelerometry data, causal inference (single-subject trials; non-experimental settings; time-varying exposures), adaptive clinical trials, GAMs, machine learning, R software development.

SCIENTIFIC RESEARCH interests: wearable devices and their applications in epidemiological and clinical studies.

EDUCATION

**Johns Hopkins Bloomberg School of Public Health**, Baltimore, MD, USA

*Ph.D., Biostatistics* **Aug 2017 – (Exp.) Dec 2021**

- Academic Advisors: Ciprian M. Crainiceanu, Jacek K. Urbanek

**Wroclaw University of Science and Technology**, Wroclaw, Poland

*M.S., Mathematics (Mathematical Statistics)* **Sep 2013 – Jun 2015**

- Dissertation: "Theoretical and practical issues in change point detection." (*Thesis link*)
- Academic Advisor: Malgorzata Bogdan
- Final grade: 5.5/5.5 (Excellent). Graduation with Academic Distinction

**Wroclaw University of Science and Technology**, Wroclaw, Poland

*B.S., Mathematics (Mathematical Statistics)* **Sep 2010 – Jun 2013**

- Final grade: 5.0/5.5 (Very good)

INDUSTRY EXPERIENCE

**Evidation Health** (Digital Health), San Mateo, CA, USA

*Data Science Intern* **Jun 2019 - Aug 2019**

- Designed, performed, and reported analysis to estimate post-surgery recovery trajectories and predict recovery time from wearable patient-generated health data (*first-author article published*).
- Proposed and implemented an extension of the existing methodology for measuring sedentary/active accumulation time.

**Novartis** (Pharmaceutical), Basel, Switzerland

*Sensor Data Analytic Intern* **Jun 2019 - Aug 2019**

- Proposed, implemented, and evaluated a method for free-living walking strides segmentation from wrist-worn accelerometry sensor (*first-author article published*).
- Quantified association between walking features and PROs in a diseased population.

**Opera Software** (Software, Web Browser), Wroclaw, Poland

*Analyst (full-time)* **Aug 2016 - Dec 2016, Jul 2015 - Dec 2015**

- Designed and implemented methodology for A/B-test results analysis.
- Developed time-series forecasting models for Opera browser's KPIs.
- Performed ad hoc user base analysis for software product improvements.
- Designed and implemented a Bayesian framework for inference about users' behavior.

**Datarino** (Big Data Services & Data Management Solutions), Wroclaw, Poland

*Data Scientist (part-time)* **Jul 2014 - Mar 2015**

- Performed ad hoc analysis of user base and monetization KPIs of Polish social network service.
- Performed analyses of business partners' big-data size data sets.

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## Academic Experience

**Johns Hopkins University**, Department of Biostatistics, Bloomberg School of Public Health, Baltimore, MD, USA

*Research Assistant* **Jan 2018 - present**

Work in progress:

- Proposing and implementing a method for estimating the causal effect of time-varying exposure in a single-subject observational study with repeated outcomes.
- Evaluating novel resampling method for estimating statistical test power sample size in complex modeling settings, including multilevel data problems (*first-author article in prep.*).

Completed work:

- Performed extensive literature review on raw accelerometry data usage in health research (*first-author article published*).
- Developed and evaluated a method for pattern segmentation from raw accelerometry data (*first-author article published*).
- Proposed, implemented and evaluated a method for high-specificity identification of walking from wrist-worn accelerometry data collected in free-living (*first-author article published*).
- Designed, performed and reported analysis of large (n=600+) cohort study to develop harmonization mappings for minute-level actigraphy-derived measures (*first-author article in prep.*).
- Designed and conducted small studies to collect raw accelerometry data in free-living with semi-supervised exercise components.
- Developed open-source software (R packages) scoring a total of 2500+ CRAN downloads/month.

