

# JUNRUI DI

(Updated Mar 21st 2019)

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## STATISTICAL METHODS RESEARCH INTERESTS

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feature engineering from accelerometry signals, dimension reduction, functional data analysis, integration of multiple modalities, multilevel data.

## SCIENTIFIC RESEARCH INTERESTS

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wearable devices and their applications in public health (e.g. mental health and aging) and clinical trials, physical activity assessment, sleep, circadian rhythmicity.

## EDUCATION

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**Johns Hopkins Bloomberg School of Public Health**

*Mar 2019*

Ph.D. in Biostatistics

Thesis: *Feature Engineering and Statistical Modeling of Wearable Devices Data*

Advisor: Vadim Zipunnikov, Ph.D.

**Georgetown University**

*Dec 2013*

M.S. in Biostatistics

Thesis: *Robust Integrative Analysis of Multi-Block Contaminated Datasets*

Advisor: Valeriy Korostyshevskiy, Ph.D.

**University of California, Berkeley**

*May 2012*

B.A. in Applied Mathematics

*High Distinction General Scholarship (roughly equivalent to Magna Cum Laude)*

## EXPERIENCE

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**Research Assistant**

*Jun 2015 - Apr 2019*

*Johns Hopkins Bloomberg School of Public Health*

*Baltimore, MD*

- Developed statistical methods to extract features from noisy accelerometry signal, to reduce dimensionality of multivariate accelerometry features, and to integratively analyze features representing multiple physiological domains.
- Conducted data processing and statistical analysis of multiple studies with measurements of sleep, activity, and circadian rhythms using wearable devices.

**Biostatistician Intern**

*Jun 2018 - Aug 2018*

*Takeda Pharmaceuticals*

*Cambridge, MA*

- Provided theoretical and analytic evidence that digital endpoints measured by wearable devices are more sensitive than traditional measurement.
- Developed an R Shiny App to analyze/visualize a clinical study with a chest-worn device to measure physical activity and cardiovascular behavior to assist clinicians to identify false positive events reported.

**Research Assistant**

*May 2013 - Apr 2014*

*Georgetown University, Medicine*

*Washington, DC*

- Supported the Multicenter AIDS Cohort Study (MACS) site PI by providing data analysis, visualization, and tabulation on data generated from the 30-year nationwide longitudinal cohort study involving four sites, and over two hundred tested variables.
- Quantified satisficing in MACS online survey based on the group-based trajectory analysis of average response time across visits.

#### Research Assistant

Georgetown University, Biostatistics

Sep 2012 - May 2013

Washington, DC

- Refined Joint and Individual Variation Explained (i.e. JIVE), a recently developed integrative analysis method of multi-block datasets of different types, to be robust to outliers using low-rank approximation based on robust singular value decomposition.
- Selected metabolomics biomarkers to develop clinical assays for diagnosis and prognosis of Pancreatic Ductal Adenocarcinoma (PDAC) by applying various variable selection techniques.

