

# Nesreen K. Ahmed

## Curriculum Vitae

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### Research Interests

My research lies in the field of machine learning and data mining with an emphasis on statistical relational learning, graph mining, big data, sampling and estimation, intrusion and fraud detection, cyber-security, massive streaming data, and time-series prediction.

### Education

- Aug'08–Jul'15 **Ph.D. in Computer Science**, Purdue University, USA.  
Thesis Title: Scaling Up Network Analysis and Mining: Statistical Sampling, Estimation, and Pattern Discovery – GPA 3.8/4.0  
Thesis Advisor: Jennifer Neville (Prof. of Computer Science & Statistics)
- Aug'12–May'14 **M.Sc. in Statistics & Computer Science**, Purdue University, USA.
- Sep'03–May'06 **M.Sc. in Information Technology**, Cairo University, Egypt.  
Thesis Title: A Proposed Intrusion Detection System for Encrypted Computer Networks
- Sep'97–Aug'01 **B.Sc. in Information Technology**, Cairo University, Egypt.  
Distinction with Honors - Ranked 2nd in my class  
Thesis Title: Arabic Speech Recognition using Hidden Markov Models

### Experience

- Oct'15–Present **Research Scientist - Machine Learning**, Intel Research Labs, CA.  
- Working on machine learning algorithms and tools for massive graphs with applications in brain network analysis and cyber-security
- Aug'15–Oct'15 **Researcher**, Technicolor Research & Innovation Labs, CA.  
- Designed methods for user cohort analysis and recommendation techniques for online movie recommendation systems
- Aug'08–Jul'15 **Ph.D. Candidate/Research Assistant**, Purdue University, USA.  
- Research Focus: Large-scale Graph Mining and Relational Machine Learning  
- Designed fast, efficient, and parallel algorithms for mining and modeling large graph data  
- Writing conference/journal papers, proposals, and mentoring junior students  
- Advisor: Prof. Jennifer Neville, Network Learning and Discovery Lab
- May'14–Aug'14 **Data Science Research Intern**, Facebook Inc..  
- Research Focus: Prediction and Analysis of User Activity and Time Spent in Social Networks  
- Designed software pipelines for the analysis and prediction of user activity on Facebook  
- Designed software pipelines for mining the Facebook traffic
- May'13–Aug'13 **Data Science Research Intern**, Intel, Data Analytics.  
- Research Focus: Web Usage Classification using Machine Learning and Text Mining Techniques  
- Designed machine learning methods to predict the topic of webpages with partially-observable data
- May'12–Aug'12 **Analytics Research Intern**, Adobe, Research Labs.  
- Research Focus: Mining Semi-Structured Social Media  
- Designed a novel system and method for mining semi-structured social media  
- Designed predictive tools for the analysis of observed marketing activities  
- Filed two patents with Adobe labs  
- Manager: Ayman Farahat (Distinguished Architect at Yahoo!)

- Aug'05–Jul'08 **Research Assistant**, Data Mining & Computer Modeling Center of Excellence, Egypt.
- Research Fellowship from the United Nations Development Program
  - Research Focus: Feature Extraction and Machine Learning Methods for Time-series Prediction
  - Application to tourism demand prediction
  - Published two journal papers
  - Developed machine learning methods for time-series prediction with application to tourism demand prediction were ranked the 5th in the NN3 forecasting competition
  - Advisor: Amir Atiya (Prof. at Cairo University)
- Sep'01–Jul'08 **Assistant Lecturer**, Cairo University, Information Technology.
- Lecturing, grading, and mentoring undergraduate students
  - Prepared homework/labs/projects for undergraduate courses
  - Prepared online learning course materials for fuzzy logic and neural networks
  - Teaching courses: pattern recognition, machine learning, network security, and neural networks
- Sep'06–Jul'08 **Cisco Certified Instructor**, CCNA Networking Academy Program, Cairo University.
- Prepared summer training classes to teach students practical skills to build and manage networks
- Spring 2008 **Visiting Lecturer**, German University in Cairo, College of Media Engineering & Technology.
- Invited to teach media and networks lab
  - Teaching students practical skills to configure IP networks, analyze network traffic, and applications

