Timothy LaRock

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Education

Northeastern University Network Science Institute **Boston, MA**
PhD in Network Science *August 2016 - Present (Exp. Summer 2021)*

Dissertation: Representing and Analyzing Pathway Data Through Networks

Committee: Prof. Tina Eliassi-Rad (Advisor), Prof. Samuel V. Scarpino (Northeastern), Prof. Ingo Scholtes (University of Wuppertal), Prof. Rose Yu (UCSD)

The Honors College, University at Albany, State University of New York **Albany, NY**
Bachelor of Science in Computer Science and Applied Mathematics *May 2016*
Minor: Philosophy

Advisors: Prof. Petko Bogdanov & Prof. Mariya Zheleva

Honors Thesis: *Wireless Frequency Spectrum Characterization and Transmitter Detection Using Wavelets*

Research Experience

Network Science Institute, Northeastern University **Boston, MA**
Research Assistant, Rad Lab *August 2016 - Present*

- Analyzing Anomalous Paths Through Networks Using Higher-Order Network Models
  - Worked with a team of 6 collaborators in developing methodology to identify statistically anomalous sequences of nodes traversed in a network using higher-order network representations.
  - Responsible for developing and implementing the statistical higher-order network model, as well as generating, analyzing, and writing about results of data analysis using the methodology.
  - Collaborated successfully resulting in a publication in *SIAM International Conference on Data Mining* (see Peer-Reviewed Conference Papers).
- Human Mobility and Physical Distancing during the COVID-19 Pandemic
  - Worked with a large research team in analyzing human mobility data from cellular GPS to understand mobility changes in response to the COVID-19 pandemic.
  - Collaborated to estimate mobility indices to be supplied directly to epidemiological models and posted to an online dashboard accessible to policy makers and the public. Assisted in writing multiple pre-publication reports (see Preprints) and a research article to be submitted.
- Reducing Network Incompleteness via Network Online Learning
  - Worked with a team of 5 collaborators in developing machine learning algorithms to grow incomplete networks through adaptive querying of partially observed nodes.
  - Responsible for model construction and implementation as well as conceiving of and executing simulations and collecting, analyzing, and writing about results.
  - Collaborated successfully resulting in a peer-reviewed research article published in *Applied Network Science* (see Peer-Reviewed Journal Papers).

ETH Zürich/University of Zürich **Zürich, Switzerland**
Visiting Researcher - Chair of Systems Design/Data Analytics Group *Summer 2018*
Supervisor: Dr. Ingo Scholtes

- Two month invited research visit to work directly with collaborators located in Switzerland on analyzing anomalous paths through networks via higher-order network models.

Computer Science Department, University at Albany, SUNY **Albany, NY**
Research Assistant, Data Management and Mining Lab *Fall 2014 - Summer 2016*

- Airpress (Summer 2015 - Summer 2017)
  - Developed wavelet methods for real time transmitter detection and spectrum characterization to facilitate the use of Dynamic Spectrum Access devices based on FCC guidelines.
- Scalable Targeted Group Centrality (Spring 2015)
  - Devised a computationally efficient algorithm to compute group centrality in large scale graphs based on given targeting criteria.
  - Designed and conducted experiments to test our algorithm on a real world dataset.
- Adaptive Power Load Balancing in Cellular Networks (Fall 2014)
  - Analyzed cellular call data to identify load disparity between antennas in a real-world network.
  - Devised and tested an algorithm to adaptively adjust the power of cellular antennas based on neighborhood load disparity employing the concept of Power Diagrams.

NSF Research Experience for Undergraduates **Siena College, Loudonville, NY**
Research Assistant *Summer 2014*

- Siena's Twitter Information Retrieval System (STIRS)
  - Implemented information retrieval algorithms and techniques in Java to develop the STIRS information retrieval system.
  - Resulted in a poster at the *2014 Text REtrieval Conference* (see Peer-Reviewed Conference Papers).

Teaching Experience

Khoury College of Computer Sciences, Northeastern University **Boston, MA**
Instructor - CS 3000 - Algorithms & Data *Summer 2020*
Course Website: `https://tlarock.github.io/teaching/cs3000/syllabus.html`

- Instructor of Record for a 7-week intensive summer course in algorithms for more than 80 undergraduate students in computer science.
- Converted course from in-person to remote instruction mode blending synchronous and asynchronous elements to accommodate students in multiple timezones.
- Collaboratively managed 9 Teaching Assistants in administering the course.

Computer Science Department, University at Albany, SUNY **Albany, NY**
Teaching Assistant - ICSI 201 - Introduction to Computer Science *Fall 2014*

Peer-Reviewed Journal Papers

- **Timothy LaRock**, T. Sakharov, S. Bhadra, T. Eliassi-Rad, "Understanding the Limitations of Network Online Learning", Applied Network Science, 5:60, September 2020.

Peer-Reviewed Conference Papers

- **Timothy LaRock**, V. Nanumyan, I. Scholtes, G. Casiraghi, T. Eliassi-Rad, F. Schweitzer, "HYPA: Efficient Detection of Path Anomalies in Time Series Data on Networks", Proceedings of the 2020 SIAM International Conference on Data Mining (SDM). May 2020.
- M. Zheleva, **Timothy LaRock**, P. Schmitt, P. Bogdanov, "Efficient spectrum summarization using compressed spectrum scans", 2018 IEEE Conference on Computer Communications Poster and Demo (INFOCOM), April 2018. Poster.
- M. Zheleva, P. Bogdanov, **Timothy LaRock**, P. Schmitt, "AirVIEW: Unsupervised transmitter detection for next generation spectrum sensing", IEEE International Conference on Computer Communications (INFOCOM2018), April 2018.
- **Timothy LaRock**, P. Schmitt, P. Bogdanov, E. Belding, M. Zheleva, "AirPress: Towards Scalable

Spectrum Inventory", 13th USENIX Symposium on Networked Systems Design and Implementation, March 2016. Poster.
- **Timothy LaRock**, L. Mathews, M. Roberts, D. Lim, S. Small, "Siena's Twitter Information Retrieval System: The 2014 Microblog Track", In Proceedings of the Twenty-Third Text REtrieval Conference (TREC), November 2014. Poster.