## PUBLICATIONS

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### Published / In Press

1. Schrack, J., Kuo, P., Wanigatunga, A., **Di, J.**, Simonsick, EM., Spira, A., Ferrucci, L., and Zipunnikov, V.. Active-to-Sedentary behavior transitions, fatigability, and physical functioning in older adults. *Journal of Gerontology: Series A*. 2019; 74(4): 560-567.
2. Johns, J., **Di, J.**, Merikangas, K., Cui, L., Swendsen, J., and Zipunnikov, V.. Fragmentation as a novel measure of stability in normalized trajectories of mood and attention measured by ecological momentary assessment. *Psychological Assessment*. 2019; 31(3): 329-339.
3. Leroux, A., **Di, J.**, Smirnova, E., McGuffey, E., Cao, Q., Bayatmokhtari, E., Tabacu, L., Zipunnikov, V., Urbanek, J., Crainiceanu, C.. Organizing and analyzing the activity data in NHANES. *Statistics in Biosciences*. 2019.
4. Schmidt, A., Bosse, M., Obremsky, W., O'Toole, R., Carroll, E., Stinner, D., Hak, D., Karunakar, M., Hayda, R., Frey, K., **Di, J.**, Zipunnikov, V., MacKenzie, E., and METRC. Continuous near-infrared spectroscopy demonstrates limitations in monitoring the development of acute compartment syndrome in patients with leg injuries. *The Journal of Bone & Joint Surgery*. 2018; 100(19): 1645-1652.
5. Grigsby, M., **Di, J.**, Leroux, A., Xiao, L., Zipunnikov, V., Crainiceanu, C., and Checkley, W.. Novel metrics for growth model selection. *Emerging Themes in Epidemiology*. 2018; 15(1): 4.
6. Urbanek, J., Spira, A., **Di, J.**, Leroux, A., Crainiceanu, C., and Zipunnikov, V.. Epidemiology of objectively measured bedtime and chronotype in US adolescents and adults: NHANES 2003-2006. *Chronobiology International*. 2018; 35(3): 416-434.
7. Varma, V., Dey D., Leroux A., **Di, J.**, Urbanek, J., Xiao, L., and Zipunnikov, V.. Total volume of physical activity: TAC, TLAC or TAC( $\lambda$ ). *Preventive Medicine*. 2018; 106: 233-235.
8. Varma, V., Dey D., Leroux A., **Di, J.**, Urbanek, J., Xiao, L., and Zipunnikov, V.. Re-evaluating the effect of age on physical activity over the lifespan. *Preventive Medicine*. 2017; 101: 102-108.
9. **Di, J.**, Li, Y., Friedman, MR., Reddy, S., Surkan, PJ., Shoptaw, S., and Plankey, M.. Determining survey satisficing of online longitudinal survey data in the Multicenter AIDS Cohort Study using a Group-Based Trajectory Analysis. *Journal of Medical Internet Research Public Health and Surveillance*. 2016; 2(2): e150.

### Preprints / Technical Reports

10. **Di, J.**, Leroux, A., Urbanek, J., R., Varadhan, Spira, A., Schrack, J., and Zipunnikov, V.. Patterns of sedentary and active time accumulation are associated with mortality in US adults: The NHANES study. *bioRxiv: 182337*.

#### **Under Review / Revision**

11. **Di, J.**, Spira, A., Bai, J., Urbanek, J., Leroux, A., Wu, M., Resnick, S., Simonsick, E., Ferrucci, L., Schrack, J., and Zipunnikov, V.. Joint and individual representation of domains of physical activity, sleep, and circadian rhythmicity. Under review *Statistics in Biosciences*.
12. Schmidt, A., **Di, J.**, Zipunnikov, V., Frey, K., Scharfstein, D., O'Toole, R., Bosse, M., Obremskey, W., Stinner, D., Hayda, R., Karunakar, R., Hak, M., Carroll, E., Collins, S., MacKenzie, E.. Perfusion pressure lacks diagnostic specificity for the diagnosis of acute compartment syndrome. Under review *Journal of Orthopaedic Trauma*.
13. Malone, SK., **Di, J.**, Leroux A., Riegel B., Melkus, GD., Rickels, M., Pubjabi, N., Pach, A., Crainiceanu, C., and Urbanek, J.. Bedtime habits in adults with and without diabetes. Under review *Nursing Research*.
14. Chen O.Y., Cao, H., Phan H., Gou, J., Qian, T., Reinen, J., **Di, J.**, Cannon, T., and De Vos, M.. High-dimensional whole brain mediation analysis: methods and application in psychosis research. Under review *Journal of American Statistical Association ABCS*.

#### **In Preparation**

15. Capturing enhanced information with higher-order tensorian statistics and its application in accelerometry-measured physical activity. Ready to submit to *Biometrics*.
16. **Di, J.**, Leroux, A., Urbanek, J., Wanigatunga A., R., Varadhan, Spira, A., Schrack, J., and Zipunnikov, V.. Prolonging active and breaking sedentary bouts are independently associated with mortality in US adults: The NHANES study. Ready to submit to *American Journal of Preventive Medicine*.
17. Activity fragmentation is associated with mortality in BLSA. *In progress*.

#### **SOFTWARES**

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1. **actigraphy** (R package). Feature extraction from minute level actigraphy/accelerometry data.  
<https://github.com/junruidi/actigraphy>.
2. **cdHOTS** (R package). Construct and decompose higher order tensorian statistics.  
<https://github.com/junruidi/cdHOTS>.
3. **actigraphy-profiles** (R Shiny app). A visualization tool for displaying minute-level actigraphy profiles.  
<https://github.com/junruidi/actigraphy-profiles>

#### **PRESENTATIONS**

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1. Integrative Analysis of Domains of Physical Activity, Sleep, and Circadian Rhythmicity Collected by Wearables. (**invited**). *2019 JSM, Denver, Colorado*.
2. Joint and Individual Representation of Domains of Physical Activity, Sleep, and Circadian Rhythmicity Collected by Wearables (**invited**). *2018 BigDIA, Houston, TX*.
3. Feature Engineering and Statistical Modeling of Wearable Devices data (**invited**). *Critical-Path Institute, 2018*.

