Charu C. Aggarwal

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Professional Interest

Applications of optimization and statistical techniques to data mining and machine learning

Biography

Charu Aggarwal is a Distinguished Research Staff Member (DRSM) at the IBM T. J. Watson Research Center. He completed his B.Tech. from IIT Kanpur in 1993 and his Ph.D. from Massachusetts Institute of Technology in 1996. He has published over 400 papers, authored 10 books, and has been granted over 80 patents (*Google Scholar* h-index=136). Because of the commercial value of the aforementioned patents, he has thrice been designated a Master Inventor by IBM. He is a recipient of the *IEEE ICDM Research Contributions Award* (2015) and the *ACM SIGKDD Innovations Award* (2019), which are the two most prestigious awards for influential research contributions in the field of data mining. He is also a recipient of the *W. Wallace McDowell Award* (2021), the highest technical honor bestowed by the IEEE Computer Society for research contributions in computer science. He received the *Distinguished Alumnus Award* from IIT Kanpur in 2023. He is a recipient of an *IBM Corporate Award* (2003) for his work on bio-terrorist threat detection in data streams, a recipient of the *IBM Outstanding Innovation Award* (2008) for his scientific contributions to privacy technology, and a recipient of two *IBM Outstanding Technical achievement Awards* (2009, 2016) for his scientific contributions to data streams and high-dimensional data. He also received the *EDBT 2014 test-of-time award* for the long-term impact of one of his results on privacy. He served as program co-chair/general co-chair of *IEEE Big Data Conference*(2014), *IEEE ICDM Conference* (2015), *ACM CIKM Conference*(2015), and the *ACM KDD Conference* (2016). He has served as an editor-in-chief of the *ACM SIGKDD Explorations*, *ACM Books*, and the *ACM Transactions on Knowledge Discovery from Data*. He is a fellow of the ACM, SIAM, and the IEEE for contributions to knowledge discovery and data mining algorithms.

Education

Massachusetts Institute of Technology **Cambridge, MA**

Ph.D. in Operations Research, April 1996.

Thesis Title: Faster Algorithms for Some Network Flow Problems (Advisor: James B. Orlin).

Indian Institute of Technology, Kanpur **Kanpur, India**

Bachelor of Technology in Computer Science and Engineering, May 1993.

Award for best finishing undergraduate in Computer Science Department (GPA: 10.0/10.0).

Placed 9th nationally (India) in the IIT Joint Entrance Examination, 1989.

IIT Kanpur Distinguished Alumnus Award, 2023.

Experience

IBM T. J. Watson Research Center **Yorktown Heights, NY (1996-present)**

Distinguished Research Staff Member (2014-present).

Research Staff Member (1996-2014).

Worked extensively across a broad array of topics in data mining, artificial intelligence, and machine learning.

Designed algorithms for streaming data analytics, high dimensional data analytics, automated artificial intelligence, recommender systems, and text machine learning.

Massachusetts Institute of Technology **Cambridge, MA (1993- 1996)**

Research and Teaching Assistant.

Worked in the area of network optimization.

Twice served as teaching assistant for the course 15.082 (Network Flow Algorithms).

Honors

IIT Kanpur Distinguished Alumnus Award in 2023.

SIGKDD Service Award in 2022 for sustained service to data mining conference organization and journal editorships.

W. Wallace McDowell Award, which is the highest award given solely by the IEEE Computer Society for contributions in any area of computer science.

ACM SIGKDD Innovation Award (2019), which is one of two highest awards for research achievements in the field of data mining.

IEEE ICDM Research Contributions Award (2015), which is one of two highest awards for research achievements in the field of data mining.

IFIP WG 11.3 Outstanding Research Award for career contributions in the field of security and privacy, 2021.

SIAM Fellow for *" contribution to knowledge discovery and data mining algorithms."*, 2015.

ACM Fellow for *"contribution to knowledge discovery and data mining algorithms."*, 2013.

IEEE Fellow for *"contributions to knowledge discovery and data mining algorithms".*

EDBT 2014 Test of Time Award, EDBT Conference, 2014.

Best Paper Award, ASONAM Conference, 2011.

IBM Outstanding Technical Achievement Award for contributions to research in privacy and data streams, 2018.

IBM Outstanding Technical Achievement Award for contributions to research in high-dimensional data, 2016.

IBM Outstanding Technical Achievement Award for contributions to System S (IBM Streams Product), 2010.

IBM Research Division Award for contributions to stream mining in System S, 2008.

IBM Outstanding Innovation Award for scientific contributions to privacy technology, 2008.