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## Honors & Awards

- 2016 Most Liked & Viewed Paper, IEEE conference on Big Data
- 2016 Intel Recognition, Great Place to Work
- 2015 Best Paper Candidate, IEEE conference on data mining (ICDM)
- 2015 Travel award to attend CRA-W women career workshop, from the Computing Research Association for Women
- 2014 Rising Stars Award from the University of California Berkeley — Awarded to top female Ph.D. candidates & postdocs in electrical engineering and computer science
- 2013 Paper on mining daily deals and social media, featured by **MIT Technology Review**
- 2008–2015 Research Assistantship, Purdue University, Dept. of Computer Science
- 2005–2008 Research fellowship from the United Nations Development Program (UNDP) — Awarded to top graduate students, Egypt
- 2008 Egypt excellence fellowship for Ph.D
- 1997–2001 Cairo University fellowship, Awarded to outstanding undergraduate students
- 2013 Intel Ph.D. fellowship nomination by Purdue University for big data analytics
- 2012 Best Paper Runner-Up Award, Workshop on big data, streams and source mining (Bigmine)
- 2001 Ranked 2nd, Faculty of Computers & Information, Cairo University
- 2007 Ranked 5th (time-series prediction), The Artificial Neural Network & Computational Intelligence Forecasting Competition (NN3), organized by SAS and International Institute of Forecasters
- 2012 Travel award for the women in machine learning workshop, from Women in Machine Learning Organization & Purdue University
- 2011 Travel award for Grace Hopper celebration of women in computing, from Purdue University
- 2010 Travel award, SIGKDD conference on knowledge discovery and data mining

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## Journal Publications

- J7 Nesreen K. Ahmed, Jennifer Neville, Ryan Rossi, Nick Duffield, Ted Willke. *Graphlet Decomposition: Framework, Algorithms, and Applications*, Journal of Knowledge and Information Systems (KAIS), **Invited paper**, Special Issue on Best Papers of ICDM'15, 2016.

- J6 Ryan Rossi, Nesreen K. Ahmed. *An Interactive Data Repository with Visual Analytics*, SIGKDD Explorations on Knowledge Discovery and Data Mining, ACM SIGKDD Explorations, Vol 17, No 2, 2015.
- J5 Ryan A. Rossi, Nesreen K. Ahmed. *Role Discovery in Networks*, IEEE Transactions on Knowledge and Data Engineering (TKDE), pp.1–20, 2015.
- J4 Nesreen K. Ahmed, Jennifer Neville, Ramana Kompella. *Network Sampling: From Static to Streaming Graphs*, ACM Transactions on Knowledge Discovery from Data (TKDD), Vol 8, No 2-7, pp.1–56, 2014.
- J3 Ryan A. Rossi, Nesreen K. Ahmed. *Coloring Large Complex Networks*, Social Network Analysis and Mining, Vol 4, No 1-228, Springer, pp.1–37, 2014.
- J2 Nesreen K. Ahmed, Amir Atiya, Neamat ElGayar, Hisham El-Shishiny. *An Empirical Comparison of Machine Learning Models for Timeseries Forecasting*, Econometric Reviews, Taylor and Francis Journals, Vol 29, No 5-6, Special Issue on "The Link between Statistical Learning Theory and Econometrics: Applications in Economics, Finance, and Marketing", pp.1–27, 2010.
- J1 Nesreen K. Ahmed, Amir Atiya, Neamat ElGayar, Hisham El-Shishiny. *Tourism Demand Forecasting Using Machine Learning Methods*, International Journal on Artificial Intelligence and Machine Learning (AIML), Special Issue on Computational Methods for the Tourism Industry, pp.1–7, 2007.

