

Pablo Moriano

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RESEARCH INTERESTS Complex Systems, Network Science, Data Science, Network Security, Anomaly Detection

EDUCATION **Indiana University**, Bloomington, IN
Ph.D., Informatics, Complex Systems, Expected May 2019
- Dissertation: Anomaly detection in real-world temporal networks
- Committee: L. Jean Camp (Chair), Yong-Yeol Ahn, Filippo Radicchi, Raquel Hill
- Minor in Statistical Science
M.S., Informatics, October 2017
Pontificia Universidad Javeriana, Cali, Colombia
M.S., Electrical Engineering, October 2011
- Master thesis: Heavy-tailed distributions from local decision-making strategies
- Advisor: Jorge Finke
- *Summa cum laude*, with highest distinction
- Ranked top 1%, GPA: 4.74/5.00
B.S., Electrical Engineering, May 2008
- *Summa cum laude*, with highest distinction
- Ranked top 1%, GPA: 4.45/5.00

PUBLICATIONS

Peer Reviewed Journals

- [J5] P. Moriano, S. Achar, and L. J. Camp. **Incompetents, criminals, or spies: Macroeconomic analysis of routing anomalies.** *Computers & Security*, vol. 70, pp. 319–334, 2017.
- [J4] P. Rajivan, P. Moriano, T. Kelley, and L. J. Camp. **Factors in an end user security expertise instrument.** *Information and Computer Security*, vol. 25, no. 2, pp. 190–205, 2017.
- [J3] P. Moriano and J. Finke. **On the formation of structure in growing networks.** *Journal of Statistical Mechanics: Theory and Experiment*, 2013 (06), P06010.
- [J2] P. Moriano and J. Finke. **Power-law weighted networks from local attachments.** *Europhysics Letters*, vol. 99, no. 1, p.18002(6), 2012.
- [J1] P. Moriano and F. Naranjo. **Modelado y control de un nuevo sistema bola viga con levitación magnética.** *Revista Iberoamericana de Automática e Informática Industrial*, vol. 9, no. 3, pp. 249–258, 2012.

Peer Reviewed Conferences

- [C6] P. Moriano, S. Iyer, and L. J. Camp. Characterization of Internet Routing Anomalies Through Graph Mining. *Under Review*, 2017.
- [C5] P. Rajivan, P. Moriano, T. Kelley, and L. J. Camp. **What Can Johnny Do? – Factors in an End-User Expertise Instrument.** In Proceedings of the *Tenth International Symposium on Human Aspects of Information Security & Assurance (HAISA 2016)*, pp. 199–208, Frankfurt, Germany, July 2016.
- [C4] P. Moriano and J. Finke. **Model-based fraud detection in growing networks.** In Proceedings of the *IEEE Conference on Decision and Control*, pp. 6068–6073, Los Angeles, CA, USA, December 2014.
- [C3] P. Moriano and J. Finke. **Characterizing the relationship between degree distributions and community structures.** In Proceedings of the *American Control Conference*, pp. 2383–2388, Portland, OR, USA, June 2014.
- [C2] P. Moriano and J. Finke. **Structure of growing networks with no preferential attachment.** In Proceedings of the *American Control Conference*, pp. 1088–1093, Washington, DC, USA, June 2013.
- [C1] P. Moriano and J. Finke. **Heavy-tailed weighted networks from local attachment strategies.** In Proceedings of the *50th IEEE Conference on Decision and Control and European Control Conference*, pp. 5211–5216, Orlando, FL, USA, December 2011.

Referred Workshops

[W3] P. Moriano, J. Pendleton, S. Rich, and L. J. Camp. **Insider Threat Event Detection in User-System Interactions**. In *9th ACM CCS International Workshop on Managing Insider Security Threats (MIST)*, pp. 1–12, Dallas, TX, USA, October 2017.

[W2] P. Moriano, E. Ferrara, A. Flammini, and F. Menczer. **Dissemination of scholarly literature in social media**. In *ACM Web of Science Conference Workshop Altmetrics 14*, Bloomington, IN, USA, June 2014.

[W1] P. Moriano and F. Naranjo. **Modelado de un nuevo sistema bola viga con levitación magnética**. In the *4th IEEE Colombian Workshop in Robotics and Automation*, Cali, Colombia, August 2008.

Referred Abstracts & Posters

[A3] C. McElroy, P. Moriano, and L. J. Camp. **On Predicting BGP Anomalous Incidents: A Bayesian Approach**. In *Network and Distributed Security Symposium*, San Diego, CA, USA, February 2018.

[A2] P. Moriano, J. Finke, and Y.-Y. Ahn. **Community-based event detection in temporal networks**. In *Conference on Complex Systems*, Cancún, Mexico, September 2017.

