

## SHYAM RANGANATHAN

Assistant Professor, Department of Statistics, Virginia Polytechnic Institute and State University (Virginia Tech)

EMAIL: shyam81@vt.edu

---

### EDUCATION

Degree	Year	Institute	CGPA	Additional Information
PhD in <b>Mathematics</b>	2015	Department of Mathematics, Uppsala University, Sweden	NA	Thesis: Non-linear dynamical modelling of panel data for the social sciences
PG Diploma in <b>Journalism</b>	2008	Asian College of Journalism, Chennai, India	NA	Rank: 1 of 120
MS in <b>Electrical Engineering</b>	2007	University of Notre Dame, IN, USA	3.83/4.00	Information Theory of Wireless Communication Channels
B Tech in <b>Electrical Engineering</b>	2003	Indian Institute of Technology-Madras	8.73/10.0	Rank 11 of 106; Minor: Theoretical Computer Science

### RESEARCH INTERESTS

Mathematical Modelling, High-Dimensional Time Series, Spatio-Temporal models, Networks, Sustainability, Multilevel Modeling, Structural Equation Modeling, Probability and Stochastic Processes, Linear and Non-linear dynamic models, Bayesian Methods, Econometrics, Agent-based modelling, Computational Social Science, Education research, Engineering Applications, Human Development.

### RESEARCH PROPOSALS

Co-PI: **“A synthetic population approach to modeling human health and the environment: A tool for adaptation planning”**, Global Change Center - ISCE, proposal funded (\$22,000 – 50%) Nov 2017

Affiliate Member: Rural Environments, Global Change Center, proposal funded (\$70,000 – 7%)

Co-PI: **“A tale of two networks: trade and financial linkages in the global economy”**, Dean’s Discovery Fund 2017, proposal funded (\$20,000 - 40%) July 2017

Co-PI: **“Bio-behavioral monitoring of Self Injurious Behaviors in Autism Spectrum Disorder”**, ISCE Scholars Program 2017, proposal funded (\$30,000 – 33%) June 2017

PI: **“Measuring Academic and Professional Outcomes of the College Experience”**, ISCE Summer Scholars Program 2016, proposal funded (\$30,000 – 50%) Dec 2016

### RESEARCH PROPOSALS SUBMITTED

Co-PI: Spatiotemporal analysis of adverse birth outcomes in Central Appalachia, NIH, 2017.

Co-PI: A neurotechnological approach to real-time assessment and feedback of self-injurious behaviors in ASD, Department of Defense, 2017.

Co-PI: Development of a neurotechnological system that uses emotional states to predict the occurrence of self-injurious behaviors in Autism Spectrum Disorder, NSF, 2017.

## SHYAM RANGANATHAN

Assistant Professor, Department of Statistics, Virginia Polytechnic Institute and State University (Virginia Tech)

EMAIL: shyam81@vt.edu

---

PI: Defeating the Sophomore Slump: Increasing Year-to-Year Persistence among Diverse Students in Engineering, NSF, 2017.

PI: ATD: Threat Forecasting Using Spatio-Temporal Modeling of Topic Flows, NSF, 2018.

### STUDENT RESEARCH

#### Undergraduate Research Advisor:

Chelsea Robertson, “Underrepresentation of Women in STEM Fields – A Time Series Analysis”, Spring 2017.

Katherine Burke, “Studying the impact of video games on attitudes towards women”, Spring 2017.

