# Congyu "Peter" Wu

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## EDUCATION

**Doctor of Philosophy, University of Virginia** Systems Engineering May 2019
- Advisors: Matthew S. Gerber, Laura E. Barnes. Committee Chair: William T. Scherer.
- Dissertation: "Mining Social Signals in Cyber-Human Systems: Collective Behavior, Personal Health, and Modeling Methods".

**Master of Engineering, University of Virginia** Systems Engineering May 2015
- GPA: 3.79/4. Extensively trained in systems thinking, stochastic systems, optimization, discrete event and agent-based simulation, decision analysis, statistical modeling, machine learning, text mining.

**Bachelor of Science, Tianjin University** Industrial Engineering June 2012
- GPA: 3.84/4. Highest of class.

## RESEARCH INTERESTS

Innovating cyber-human-social systems and human-centered informatics using ubiquitous information technology (e.g., personal IoT devices, social media) and data science methods (e.g., statistical modeling, machine learning, network science, natural language processing), specifically:
- Mobile sensing for predictive health detection and intervention
- Social signal processing for socially-aware AI
- Computational Social Science

## EXPERIENCE

**University of Texas at Austin**, Department of Psychology July 2019 – present
*Postdoctoral Fellow* (Supervisors: David M. Schnyer, Christopher G. Beevers)
- ***Research***
  - Lead data science research for the Whole Communities Whole Health Initiative (WCWH; engineering/behavioral science multidisciplinary team focusing on health sensing and community engagement) and the Institute for Mental Health Research (IMHR) at UT-Austin.
  - Write and publish papers on mining large-scale mobile sensing data (smartphone, wearable, ecological momentary assessment survey, environment sensor) for behavior modeling and health detection.
  - Current research: (1) Gaussian Latent Dirichlet Allocation for personalized compound psycho-physiological state discovery; (2) Inferring behavioral tendency from passively sensed activity traces using Inverse Reinforcement Learning. (For past research please see publications below)
- ***Proposals***
  - "Change in smartphone sensed behavioral patterns in response to a digital intervention for depression": R34 proposal under review by NIH.
  - "Sensing therapist-patient interaction using medical-grade smartwatches (Empatica E4) for better quality of care in psychotherapy": IRB approved for pilot data collection with UT-Austin IMHR.
- ***Service***
  - Serve on the Measures, Analysis, Data Transfer, and Storage (MADS) faculty committee.

- Advise undergrad/graduate students on research methods, programming, and paper writing.
- Facilitate research collaboration across academic departments.

**University of Virginia**, Department of Systems and Information Engineering August 2012 – May 2019
*Graduate Research Assistant*

- ***Research***
  - Developed novel machine learning and predictive modeling methods for (1) civil crisis early warning, (2) mobile health monitoring/intervention (partially funded by the Lockheed Martin Corporation), and (3) social network modeling, using diverse cyber-human data (mobile sensing, social media, tech-mediated communication).
  - Designed and administered human subject behavioral tracking studies with *Sensus*, a cross-platform mobile sensing system.
  - Managed IRB protocol writing and compliance procedures.
- ***Fellowships***
  - *Data Science Institute Presidential Fellow* (2014-2015). Discovered driving factors of predictive power in online social media activity and real-time societal event data for civil unrest early warning (publicity).
  - *UVa Library StatLab Fellow* (2017-2018). Lead interdisciplinary natural language processing research on partisan online discourse on politically provocative societal events.
- ***Teaching***
  - Served as Teaching Assistant for 2 graduate Data Science courses (~40 students each): Data Mining (R), Deep Learning (Python)
  - Served as Teaching Assistant for 5 undergraduate Systems Engineering courses (>100 students each): Statistical Modeling (R), System Evaluation, Data and Information Engineering (SQL), Management of E-Commerce Systems, Systems Engineering Concepts.
  - Designed exams, graded homework, hosted office hours, mentored students, lead lab sessions, gave occasional lectures.
- ***Awards***
  - *Robert T. Ferguson III Memorial Award* (2019). Peer nominated and presented to the graduate student who has been the most helpful to other graduate students.
  - *Graduate Student Travel Scholarship* (2018). US$2000 departmental support for conference travels.
  - *High Performance Parallel Computing Certificate* (2015). Issued by UVa Advanced Research Computing Services for completing training in parallel computing with MPI and OpenMP using Python.
- ***Service***
  - Reviewer for IMWUT (Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies), PMC (Pervasive and Mobile Computing), and SNAM (Social Network Analysis and Mining).
  - Vice Chair (2013-2014), Graduate Engineering Students Council.
  - Student Volunteer for SIEDS'17 (Systems & Information Engineering Design Symposium), UbiComp'18 (Ubiquitous Computing).
  - Social Chair and Bass (2017-2019), The First Harmonics, UVa's premier post-graduate acapella group.

**Standard Life Asia Limited** (China subsidiary of UK-based global life insurance company) June-August 2011
*Risk Analyst Intern*

- Identified key predictors of premature surrenderer clients using client record data.
- Examined payout structures of major competitor policies and their sensitivity to client behavior.

## PUBLICATIONS

**Wu, C.** (2021). Connections between Relational Event Model and Inverse Reinforcement Learning for Characterizing Group Interaction Sequences. *IEEE Transactions of Computational Social Systems*. DOI: 10.1109/TCSS.2021.3070239. Ⓙ -- indicates journal paper; the rest are conference.