**Indiana University Bloomington**, Department of Epidemiology and Biostatistics, School of Public Health, Bloomington, IN, USA

*Research Assistant* **Jan 2017 - Jul 2017**

- Applied graph-constrained regularization methods to quantify the association between brain structural imaging markers and HIV+/HIV− status (*article published*).

**Indiana University – Purdue University Indianapolis**, Department of Biostatistics, Richard M. Fairbanks School of Public Health, Indianapolis, IN, USA

*Research Assistant* **Jan 2016 - Jul 2016**

- Proposed, implemented and evaluated extension of existing graph-constrained regularization methods for linear regression (*first-author article published*).
- Quantified association between brain structural imaging markers and alcohol abuse.

## Teaching Experience

**Johns Hopkins University**, Department of Biostatistics, Bloomberg School of Public Health, Baltimore, MD, USA

*Instructor*

- 140.604 Introduction to R for Public Health Researchers (2021-22)
- 140.850 Special topics course: Biostatistical Methods for Wearable Computing (2019-20)

*Teaching assistant*

- 140.651-2 Methods in Biostatistics I-II (2018-19, 2019-20, 2020-21)
- 140.623-4 Statistical Methods in Public Health III-IV (2018-19)

## Honors and Awards

1. Louis I. and Thomas D. Dublin Award for the Advancement of Epidemiology and Biostatistics. Johns Hopkins University, Department of Biostatistics and Department of Epidemiology. 2021 (*link*)
2. Helen Abbey Award for Excellence in Teaching. Johns Hopkins University, Department of Biostatistics. 2021 (*link*)
3. Joseph Zeger Travel Reimbursement Award to CFE-CMStatistics 2020 conference. Johns Hopkins University, Department of Biostatistics. 2020
4. Joseph Zeger Travel Reimbursement Award to ICAMPAM 2019 conference. Johns Hopkins University, Department of Biostatistics. 2019
5. Leadership, Empowerment and Learning Culture Award. Novartis US Analytics Conference. 2019
6. ENAR Poster Award. ENAR 2017 Spring Meeting. 2017
7. The 2nd Summer Institute in Statistics for Big Data Scholarship Award. University of Washington, Department of Biostatistics. 2016

## Publications

1. **Karas, M.**, Urbanek, J.K., Illiano, V.P., Bogaarts, G., Crainiceanu, C.M., Dorn, J.F. (2021). *Estimation of free-living walking cadence from wrist-worn sensor accelerometry data and its association with SF-36 quality of life scores*, Physiological Measurement, Online ahead of print. (*Article link*)
2. Brzyski, D., **Karas, M.**, Ances, B., Dzemidzic, M., Goni, J., Randolph, T.W., Harezlak, J. (2021). *Connectivity-Informed Adaptive Regularization for Generalized Outcomes*, The Canadian Journal of Statistics.
3. **Karas, M.**, Marinsek, N., Goldhahn, J., Foschini, L., Ramirez, E., Clay, I. (2020). *Predicting subjective recovery from lower limb surgery using consumer wearables*, Digital Biomarkers, 4(suppl 1):73-86. (*Article link*)
4. **Karas, M.**, Straczkiewicz, M., Fadel, W., Harezlak, J., Crainiceanu, C.M., Urbanek, J.K. (2018). *Adaptive empirical pattern transformation (ADEPT) with application to walking stride segmentation*, Biostatistics, kxz033. (*Article link*)
5. **Karas, M.**, Bai, J., Straczkiewicz, M., Harezlak, J., Glynn, N W., Harris, T., Zipunnikov, V., Crainiceanu, C.M., Urbanek, J.K. (2019). *Accelerometry data in health research: challenges and opportunities*. Statistics in Biosciences, 11(2), 210–237. (*Article link*)

6. **Karas, M.**, Brzyski, D., Dzemidzic, M., Goni, J., Kareken, D.A., Randolph, T., Harezlak, J. (2019). *Brain connectivity-informed regularization methods for regression.* Statistics in Biosciences, 11(1), 47-90. (*Article link*)