#### Graduate Research:

**Committee Member:** PhD Committee of GC Raj Kumar, SPIA. **Research Advisor:** Chris Grubb, Statistics.

### PUBLICATIONS

#### PEER-REVIEWED JOURNAL PAPERS

- Alison Bowers, *Shyam Ranganathan*, Denise R. Simmons. Defining Quality in Undergraduate Education: Directions for Future Research Informed by a Literature Review. **Higher Learning Research Communications**, 2018.
- Somayajulu Dhulipala, Adrian Marek, *Shyam Ranganathan*, & Madeleine Flint, A site-consistent method to quantify sufficiency of alternative IMs in relation to PSDA, **Earthquake Engineering and Structural Dynamics**, 2017.
- *Shyam Ranganathan*, Stamatios C. Nicolis, Ranjula Bali Swain, David J.T. Sumpter. Setting development goals using stochastic, dynamical system models. **PLOS ONE**, 2017.
- Ralph P. Hall, *Shyam Ranganathan*, Raj GC. A General Micro-Level Modeling Approach to Analyzing Interconnected SDGs: Achieving SDG 6 and More through Multiple-Use Water Services (MUS) **Sustainability** 9(2):314-314, 2017.
- Viktoria Spaiser, *Shyam Ranganathan*, Ranjula Bali Swain, David J.T. Sumpter. The Sustainable Development Oxymoron: Quantifying and Modeling the Incompatibility of Sustainable Development Goals, **International Journal of Sustainable Development and Ecology**, 2016.
- Viktoria Spaiser, Peter Hedström, *Shyam Ranganathan*, Kim Jansson, Monica K. Nordvik, David J.T. Sumpter. Identifying complex dynamics in social systems: The case of school segregation. **Sociological Methods and Research**, 2016.
- *Shyam Ranganathan*, Ranjula Bali Swain, David J.T. Sumpter. The Demographic Transition and Economic Growth: Implications for Development Policy. **Palgrave Communications**, 2015.
- *Shyam Ranganathan*, Stamatios C. Nicolis, Viktoria Spaiser, David J.T. Sumpter. Understanding Democracy and Development Traps Using a Data-Driven Approach. **Big Data** 3(1), 2015.
- Viktoria Spaiser, *Shyam Ranganathan*, Richard P. Mann, David J.T. Sumpter. The Dynamics of Democracy, Development and Cultural Values. **PLOS ONE** 9(6), 2014.
- *Shyam Ranganathan*, Viktoria Spaiser, Richard P. Mann, David J.T. Sumpter. Bayesian Dynamical Systems Modeling in the Social Sciences. **PLOS ONE** 9(1), 2014.

## SHYAM RANGANATHAN

Assistant Professor, Department of Statistics, Virginia Polytechnic Institute and State University (Virginia Tech)

EMAIL: shyam81@vt.edu

---

### MANUSCRIPTS UNDER REVIEW/IN PREPARATION

- **Shyam Ranganathan**, Ranjula Bali Swain. Analysing Mechanisms for meeting global emissions targets – A Dynamical Systems Approach. *Revise and resubmit*, **Sustainable Development**.
- **Shyam Ranganathan**, Shaowen Luo, Kwok Ping Tsang, Christopher Grubb, and Sudipta Sarangi. Modeling and Prediction in dynamic multiplex networks: A case study using interlinked global trade and financial networks. In preparation.
- **Shyam Ranganathan**, and Xinwei Deng. Neighborhood Vector Autoregression Models for High-Dimensional Time Series. In preparation.

### PEER REVIEWED CONFERENCE PROCEEDINGS/PRESENTATIONS/POSTERS

- **Shyam Ranganathan**, Shaowen Luo, Kwok Ping Tsang, Christopher Grubb, and Sudipta Sarangi. Modeling and Prediction in dynamic multiplex networks: A case study using interlinked global trade and financial networks. In *International Indian Statistics Association Annual Meeting*. Hyderabad, India, 2017.
- **Shyam Ranganathan**, and Xinwei Deng. Neighborhood Vector Autoregression Models for High-Dimensional Time Series. In *INFORMS Annual Meeting*. Houston, 2017.
- Robin Queen, Daniel Schmitt and **Shyam Ranganathan**, Assessing Movement Asymmetry using the Normalized Symmetry Index in ACL Patients, American Society for Biomechanics Thematic Session, 2017.
- **Shyam Ranganathan**, Stamatios C. Nicolis, David J.T. Sumpter. Setting development goals using stochastic data-driven models. **International Conference on Computational Social Science**, Helsinki, Finland, 2015.
- **Shyam Ranganathan**, Stamatios C. Nicolis, Viktoria Spaier, Ranjula Bali Swain, David J.T. Sumpter. Data-driven Modeling in the Social Sciences - A pragmatic approach for policy-makers. **Workshop Paper Series, 20<sup>th</sup> ACM SIGKDD Conference on Knowledge Discovery and Data Mining: Data Science for Social Good**, New York, 2014.
- Rashid Waraich, **Shyam Ranganathan**, Kay W. Axhausen. The Parking Game. **14<sup>th</sup> Swiss Transport Research Conference**, Ascona, 2014.
- **Shyam Ranganathan**, Viktoria Spaier, Stamatios C. Nicolis, David J.T. Sumpter. Data-driven Bayesian Approach to Model Dynamical Social Systems. **6<sup>th</sup> International Network of Analytical Sociologists (INAS) Conference**, 2013.
- **Shyam Ranganathan**, Viktoria Spaier, David J.T. Sumpter. A Bayesian approach to modeling dynamical systems in the social sciences. **Proc. 3<sup>rd</sup> International Conference on Simulation and Modeling Methodologies, Technologies and Applications**, Reykjavik, 2013.
- **Shyam Ranganathan**, Richard P. Mann, David J.T. Sumpter. Dynamical Systems models for Development Economics. **European Conference on Complex Systems**, Brussels, 2012.
- **Shyam Ranganathan**, Richard P. Mann, David J.T. Sumpter. Development Space – a data-driven approach to human development. **European Conference on Complex Systems**, Vienna, 2011.