### Conference/Workshop Publications (Peer-reviewed)

- C17 Nesreen K. Ahmed, Nick Duffield, Ted Willke, Ryan Rossi. *On Sampling from Massive Graph Streams*, (to appear), In Proceeding of the 43rd International Conference on Very Large Databases, VLDB 2017, Germany.
- C16 Nesreen K. Ahmed, Ryan Rossi, Ted Willke, Rong Zhou. *Edge Role Discovery via Higher-order Structures*, In Proceedings of the Pacific-Asia Conference on Knowledge Discovery and Data Mining, PAKDD, Jeju, South Korea, 2017.
- C15 Nesreen K. Ahmed, Ryan Rossi, Ted Willke, Rong Zhou. *A Higher-order Latent Space Network Model*, In Proceedings of AAAI Conference on Artificial Intelligence, AAAI-PAIR Workshop, San Francisco, 2017.
- C14 Kayhan Ozcimder, Biswadip Dey, Sebastian Musslick, Giovanni Petri, Nesreen K. Ahmed, Theodore L Willke, Jonathan D Cohen. *A Formal Approach to Modeling the Cost of Cognitive Control*, In Proceedings of the 39th Annual Meeting of the Cognitive Science Society, CogSci, 2017.
- C13 Nesreen K. Ahmed, Ted Willke, Ryan Rossi. *Estimation of Local Subgraph Counts*, In Proceedings of the IEEE International Conference on Big Data, Washington D.C., 2016.  
**Most Liked/Viewed Paper**
- C12 Nesreen K. Ahmed, Ted Willke, Ryan Rossi. *Exact and Estimation of Local Edge-centric Graphlet Counts*, In Proceedings of the 5th International Workshop on Big Data, Streams and Heterogeneous Source Mining, Bigmine, held with KDD, San Francisco, CA, 2016.
- C11 Ryan A. Rossi, Rong Zhou, Nesreen K. Ahmed. *Relational Similarity Machines*, In Proceedings of the 12th Workshop on Mining and Learning with Graphs, MLG, held with KDD, San Francisco, CA, 2016.
- C10 Nesreen K. Ahmed, Jennifer Neville, Ryan Rossi, Nick Duffield. *Efficient Graphlet Counting for Large Networks*, In Proceedings of the IEEE International Conference on Data Mining, ICDM, New Jersey, 2015. **Best Paper Candidate**
- C9 Nesreen K. Ahmed, Ryan A. Rossi. *Interactive Visual Graph Analytics on the Web*, In Proceedings of the 9th International AAAI Conference on Web and Social Media, ICWSM, UK, 2015.

- C8 Ryan A. Rossi, Nesreen K. Ahmed. *The Network Data Repository with Interactive Graph Analytics and Visualization*, In Proceedings of the 29th AAAI Conference on Artificial Intelligence, Demo paper, AAAI, Texas, 2015. **Featured by Kdnuggets.com**
- C7 Nesreen K. Ahmed, Nick Duffield, Jennifer Neville, Ramana Kompella. *Graph Sample and Hold: A Framework for Big-Graph Analytics*, In Proceedings of the 20th SIGKDD Conference on Knowledge Discovery and Data Mining, KDD, New York, 2014.
- C6 Nesreen K. Ahmed, Jennifer Neville, Ramana Kompella. *Network Sampling Designs for Relational Classification*, In Proceedings of the 6th International AAAI Conference on Weblogs and Social Media, ICWSM, Ireland, 2012.
- C5 Ayman Farahat, Nesreen K. Ahmed, Utpal Dholakia. *Does a Daily Deal Signal a Distressed Business? An Empirical Investigation of Small Business Survival*, In Proceedings of the Workshop on the Economics of Web Search and Social Networks, WSDM, Italy, 2013.  
**Featured by MIT Technology Review**
- C4 Nesreen K. Ahmed, Jennifer Neville, Ramana Kompella. *Space-Efficient Sampling From Social Activity Streams*, In Proceedings of the 1st International Workshop on Big Data, Streams and Heterogeneous Source Mining, Bigmine, held with KDD, China, 2012.  
**Best Paper Runner-Up**
- C3 Nesreen K. Ahmed, Jennifer Neville, Ramana Kompella. *Reconsidering the Foundations of Network Sampling*, In Proceedings of the 2nd Workshop on Information in Networks, WIN, New York, 2010.
- C2 Nesreen K. Ahmed, Jennifer Neville, Ramana Kompella. *Time-Based Sampling of Social Network Activity Graphs*, In Proceedings of the 8th Workshop on Mining and Learning with Graphs, MLG, held with KDD, Washington D.C., 2010.
- C1 Nesreen K. Ahmed, Nabil Hamdy, Sanaa El-Ola Ahmed. *A Proposed Intrusion Detection System for Encrypted Computer Networks*, In Proceeding of the 3rd International Conference on Informatics and Systems, INFOS, Cairo, 2005.