[A1] P. Moriano, S. Achar, and L. J. Camp. **Macroeconomic Analysis of Routing Anomalies**. In *Telecommunications Policy Research Conference*, Arlington, VA, USA, October 2016.

Work in Progress

[WP2] P. Moriano, J. Finke, and Y.-Y. Ahn. **Community-based event detection in temporal networks**. In preparation.

[WP1] P. Moriano, C. McElroy, and L. J. Camp. **On predicting BGP hijacking incidents: A Bayesian approach**. In preparation.

RESEARCH EXPERIENCE

Cisco Systems, Knoxville, TN

Research Intern

Summer 2016, 2017

- **Insider Threat Modeling**: This project aims to model interactions between engineers and software components in order to understand malicious events.
- Studied the temporal evolution of engineer/component interactions and its correlation with precipitating events.
- Published a research paper on insider threat event detection in the 9th ACM CCS International Workshop on Managing Insider Security Threats (MIST).

Mentor: **Steven Rich**

Indiana University, Bloomington, IN

Research Assistant

June 2015 to Present

- **BGP as a Trust Network**: This interdisciplinary project aims to identify and classify route anomalies using analytical and data-driven models.
- Completed the macroeconomic analysis of the anomalies and analyzed routing data as a temporal network.

PI: Prof. **L. Jean Camp**

Research Assistant

September 2013 to July 2014

- **Truthy**: This project aims to understand how information propagates through information networks.
- Analyzed Twitter data to understand how the announcement of scientific publications spread online.

PIs: Prof. **Filippo Menczer**, Prof. **Alessandro Flammini**

Pontificia Universidad Javeriana, Cali, Colombia

Research Assistant

February 2009 to July 2013

- **Emergence of heavy-tailed networks from local decision-making strategies**: This project aims to introduce a wide class of local decision-making strategies which lead to heavy-tailed distributions on growing networks.
- Developed a mathematical framework to understand mechanisms that lead to the emergence of heavy-tailed distributions.

- Developed software for simulating patterns of global group distributions (asynchronous Discrete Event System models), stability analysis of group behavior (using extensions of Lyapunov theory).
- PI: Dr. **Jorge Finke**

TEACHING
EXPERIENCE

Indiana University, Bloomington, IN
Associate Instructor

August 2014 to May 2015

- **I400: Performance Analytics Spring 2015.**
- **I201: Discrete Mathematics Fall 2014.**
- Led lab sessions, held office hours, graded homework and exams.

Pontificia Universidad Javeriana, Cali, Colombia
Lecturer in Introduction to Programming

July 2011 to July 2013

- This course provides an introduction to the discipline of programming viewed as a conceptual and technological tool for solving real-world engineering problems using Python.
- Ran and prepared lectures and lab sessions, held office hours, and graded exams.

AWARDS

Indiana University, Bloomington, IN

- Research and teaching assistantship, 2013–2017

Colciencias, Bogotá, Colombia

- Science, technology, and innovation scholar, January 2014
- Young investigator from Colombia's National Science Agency (\$10,000), October 2010

Colfuturo, Bogotá, Colombia

- Graduate student scholarship, June 2013

Pontificia Universidad Javeriana, Cali, Colombia

- Outstanding lecturer, May 2013
- Outstanding master thesis, October 2011
- M.S. research scholarship, 2009–2011
- Outstanding undergraduate thesis, May 2008
- Dean's list, 2003–2007

Travel Grants

- IU Graduate and Professional Student Government, 2017, (\$500)
- IEEE Symposium on Security and Privacy (IEEE S&P), 2017, (\$900)
- GREPSEC III Workshop (supported by NSF), 2017, (\$700)
- American Control Conference (ACC), 2014, (\$800)

Best Paper Award

- MIST 2017

COMMUNITY
SERVICE

Memberships

- Institute of Electrical and Electronics Engineering (IEEE) student member
- Association for Computing Machinery (ACM) student member
- Complex Systems Society (CCS) member
- Federation of Automatic Control (IFAC) technical committee member for Technology, Culture, and International Stability

Mentoring and Advising

- Clint McElroy (B.S. in Informatics at Indiana University), collaboration, 2017–Present
- Srivatsan Iyer (M.S. in Computer Science at Indiana University), collaboration, 2015–2017
- Soumya Achar (M.S. in Computer Science at Indiana University), collaboration, 2015–2016

Reviewing

- ACM Transactions on Information and System Security (TISSEC)
- ACM Internet Measurement Conference Shadow PC

SKILLS

Programming Languages

Frequent user of Python for data analysis using Matplotlib, igraph, Pandas, Scikit-learn
Experience in L^AT_EX, R, MATLAB, Mathematica, C/C++
Familiar with HTML, CSS, JS for frontend
Used SQLite, NoSQL (MongoDB)

Spoken Languages

English (fluent), Spanish (native)

Extracurricular Activities

Tennis, travel, hiking