4. Capturing Enhanced Information with Higher-Order Tensorian Statistics and Predicting Mortality from Accelerometry-MeasurePhysical Activity (contributed). *2018 JSM, Vancouver, BC, Canada.*
5. Analysis of Tensor Cumulants and Its Application to NHANES (contributed). *2018 ENAR, Atlanta, GA.*
6. Fragmentation of Daily Physical Activity: Prediction of Mortality in NHANES 2003-2006 (oral). *2017 IAGG, San Francisco, CA.*
7. Fragmentation of Physical Activity and Its Application (oral). *2017 ICAMPAM, Bethesda, MD.*
8. Novel Statistical Framework to Quantify Fragmentation of Physical Activity (contributed). *2017 ENAR, Washington, DC.*
9. Fragmentation of Physical Activity and Its Application (poster). *2016 Baltimore Aging Showcases, Baltimore, MD.*
10. Integrative Analysis of Multi-Block Contaminated Datasets (topic contributed). *2013 JSM, Montreal, Canada.*

## EDITORIAL ACTIVITIES

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### Referee for:

Journal of Statistical Software (JSS) [1]

International Association of Gerontology and Geriatrics 2017 World Congress (IAGG) [1]

Journal of Medical Internet Research Cardio (JMIR Cardio) [1]

Journal of Medical Internet Research Mental Health (JMIR Mental Health) [1]

Journal of Medical Internet Research mHealth and uHealth (JMIR mHealth and uHealth) [2]

Interactive Journal of Medical Research [1]

Statistics in Biosciences (SIB) [1]

Journal of Medical Internet Research Research Protocols (JRP) [1]

Journal of Medical Internet Research Serious Games (JSG) [1]

## PROFESSIONAL ACTIVITIES

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Session chair, JSM 2018

Organizer of the JHSPH Biostatistics Computing Club 2015 - 2016

## HONORS & AWARDS

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BigDIA Travel Award *Sep 2018*

*This is the travel award for the 4th International Conference on Big Data and Information Analytics.*

The June B. Culley Award *Dec 2017*

*This award honors outstanding achievement by a Biostatistics student on his or her schoolwide examination paper.*

The Louis I. and Thomas D. Dublin Award *Mar 2017*

*This award, which is for the Advancement of Epidemiology and Biostatistics, supports those students whose research focuses on the effective use of statistical reasoning and methods in epidemiology.*

Washington Statistical Society Outstanding Graduate Student Award

*Jun 2013*

*This award is presented by the Washington Statistical Society to the outstanding full-time graduate student of statistics/biostatistics at each university in the Washington metropolitan area with a graduate statistics/biostatistics program.*

Phi Beta Kappa Honor Society Inductee

*May 2012*

*Phi Beta Kappa Honor Society*

## TEACHING EXPERIENCE

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PH.140.623 - **Lab Instructor** Statistical Methods in Public Health III

*Spring 2019*

PH.140.621 - **Lab Instructor** Statistical Methods in Public Health I

*Fall 2018*

PH.140.623 - **Lab Instructor** Statistical Methods in Public Health III

*Spring 2018*

PH.140.621 - **Lab Instructor** Statistical Methods in Public Health I

*Fall 2017*

PH.140.623-4 - **TA** Statistical Methods in Public Health III-IV

*Spring 2017*

PH.140.621-2 - **TA** Statistical Methods in Public Health I-II

*Fall 2016*

PH.140.753-4 - **TA** Advanced Methods in Biostatistics III-IV

*Spring 2016*

PH.140.751-2 - **TA** Advanced Methods in Biostatistics I-II

*Fall 2015*

BIST 514 - **TA** Linear Modeling & Multivariate Analysis

*Spring 2014*

## PROFESSIONAL MEMBERSHIP

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American Statistical Association (ASA)

Washington Statistical Society (WSS)

International Biometric Society (ENAR)

## CERTIFICATIONS

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SAS Certified Advanced Programmer for SAS 9

*Aug 2013*

SAS Certified Base Programmer for SAS 9

*Jul 2013*