## Preprints (manuscripts in preparation, under review)

- P7 Ryan A. Rossi, Rong Zhou, Nesreen K. Ahmed. *Deep Feature Learning for Graphs*, Under Review, 2017.
- P6 Nick Duffield, Yunhong Xu, Linagzhen Xia, Nesreen K. Ahmed, Minlan Yu. *Stream Aggregation with Priority Sample and Hold*, In Submission, 2017.
- P5 Ryan A. Rossi, Rong Zhou, Nesreen K. Ahmed. *Estimation of Graphlets in Massive Networks*, Journal Article Under Review, 2016.
- P4 Nesreen K. Ahmed, Ryan A. Rossi, Ted Willke, Rong Zhou, Nesreen K. Ahmed. *Revisiting Role Discovery in Networks: From Node to Edge Roles*, In Submission, arxiv.org/abs/1610.00844, 2016.
- P3 Ryan A. Rossi, Nesreen K. Ahmed. *NetworkRepository: A Graph Data Repository with Visual Interactive Analytics*, arXiv:1410.3560, 2014.
- P2 Nesreen K. Ahmed, Ryan A. Rossi. *A Web-based Interactive Visual Graph Analytics Platform*, arXiv:1410.3560, 2014.
- P1 Nesreen K. Ahmed, Chris Cole, Jennifer Neville. *Learning the Latent State Space of Time-Varying Graphs*, arXiv:1403.3707, 2014.

## Technical Reports

- T2 Nesreen K. Ahmed, Jennifer Neville, Ramana Kompella. *Network Sampling via Edge-based Node Selection with Graph Induction*, Technical Report TR-11-016, Dept of Computer Science, Purdue University, 2011.

- T1 Nesreen K. Ahmed, Amir Atiya, Neamat ElGayar, Hisham El-Shishiny. *A Combined Neural Network/Gaussian Process Regression Timeseries Forecasting System for the NN3 Competition*, The Artificial Neural Network and Computational Intelligence Competition, NN3, 2007.

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## Patents

1. Ayman Farahat, Nesreen K. Ahmed. *Mining Semi-Structured Social Media*, Adobe Systems, US Patent No. US9002852 B2, Granted 2015.
2. Ayman Farahat, Nesreen K. Ahmed. *Predictive Tool Utilizing Correlations With Unmeasured Factors Influencing Observed Marketing Activities*, Adobe Systems, US Patent App. 13/678,149, Published 2014.

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## Tutorials

1. Mohamed Al Hasan, Nesreen K. Ahmed, and Jennifer Neville. *Methods and Applications of Network Sampling*, SIAM International Conference on Data Mining (SDM), 2015.
2. Mohamed Al Hasan, Nesreen K. Ahmed, and Jennifer Neville. *Network Sampling: Methods and Applications*, ACM SIGKDD International Conference on Knowledge Discovery and Data Mining (KDD), 2013.
3. Mohamed Al Hasan, Nesreen K. Ahmed, and Jennifer Neville. *Methods and Applications of Network Sampling*, IEEE International Conference on Data Mining (ICDM), 2013.

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## Invited Talks

- 2016 UC Berkeley, Department of Statistics, *Fast Graphlet Decomposition: Theory, Algorithms, and Applications*, Workshop on Algorithms for Modern Massive Data Sets (MMDS), Berkeley, CA
- 2016 Princeton University, Neuroscience Institute, *Mining and Learning with Graphs*, Princeton, NJ
- 2016 Intel Analytics Summit, *Statistical Sampling Methods for Big Graph Analytics*, Santa Clara, CA
- 2015 IEEE conference on Data Mining (ICDM), *Efficient Graphlet Counting from Large Networks*, Atlantic City, NJ
- 2015 Intel Labs, *Large-scale Network Analysis and Graph Mining*, (Invited Talk), Santa Clara, CA
- 2015 Stanford University, *Large-scale Network Analysis*, (Invited Talk), Stanford, CA
- 2015 Vanderbilt University, EECS Colloquium, *Large-scale Network Analysis and Graph Mining*, (Invited Talk), Nashville, TN
- 2015 College of William & Mary, CS Colloquium, *Large-scale Network Analysis and Graph Mining*, Williamsburg, VA
- 2015 University of Miami, CS Colloquium, *Large-scale Network Analysis and Graph Mining*, (Invited Talk), Miami, FL
- 2015 NEC Labs, *Large-scale Network Analysis and Graph Mining*, (Invited Talk), Princeton, NJ
- 2015 Technicolor R&I Labs, *Large-scale Network Analysis and Graph Mining*, (Invited Talk), Los Altos, CA
- 2015 SIAM conference on Data Mining (SDM), *Methods and Applications of Network Sampling*, (Tutorial), Vancouver, British Columbia
- 2014 SIGKDD Conference on Knowledge Discovery and Data Mining, *Graph Sample and Hold: A Framework for Big Graph Analytics*, NewYork, NY