## SHYAM RANGANATHAN

Assistant Professor, Department of Statistics, Virginia Polytechnic Institute and State University (Virginia Tech)

EMAIL: shyam81@vt.edu

---

- Ravikiran Gopalan, Krishnan Padmanabhan, *Shyam Ranganathan*, Oliver M. Collins. Calculating and Achieving Capacity on the Unknown Fading MIMO Channel. **Proc. International Symposium on Information Theory**, Seattle, 2006.
- Ravikiran Gopalan, *Shyam Ranganathan*, Krishnan Padmanabhan, Oliver M Collins. Rate-Splitting and its Applications for a General Wireless Channel. **Proc. Forty-fourth Annual Allerton Conference on Communication, Control and Computing**, Allerton, Indiana, 2006.
- Krishnan Padmanabhan, *Shyam Ranganathan*, Srinath P. Sundaravaradhan, Oliver M. Collins. General CPM and its capacity. **Proc. International Symposium on Information Theory**, Adelaide, 2005.
- Ravikiran Gopalan, Teng Li, *Shyam Ranganathan*, Krishnan Padmanabhan, Oliver M. Collins. Capacity of MIMO systems without CSI. **Proc. Forty-third Annual Allerton Conference on Communication, Control and Computing**, Allerton, Indiana, 2005.
- Jay Kumar Sundararajan, *Shyam Ranganathan*, Harish Venkatachari. A Generic Fragile Watermarking Algorithm for Image Authentication. **Proc. National Conference on Communication**, Chennai, India, 2003.

### PUBLISHED SOFTWARE PACKAGES

- *Shyam Ranganathan*, Viktoria Spaiser, Richard P. Mann, David J.T. Sumpter. R package **bdynsys** available in the CRAN repository.

### POPULAR SCIENCE/MEDIA ARTICLES AND COVERAGE

- David J.T. Sumpter, *Shyam Ranganathan*, Ranjula Bali Swain. Single SDG targets are impractical and unrealistic. **Invited opinion piece on Science's development portal *scidev.net*: January 13, 2015.** (<http://www.scidev.net/global/mdgs/opinion/sdg-impractical-unrealistic-governance.html>).
- Press coverage of work on **sciencedaily.com** and **phys.org**, March 18, 2015: "[Understanding democracy, development traps using a data-driven approach](#)".
- Press coverage of work on **sciencedaily.com**, January 21, 2014: "[New method for studying social processes brings clarity to global economic, political change](#)".
- Contributions to the **Collective Behavior group blog** [www.collective-behavior.com](http://www.collective-behavior.com).

### INVITED TALKS

- Seminar on "**Follow the Data: A data-driven approach to modeling complex socio-economic systems**", NDSSL, Biocomplexity Institute of Virginia Tech, 2016.
- Seminar on "**Setting better development goals using non-linear dynamic models: The MDGs and the SDGs**", Beijer Institute, Royal Swedish Research Council, 2015.
- Two-day workshop on **Social Change as a Complex Dynamical System**, Uppsala University, 2015.
- One day workshop on **The R package bdynsys and Using a non-linear dynamic modeling approach for social science data**, Institute for Analytical Sociology, Linköping University, 2015.

## SHYAM RANGANATHAN

Assistant Professor, Department of Statistics, Virginia Polytechnic Institute and State University (Virginia Tech)

EMAIL: shyam81@vt.edu

---

### DEPARTMENT, UNIVERSITY AND PROFESSIONAL SERVICE

- **Session Organizer and Chair**, High Dimensional Spatio-Temporal Statistics I and II, INFORMS Annual Meeting, 2017
- **Member**, Hiring Committee for Assistant Professor position on Data Analytics and Communication, DADS, Virginia Tech (candidate hire successful) 2016
- **Member**, Statistics Department Diversity Committee 2016-17
- **Chair**, Statistics Department Diversity Committee 2017-
- **Invited member for panel review**, NSF Research in the Formation of Engineers (RFE), 2017
- **Co-organized workshop on Binary Economics**, Virginia Tech NCR, Arlington, 2016
- **Reviewer**: Papers in PLOS ONE, Political Science Research and Methods, Chemometrics and Intelligent Laboratory Systems.