Peer-Reviewed Workshop Papers

- **Timothy LaRock**, T. Sakharov, S. Bhadra, T. Eliassi-Rad, "Reducing Network Incompleteness Through Online Learning: A Feasibility Study", 14th International Workshop on Mining and Learning with Graphs (MLG, co-located with The 24th ACM SIGKDD Conference on Knowledge Discovery and Data Mining), August 2018.

Conference Presentations

- **Timothy LaRock**, M. Xu, T. Eliassi-Rad, "Analyzing Maritime Shipping Routes With Higher-order Network Analysis," Networks 2021: A Joint Sunbelt and NetSci Conference, June 2021. Abstract & oral presentation.
- **Timothy LaRock**, V. Nanumyan, I. Scholtes, T. Eliassi-Rad, "Frequency of Significant Sequential Motifs Reveal Patterns in Pathway Data", International Conference on Network Science (NetSci'20), September 2020. Abstract & oral presentation (video link).
- **Timothy LaRock**, R. Caceres, P. Morales, T. Eliassi-Rad, "Incompleteness in Networks: Biases, Skewed Results, and Some Solutions", 25th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD), August 4th, 2019. Peer-reviewed Tutorial.
- **Timothy LaRock**, V. Nanumyan, I. Scholtes, G. Casiraghi, T. Eliassi-Rad, F. Schweitzer, "Finding Over- and Under-represented Pathways in Higher Order Networks", International Conference on Network Science (NetSci), May 2019. Abstract & oral presentation.
- **Timothy LaRock**, T. Sakharov, S. Bhadra, T. Eliassi-Rad, "Limits of Learning in Incomplete Networks", International Conference on Network Science (NetSci), June 2018. Abstract & oral presentation.
- **Timothy LaRock**, T. Sakharov, S. Bhadra, T. Eliassi-Rad, "Learning to Complete Partially Observed Networks", 9th International Conference on Complex Networks (CompleNet), March 2018. Abstract & oral presentation.

Invited Talks

- **Timothy LaRock**, "Detecting Path Anomalies in Time Series Data on Networks", Higher Order Models in Network Science Satellite (HONS), May 2019.

Preprints

- S. McCabe, L. Torres, **Timothy LaRock**, et al., "netrd: A library for network reconstruction and graph distances", arXiv, October 2020. `https://arxiv.org/abs/2010.16019`.
- B. Klein, **Timothy LaRock**, S. McCabe, L. Torres, et al., "Reshaping a nation: Mobility, commuting, and contact patterns during the COVID-19 outbreak", MOBS Lab (self-published), May 2020. `https://www.mobs-lab.org/uploads/6/7/8/7/6787877/covid19mobility_report2.pdf`
- B. Klein, **Timothy LaRock**, S. McCabe, L. Torres, et al., "Assessing changes in commuting and individual mobility in major metropolitan areas in the United States during the COVID-19 outbreak", MOBS Lab (self-published), March 2020. `https://www.mobs-lab.org/uploads/6/7/8/7/6787877/assessing_mobility_changes_in_the_united_states_during_the_covid_19_outbreak.pdf`
- **Timothy LaRock**, V. Nanumyan, I. Scholtes, G. Casiraghi, T. Eliassi-Rad, F. Schweitzer, "Detecting Path Anomalies in Time Series Data on Networks", arXiv, May 2019. `https://arxiv.org/abs/1905.10580`.

Professional Activities

Workshop/Satellite Organizer

- Networks 2021 Satellite on Dynamics and Motifs in Networks (DynaMo), June 2021

Journal Referee

- EPJ Data Science

Awards & Honors

Student-led Research on New Opportunities for Dynamic Spectrum Access Award
With Prof. Mariya Zheleva, Awarded by Dynamic Spectrum Alliance *Spring 2019*

Excellence in Undergraduate Research in Computer Science Award
Awarded to graduating students for research contributions. *Spring 2016*

University at Albany Presidential Undergraduate Award For Research
Project: Adaptive Power Load Balancing in Cellular Networks *Spring 2015*

Computer Sciences Corporation Scholarship Award
Chosen by UAlbany Computer Science Faculty - 2 students per year *Fall 2015*

University at Albany Presidential Honors Society
Invited after earning GPA above 3.8 *Spring 2015 - Spring 2016*

University at Albany Dean's List
Maintained GPA above 3.5 through all semesters *Fall 2012 - Spring 2016*

Skills

- Technical writing
- Research communication, including articles, lectures, and presentations
- Network & Data analysis
- Programming Languages:
  - Python
  - R
  - C/C++
  - Unix/Linux scripting
  - Awk
  - Java
  - Basic HTML/CSS/Javascript
  - Julia
- Operating Systems:
  - Unix/Linux
  - Mac OS X
  - Windows

Interests

- Science Communication
- Network and Data Science
- Algorithm Design
- Science and Technology Studies
- Human Mobility and Disease Modeling
- Ecological and Geospatial Networks
- Climate Modeling and Intervention
- Philosophy and Sociology of Science