- 2014 Facebook Data Science, *Graph Sample and Hold: A Framework for Big Graph Analytics*, (Invited Talk), Menlo Park, CA
- 2014 Facebook Data Science, *Prediction and Analysis of User Activity and Time Spent in Social Networks*, (Invited Talk), Menlo Park, CA
- 2014 Yahoo! Labs, *Mining Large Graphs: Sampling, Estimation, and Role Discovery*, (Invited Talk), Sunnyvale, CA
- 2014 Rising Stars Workshop, UC Berkeley, *Graph Analytics in the Age of Big Data*, (Invited Poster), Berkeley, CA
- 2013 SIGKDD Conference on Knowledge Discovery and Data Mining (KDD), *Network Sampling: Methods and Applications*, (Tutorial), Chicago, IL
- 2013 IEEE conference on Data Mining (ICDM), *Methods and Applications of Network Sampling*, (Tutorial), Dallas, TX
- 2013 Sony, *Web Usage Classification of Web-Connected Devices*, (Invited Talk), San Jose, CA
- 2013 Intel, Data Analytics, *Web Usage Classification of Web-Connected Devices*, (Invited Talk), Folsom, CA
- 2013 Purdue CS 50th Anniversary Celebration, *Network Sampling: From Static to Streaming Graphs*, West Lafayette, IN
- 2012 The 6th AAAI Conference on Weblogs and Social Media (ICWSM), *Network Sampling Designs for Relational Classification*, (Poster), Dublin, Ireland
- 2012 Women in Machine Learning Workshop, *Network Sampling Designs for Relational Classification*, (Poster), Lake Tahoe, NV
- 2012 The 1st Workshop on Big Data, Streams, and Heterogeneous Source Mining (Bigmine), *Space-Efficient Sampling from Social Activity Streams*, China
- 2012 Adobe Labs CEO Presentations, *Quantifying Social Media Impacts: from Analysis to Attribution*, (Invited Talk), San Jose, CA
- 2012 Adobe, Advanced Technology Labs, *Business Survival in The Age of Social Media*, (Invited Talk), San Jose, CA
- 2011 Grace Hopper Celebration of Women in Computing (GHC), *A Novel Approach for Network Sampling*, (Poster), Portland, OR
- 2011 Machine Learning Seminar at Purdue, *Reconsidering the Foundations of Network Sampling*, West Lafayette, IN
- 2011 Machine Learning Summer School at Purdue, *Network Sampling*, West Lafayette, IN
- 2010 The 8th Workshop on Mining and Learning with Graphs (MLG), *Time-Based Sampling of Social Network Activity Graphs*, Washington D.C.
- 2005 The 3rd International Conference on Informatics and Systems (INFOS), *A Proposed Intrusion Detection System for Encrypted Computer Networks*, Cairo

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## Open Source Software, Tools, and Data

- Parallel Parameterized Graphlet Decomposition Library (PGD)
  - Open source library for massive graph decomposition
  - <https://github.com/nkahmed/pgd>
  - <https://graphlets.org>

- Network Data Repository
  - The first network data repository with interactive analytics and visualization
  - 500+ publicly available network data sets
  - Tool for graph query and search
  - Tool for synthetic graph generation and visualization (GraphVis)
  - <http://networkrepository.com>