### TEACHING/PROFESSIONAL EXPERIENCE

- **Lead instructor** for a course on **Introduction to Biostatistics for Neuroscience** (STAT 3615), Virginia Tech, Spring 2016.
- **Lead instructor** for a course on Advanced Methods for Regression Analysis (STAT 5214G), Virginia Tech, Spring 2017, 2018.
- Attended conference on Teaching Large Classes, Virginia Tech., Fall 2016.
- **Lead instructor** for a course on **Hierarchical Modeling** (STAT 5364), Virginia Tech, Fall 2016.
- **Lead instructor** for a course on **Statistical Methods** (STAT 3005), Virginia Tech, Spring 2016.
- Completed 5-week **certificate course in pedagogy** with paper titled “Teaching mathematics with computers – a review of the pedagogical literature,” Uppsala University, 2015.
- **Teaching Assistant** for courses in: **Probability and Statistics, Transform Methods**, Uppsala University, multiple semesters, 2011-2015.
- **Supervised Masters students** (Ross Linscott, Department of Information Technology, and Tilo Wiklund, Department of Mathematics) Uppsala University. Thesis: Parsimonious Dynamical Systems using the LASSO and the Bootstrap, 2014.
- **Lead instructor** for a course on **Mathematical Biology**, Uppsala University, 2013.
- Participant in 2<sup>nd</sup> summer school on “**Mathematical Modeling of Complex Systems**,” Pescara, 2012.
- **Teaching Assistant in Signals and Systems I**, University of Notre Dame, 2006.
- **Special Correspondent** at “The Hindu” – English language national daily in India, 2008-2010.
  - Reporting on education, politics, business and development, parliamentary elections.

## SHYAM RANGANATHAN

Assistant Professor, Department of Statistics, Virginia Polytechnic Institute and State University (Virginia Tech)

EMAIL: shyam81@vt.edu

---

- International Assignments to cover post-conflict Sri Lanka in 2009 (sponsored by the Sri Lankan government); personal interviews with the then Deputy Prime Minister of Australia Julia Gillard and ambassadors of the United States and Germany to India.
- Editorial responsibility for the weekly supplement “The Hindu Education Plus”.

### ACADEMIC AWARDS

- **Sederholm Travel scholarship**, Uppsala University (~\$3,000) for research visit to ETH Zurich, 2013.
- **Center for Inter-Disciplinary Mathematics (CIM) Fellowship** (full tuition waiver and stipend for five years) to pursue PhD at Department of Mathematics, Uppsala University, Sweden, 2011-2016.
- **SAF-Madanjeet Singh Scholarship** (full tuition waiver and stipend) for Journalism Studies at the Asian College of Journalism, 2007.
- **Best Outgoing Student** at the Asian College of Journalism. **Best Dissertation Award** for paper on The Role of Intellectuals in Society. **Best Student** award in courses on Politics, Ideology and Public Policy, and Identities. 2007.
- **Summer Research Fellowship**, Center for Applied Mathematics, University of Notre Dame, 2006.

### OTHER RESEARCH EXPERIENCE

- **Graduate Research Assistant, Centre for Inter-Disciplinary Mathematics, Department of Mathematics, Uppsala University** June 2011-Dec 2015
  - Development of a Bayesian dynamical systems methodology to model socio-economic systems
  - Agent-based modeling for political party competition
  - Modeling emissions growth and mechanisms to set emission reduction targets for different countries
  - Analysis of foreign aid and its effect on economic growth
  - Machine learning approach to identify Sustainable Development Goals using feature selection algorithms
- **Visiting Researcher, Institute for Transport Planning and Systems, ETH Zurich** Oct-Nov 2013
  - Analysis of parking behavior in the Zurich transport network – empirics and modeling using the MATSim (Multi-Agent Transport Simulation) toolkit
- **Research Assistant, Collective Behavior Group, Uppsala University** Oct 2010-April 2011
  - Development of an app for PC, Mac and Linux called ‘Development Space’ to visualize human development data for the World Bank Apps for Development Competition
- **Graduate Research Assistant, Wireless Lab, Department of Electrical Engineering, University of Notre Dame** 2003-2007
  - Study of MIMO channels with fading - calculating and achieving capacity
  - Study of General Continuous Phase Modulation (CPM) channels
- **Indian Institute of Technology-Madras** 1999-2003
  - Design of a fast Viterbi decoding algorithm for use in error control in satellite communications - Matlab and Assembly language (Analog Devices Blackfin processor) implementations with testing

## **SHYAM RANGANATHAN**

Assistant Professor, Department of Statistics, Virginia Polytechnic Institute and State University (Virginia Tech)

EMAIL: shyam81@vt.edu

---

- Study of Image Authentication and watermarking techniques and design of an algorithm to implement a generic watermarking scheme

**Programming Experience:** Matlab, C, C++, Python, Java, R, SPSS