**Wu, C.**, Fritz, H., Miller, M., Craddock C., Kinney, K., Castelli D., & Schnyer, D. (2021). Exploring Post COVID-19 Outbreak Intradaily Mobility Pattern Change in College Students: a GPS-focused Smartphone Sensing Study. *Frontiers in Digital Health*. DOI: 10.3389/fdgth.2021.765972. Ⓙ

Fritz, H., Zoltan, N., **Wu, C.**, Kinney, K. (2021). Comparison of Machine Learning Methods to Predict Sleep Quality from Daytime Activity and Nightly Bedroom Environmental Conditions. In *Proceedings of the 8th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation* (BuildSys) (pp. 222-223).

**Wu, C.**, Barczyk, A., Craddock, C., Thomaz, E., Harari, G., Shumake, J., Beevers, D., Gosling, S., & Schnyer, D. (2021). Improving Prediction of Real-Time Loneliness and Companionship Type Using Geosocial Features of Personal Smartphone Data. *Smart Health*, 100180. Ⓙ

**Wu, C.**, Fritz, H., Bastami S., Maestre J. P., Thomaz E., Julien C., Castelli D., de Barbaro, K., Bearman, S. K., Harari G., Craddock C., Kinney, K., Gosling, S., Schnyer, D., & Nagy, Z. (2021). Multi-Modal Data Collection for Measuring Health and Behavior of Large-Scale Participant Cohorts. *GigaScience*, 10(6), giab044. Ⓙ

Mendu, S., Baglione, A., Baee, S., **Wu, C.**, Ng, B. W., Clore, G., Boukhechba, M., & Barnes, L. E. (2020). A Generalized Framework for Understanding the Relationship between Private Social Media Discourse and Mental Health. *Proceedings of the ACM on Human-Computer Interaction*, 4 (CSCW2), 1-23.

Boukhechba, M., Cai, L., **Wu, C.**, & Barnes, L. E. (2019). ActiPPG: Using Deep Neural networks for Activity Recognition from Wrist-Worn Photoplethysmography (PPG) sensors. *Smart Health*, 100082. Ⓙ

Cai, L., Kaur, N., Boukhechba, M., **Wu, C.**, Barnes, L. E., & Gerber, M. S. (2019). Adaptive Passive Mobile Sensing Using Reinforcement Learning. In *2019 IEEE 20th International Symposium on A World of Wireless, Mobile and Multimedia Networks* (WoWMoM) (pp. 1-6).

Mendu, S., Boukhechba, M., Baglione, A., Baee, S., **Wu, C.**, & Barnes, L. E. (2019). SocialText: A Framework for Understanding the Relationship between Digital Communication Patterns and Mental Health. In *2019 IEEE 13th International Conference on Semantic Computing* (ICSC) (pp. 428-433).

**Wu, C.**, Boukhechba, M., Cai, L., Barnes, L. E., & Gerber, M. S. (2018). Vector Space Representation of Bluetooth Encounters for Mental Health Inference. In *Proceedings of the 2018 ACM International Joint Conference and 2018 International Symposium on Pervasive and Ubiquitous Computing and Wearable Computers* (UbiComp 2018, Singapore) (pp. 1691-1699). **Awardee of UbiComp Student Travel Grant (US$1000)**

**Wu, C.**, Boukhechba, M., Cai, L., Barnes, L. E., & Gerber, M. S. (2018). Improving Momentary Stress Measurement and Prediction with Bluetooth Encounter Networks. *Smart Health,* 9, 219-231. Ⓙ

Cai, L., Boukhechba, M., **Wu, C.**, Chow, P. I., Teachman, B. A., Barnes, L. E., & Gerber, M. S. (2018). State Affect Recognition Using Smartphone Sensing Data. In *Proceedings of the 2018 IEEE/ACM International Conference on Connected Health: Applications, Systems and Engineering Technologies* (pp. 120-125).

**Wu, C.**, & Gerber, M. S. (2017). Forecasting Civil Unrest Using Social Media and Protest Participation Theory. *IEEE Transactions on Computational Social Systems*, 5(1), 82-94. Ⓙ

Cai, L., **Wu, C.**, Meimandi, K. J., & Gerber, M. S. (2017). Adaptive Mobile Behavior Change Intervention Using Reinforcement Learning. In *2017 IEEE International Conference on Companion Technology* (ICCT) (pp. 1-2).

## PAPERS UNDER RIVEW

Fritz, H., Kinney, K., **Wu, C.**, Schnyer. D., & Zoltan, N. (2021). Data fusion of mobile sensing and environmental monitoring to understand the effects of the indoor environment on sleep quality. Under review by *Building and Environment.* Ⓙ

**Wu, C.**, McMahon, M., Fritz, H., & Schnyer, D. (2021). Identifying the Relationship between Circadian Metrics Extracted Using Different Mobile Sensors and Computational Methods and Their Correlations with Sleep and Mood. Under review by *Journal of American Medical Informatics Association*. Ⓙ

## INVITED TALKS

Pennsylvania State University, College of Information Sciences & Technology Colloquium March 2021
- "Mining Social Signals in Cyber-Human Systems for Novel Health and Behavioral Informatics"

University of Texas at Austin, Whole Communities Whole Health Research Showcase December 2020
- "Correlates and Digital Phenotypes of College Student Loneliness: Evidence from the UT1000 Project"

University of Florida, Department of Industrial & Systems Engineering Seminar Series March 2020
- "Mining Social Signals in Cyber-Human Systems for Novel Behavioral and Health Analytics"

Washington, D.C., Third IEEE/ACM International Conference on Connected Health September 2018
- "Improving Momentary Stress Measurement and Prediction with Bluetooth Encounter Networks"

University of Virginia, Quantitative Psychology Design & Data Analysis Lecture Series February 2017
- "Understanding Human Response to Victimization Risk using Experience Sampling Method"

University of Virginia, Department of Politics Tenth Annual Graduate Student Conference March 2014
- "Testing Theories of Social Movements within the Arab Spring: A Data Mining Approach"