## Outreach

- 2017 AI-Track Committee Member, Grace Hopper Conference of Women in Computing (GHC17)
- 2016 Invited Panelist/Mentor at Stanford Artificial Intelligence Laboratory's Outreach Summer Program for Rising 10th Grade Girls (SAILORS), Stanford University - Goal: Expose high school students in underrepresented populations to the field of Artificial Intelligence
- 2016 Invited Mentor at the Women in Machine Learning Breakfast Event, at the AAAI conference on Artificial Intelligence, Phoenix, AZ
- 2016 Invited Panelist, Machine Learning Panel, Intel Software Professionals Conference (SWPC), Intel Corp.
- 2014 Invited Mentor at Purdue University Graduate Mentoring Program - Goal: Assist new incoming CS graduate students with their transition into graduate school and help them in developing their social and academic networks

## Professional Service & Leadership

- Workshop Chair & Organizer (2016-2017):
  - Workshop on High Performance Big Graph Data Management, Analysis, and Mining
  - Co-located with IEEE Big Data Conference
  - <http://biggraphs.org/>
- Program Committee Member:
  - WWW, The International Conference on World Wide Web (2018)
  - SIGKDD Conference on Knowledge Discovery and Data Mining (2015-2017)
  - CIKM Conference on Information and Knowledge Management (2017)
  - MLG SIGKDD Workshop on Mining and Learning with Graphs (2017)
  - ADMA Conference on Advanced Data Mining and Applications (2017)
  - International Workshop on Machine learning, Optimization Big Data - (MOD 2016-2017)
  - AI Track - Grace Hopper Conference of Women in Computing (GHC 2017)
  - National Conference on Artificial Intelligence (AAAI 2014)
  - IEEE International Conference on Big Data 2014
- Journal Reviewing:
  - Journal of Machine Learning Research (JMLR 2015-2017)
  - Knowledge and Information Systems (KAIS 2016-2017)
  - IEEE Transactions on Knowledge and Data Engineering (TKDE 2015-2017)
  - ACM Transactions on Knowledge Discovery from Data (TKDD 2015-2017)
  - ACM Transactions on Database Systems (TODS 2015)
  - Proceedings of Very Large Databases (VLDB 2015)
  - Data Mining and Knowledge Discovery Journal, Springer (DMKD 2014-2016)
  - IEEE Transactions on Computational Social Systems (TCSS 2016)
  - IEEE Transactions on Neural Networks and Learning Systems (TNNLS 2011-2016)
  - International Journal of Forecasting, Elsevier (IJF 2009)
  - Physica A: Statistical Mechanics and its Applications, Elsevier 2013-2014
- External Reviewer:
  - SIGKDD Conference on Knowledge Discovery and Data Mining (KDD 2014)
  - Workshop on online social networks (WOSN 2013)

- Membership:
  - Women in Machine Learning (WiML)
  - Women Engineers at Intel
  - Computing Research Association for Women (CRA-W)
  - Professional Member IEEE, ACM, SIGKDD
- Student organizer, Machine Learning Summer School at Purdue, 2011
- Treasurer of Egyptian Students Association at Purdue University, 2009
- Activities Coordinator of Egyptian Students Association at Purdue University, 2011
- Webmaster and designer, Workshop on mining and learning with graphs MLG, 2011
  - <http://www.cs.purdue.edu/mlg2011>

## Skills

- Analysis of Big and Semi-Structured Data:
  - Social Media: TWITTER, YELP, GROUPON, LIVING SOCIAL, YIPIT
  - Web data: OPEN DIRECTORY PROJECT (DMOZ.ORG), ALEXA.COM
  - Network data: FACEBOOK, Citation and Collaboration Social Networks, Email, IP Traffic
  - Time-series Data: M3 Competition, NN3 Competition
  - Functional Magnetic Resonance (fMRI)
- Programming skills:
  - PYTHON, MATLAB, R, STATA
  - C/C++, OPENMP, HIVE/MAPREDUCE, MYSQL
  - Web Crawling and Scraping
- Language:
  - English – Conversationally fluent
  - Arabic – Mother-tongue
  - French – Basic reading
- Writing:
  - Creative writing, fiction, reporting, and documenting

## Graduate Coursework

- Computer Science Courses:
  - Algorithm Design: Analysis & Implementation, Data Communication & Computer Networks, Database Systems, Statistical Machine Learning, Data Mining, Advanced Topics in Information Retrieval, Statistical Network Analysis, Social Media Analytics
- Statistics Courses:
  - Mathematical Statistics, Probabilistic Graphical Models, Bayesian Statistics, Probability, Advanced Statistical Methodology