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## Conference Posters

1. **Karas, M.**, Muschelli, J., Leroux, A., Urbanek, J.K., Wanigatunga, A.A., Bai, J., Crainiceanu, C.M., A. Schrack, J.A. *Comparison of accelerometry-derived physical activity summary measures by age, sex, and BMI.* ICAMPAM 2021 virtual conference, Jun 2021.
2. **Karas, M.**, Brzyski, D., Ances, B., Goni, J., Randolph, T.W., Harezlak, J. *Association of Structural Brain Imaging Measures with HIV Markers Incorporating Structural Connectivity Information: a Regularized Statistical Approach.* ENAR, Washington DC, USA, Mar 2017. (Received ENAR Poster Award).
3. **Karas, M.** *Penalized regression inference regarding variable selection in high dimensions: presentation of selected methods implemented in R.* European R Users Conference, Poznan, Poland, Oct 2016.

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## Conference / Invited Talks (selected)

1. **Karas, M.**, Dorn, J., Urbanek, J.K. *Estimation of free-living walking cadence from wrist-worn sensor accelerometry data and its association with SF-36 quality of life scores.* ENAR 2021, virtual conference, Mar 2021.
2. **Karas, M.**, Dorn, J., Urbanek, J.K. *Estimation of free-living walking cadence from wrist-worn sensor accelerometry data and its association with SF-36 quality of life scores.* CMStatistics 2020, virtual conference, Dec 2020.
3. **Karas, M.**, Dorn, J., Urbanek, J.K. *Novel approach for precise walking cadence estimation from high-density tri-axial accelerometry data collected at wrist in free-living.* 41st Annual Conference of the International Society for Clinical Biostatistics, virtual conference, Aug 2020.
4. **Karas, M.**, Roemmich, R., Bastian, A., Urbanek, J.K. Urbanek, Crainiceanu, C.M. *Functional registration of walking strides in high-density accelerometry data for estimation of gait asymmetry.* CFE-CMStatistics 2019 conference, London, UK, Dec 2019.
5. **Karas, M.**, Dorn, J. *Walking measurements derived from free-living wrist-worn sensor as novel digital endpoints.* Novartis 2019 US Analytics Conference, East Hanover, NJ, USA, Oct 2019.
6. **Karas, M.**, Roemmich, R., Crainiceanu, C.M., Bastian, A., Urbanek, J.K. *Automatic estimation of step asymmetry from accelerometry data.* ICAMPAM 2019, Maastricht, The Netherlands, Jul 2019.
7. **Karas, M.**, Harezlak, J., Straczkiewicz, M., Fadel, W., Crainiceanu, C.M., Urbanek, J.K. *ADaptive Empirical Pattern Transformation (ADEPT) with application to walking stride segmentation.* JSM 2018, Vancouver, Canada, Aug 2018.
8. **Karas, M.**. *Wearable accelerometers, accelerometry data and automatic steps segmentation in R: strideter and convo R packages.* Why R? 2018 Conference, Wroclaw, Poland, Jul 2018.

## Software development

1. `arctools` `R` package: Processing and Physical Activity Summaries of Minute Level Activity Data. (*CRAN*, *GitHub*)
2. `adept` `R` package: Adaptive Empirical Pattern Transformation. (*CRAN*, *GitHub*, *website*). (Selected in Top 40 new CRAN packages in May 2019; *list link*)
3. `adeptdata` `R` package: Accelerometry Data Sets. (*CRAN*, *GitHub*)
4. `runstats` `R` package: Fast Computation of Running Statistics for Time Series. (*CRAN*, *GitHub*, *website*)
5. `mdpeer` `R` package: Graph-Constrained Regression with Enhanced Regularization Parameters Selection. (*CRAN*)

## Professional activities

- Referee for: PLOS ONE, Digital Biomarkers. (*Publons profile link*)
- JHU Biostatistics Student Organization service: International Students Affairs Committee chair.

## Computer Skills

- R (expert), Python, Git.