Timothy LaRock

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Education

Northeastern University Network Science Institute **Boston, MA**
PhD in Network Science *August 2016 - Present (Exp. Summer 2021)*
Advisor: Prof. Tina Eliassi-Rad
Dissertation: Representing and Analyzing Pathway Data Through Networks

The Honors College, University at Albany, State University of New York **Albany, NY**
Bachelor of Science in Computer Science and Applied Mathematics, 3.79 *May 2016*
Minor: Philosophy
Advisors: Prof. Petko Bogdanov & Prof. Mariya Zheleva
Honors Thesis: *Wireless Frequency Spectrum Characterization and Transmitter Detection Using Wavelets*

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'18 Poster/Demo), 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 2014), Gaithersberg, MD USA 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'18, co-located with KDD'18), August 2018.

Conference Presentations

- **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 '19), August 4th, 2019. Traditional 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'19), 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'18), 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'18), 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 '19), May 2019.

Preprints

- **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`.

Miscellaneous

- **Timothy LaRock**, T. Sakharov, S. Bhadra, T. Eliassi-Rad, "Limits of Learning in Incomplete Networks"
  - Microsoft Research New England Machine Learning Day, May 2018. Poster.
  - MIT Lincoln Labs Graph Exploration Symposium, April 2018. Poster.
- **Timothy LaRock**, X. Feng, P. Bogdanov, M. Zheleva, "Adaptive Power Load Balancing in Cellular Networks", University at Albany Undergraduate Research Conference, April 2015. Oral Presentation.

Experience

Research

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

- Network Incompleteness
  - Incomplete network data can be improved by querying partially observed nodes to learn more complete information.
  - We develop machine learning algorithms to grow sampled networks through adaptive querying of partially observed nodes.
- Understanding Anomalous Pathways with Higher Order Network Models
  - Given trajectories or sequences of nodes through a network, we employ higher-order network representations to detect anomalous patterns.
  - Applications include anomaly detection in global shipping, internet traffic, public transportation and web clickthrough networks.

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

- Collaborative research visit to study anomaly detection and interpretability of pathway data by combining higher order network models with statistical methods.

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 further develop and refine existing STIRS system.

Teaching

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`

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

Awards & Honors

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

- Data Analysis
- Programming Languages:
  - Java
  - Unix/Linux scripting
  - Awk
  - R
  - GNUPlot
  - Dot (GraphViz)
  - C/C++
  - Python
  - LaTeX
  - Basic HTML/CSS/javascript
- Operating Systems:
  - Unix/Linux
  - MacOSX
  - Windows

Research Interests

- Network Science
- Computational Modelling
- Data Science
- Algorithm Design
- Wireless Networks
- Neural Engineering
- Computational Social/Political/Cognitive Science
- Philosophy of Mind & Science