IBM Corporate Award for Environmental Excellence, for Bio-terrorist threat detection from high dimensional data streams of medical and pharmaceutical records, 2003.

Designated **Master Inventor** at IBM Research for commercial value of patents (2000-2003, 2003-2006, 2006-2010).

IBM First to Twenty-First Plateau Invention Achievement Awards: These 21 awards were received over the course of my IBM employment starting in 1996.

Sloan School of Management Fellowship, Massachusetts Institute of Technology (1995).

Indian Institute of Technology award for best finishing undergraduate in the Department of Computer Science (1993)

1991 first prize for academic excellence in maintaining the highest undergraduate GPA in core ehgineering/science curriculum of first two years (IIT Kanpur).

1990-1991 academic proficiency award (IIT Kanpur).

1989-1990 academic proficiency award (IIT Kanpur).

Selected Service Activities

Editor-in-Chief, *ACM Transactions on Knowledge Discovery from Data*, 2017–2024.

Co-Editor-in-chief, *ACM Books*, 2019–2023.

Editor-in-Chief, *ACM SIGKDD Explorations*, 2014-2018.

Program co-chair of *ACM KDD Conference*, 2016.

Program co-chair at *IEEE ICDM Conference*, 2015.

Program co-chair of Knowledge Management Track, *ACM Conference on Information and Knowledge Management (CIKM)*, 2015.

General co-chair of *IEEE Big Data Conference*, 2014.

Program co-chair of Data Mining Track, *Worldwide Web (WWW) Conference*, 2009.

Program co-chair of *ICBK Conference*, 2018.

Associate editor, *IEEE Transactions on Knowledge and Data Engineering*, 2003-2007.

Associate editor, *IEEE Transactions on Big Data*, 2014-2018.

Associate Editor, *ACM Transactions on Knowledge Discovery from Data*, 2011–2017.

Action Editor, *Data Mining and Knowledge Discovery Journal*, 2005-2021

Advisory Board Member, *Data Mining and Knowledge Discovery Journal*, 2021–present

Advisory Board Member, Springer, *Lecture Notes in Social Networks*, 2013.

Editorial Board, *Journal of Database Management Research*, 2009-2010, 2012-2013.

Editorial Board, *Knowledge and Information Systems*, 2009-2021.

Sponsorship Co-chair of *ACM KDD* Conference, 2002

Workshop Co-chair of *ACM KDD Conference*, 2003

Vice-President, SIAM Activity Group on Data Mining (this activity group is responsible for running all data mining activities at SIAM), 2011-2013.

Advisory Board Member, Lecture Notes in Social Networks, 2018-present.

Member of **SIAM Industry Committee**, 2017 to 2020.

Member of *IEEE ICDM Steering Committee*, 2017–present.

Organized several workshops over the years at ICDM, KDD, SIGMOD, and WWW.

Regularly serve as senior program committee member at major data science conferences, such as KDD, ICDM, SDM, WSDM, and WWW.

Invited Keynote Talks

Invited Keynote Speaker, *ACM CIKM Conference*, 2024.

Invited Keynote Speaker, *ACM SIGIR Conference*, 2018.

Invited Keynote Speaker, *European Conference on Machine Learning*, 2014.

Invited Keynote Speaker, *ASONAM Conference*, 2014.

Invited Keynote Speaker, *European Conference on Machine Learning*, 2006.

Representative Publications

The following is a list of representative publications, which is selected based on historical impact. An approximate citation count according to *Google Scholar* is provided:

1. **(Textbook)** Charu Aggarwal. Neural Networks and Deep Learning, *Springer*, 2023 (> 4000 citations).
2. **(Textbook)** Charu Aggarwal. Recommender Systems: The Textbook, *Springer*, 2016 (> 2000 citations).
3. **(Textbook)** Charu Aggarwal. Data Mining: The Textbook, *Springer*, 2015 (> 2500 citations).
4. **(Monograph, Textbook)** Charu Aggarwal. Outlier Analysis, *Springer*, 2017 (first edition is a monograph, and the second edition is a textbook; > 3500 citations).
5. Charu Aggarwal, Jiawei Han, Jianyong Wang, Philip Yu. A Framework for Clustering Evolving Data Streams. *Very Large Databases Conference*, pp. 81–92, 2003 (> 2500 citations).
6. Charu Aggarwal, Alexander Hinneburg, Daniel A. Keim. On the surprising behavior of distance metrics in high dimensional space. *International Conference on Database Theory (ICDT Conference)*, pp. 420–434, 2001 (> 3000 citations).
7. Charu Aggarwal, Cecilia Procopiuc, Joel L. Wolf, Philip S. Yu, Jong Soo Park. Fast Algorithms for Projected Clustering. *ACM SIGMOD Conference on Management of Data*, pp. 61–72, 1999 (> 1500 citations).
8. Dakshi Agrawal, Charu Aggarwal. On the Design and Quantification of Privacy Preserving Data Mining Algorithms. *PODS Conference*, pp. 247–255, 2001 (> 1500 citations).
9. Charu Aggarwal. On k-anonymity and the curse of dimensionality. *Very Large Databases (VLDB) Conference*, pp. 901–909, 2005 (> 1000 citations).
10. Charu Aggarwal, Philip S. Yu. Outlier Detection for High Dimensional Data. *ACM SIGMOD Conference on Management of Data*, pp. 37–46, 2001 (> 1800 citations).
11. Charu Aggarwal, Philip S. Yu. A Condensation Approach to Privacy Preserving Data Mining. *Conference on Extending Database Technology (EDBT)*, pp. 183–199, 2004 (> 500 citations). **(EDBT 2014 Test-of-Time Award)**

Citations

Google Scholar citations to my articles (PDF Document Clickable Link):
`http://scholar.google.com/citations?user=x_wsduUAAAAJ&hl=en`

Authored Textbooks (for Classroom Teaching)

1. Charu Aggarwal. Probability and Statistics for Machine Learning, *Springer*, 2024.
2. Charu Aggarwal. Artificial Intelligence: A Textbook, *Springer*, 2021.
3. Charu Aggarwal. Linear Algebra and Optimization for Machine Learning: A Textbook, *Springer*, 2020.
4. Charu Aggarwal. Neural Networks and Deep Learning: A Textbook, *Springer*, 2018 (2nd edition in 2023).

5. Charu Aggarwal. Machine Learning for Text, *Springer*, 2018 (2nd edition in 2022).
6. Charu Aggarwal. Outlier Analysis, *Second Edition*, *Springer*, 2017 [The first edition (see below) from 2013 was officially classified as a monograph and was converted to a textbook at the request of the publisher]
7. Charu Aggarwal. Recommender Systems: The Textbook, *Springer*, 2016.
8. Charu Aggarwal. Data Mining: The Textbook, *Springer*, 2015.

Authored Books (Research Monographs)

1. Charu Aggarwal and Saket Sathe. Outlier Ensembles: An Introduction, *Springer*, 2017.
2. Manish Gupta, Jing Gao, Charu Aggarwal and Jiawei Han. Outlier Detection for Temporal Data, *Morgan and Claypool*, 2014.
3. Charu Aggarwal. Outlier Analysis, *First Edition*, Springer, 2013. (This research monograph received a designation for being among the "Best publications of 2013" by ACM Computing Reviews. The second edition of the book was written subsequently in 2017 (see above), and it was converted from a research monograph to a textbook at the specific request of the publisher.)

Edited Books

1. Chandan K. Reddy and Charu Aggarwal (editors) Healthcare Data Analytics, *CRC Press*, 2015.
2. Charu Aggarwal (editor). Data Classification: Algorithms and Applications, *CRC Press*, 2014.
3. Charu Aggarwal and Jiawei Han (editors) Frequent Pattern Mining, *Springer*, 2014.
4. Charu Aggarwal and Chandan Reddy (Editors). Data Clustering: Algorithms and Applications, *CRC Press*, August 2013.
5. Charu Aggarwal (Editor). Managing and Mining Sensor Data, *Springer*, 2013.
6. Charu Aggarwal, ChengXiang Zhai (Editors). Mining Text Data, *Springer*, 2012.
7. Charu Aggarwal (Editor). Social Network Data Analytics, *Springer*, 2011.
8. Charu Aggarwal and Haixun Wang (Editors). Managing and Mining Graph Data, *Springer*, 2010.
9. Charu Aggarwal (Editor). Managing and Mining Uncertain Data, *Springer*, 2009.
10. Charu Aggarwal and Philip S. Yu (Editors). Privacy-Preserving Data Mining: Models and Algorithms, *Springer*, 2008.
11. Charu Aggarwal (Editor). Data Streams: Models and Algorithms, *Springer*, 2007.

Journal Publications

1. Zahra Zamanzadeh Darban, Geoffrey I. Webb, Shirui Pan, Charu Aggarwal, and Mahsa Salehi. Deep Learning for Time Series Anomaly Detection: A Survey. *ACM Computing Surveys* 57(1): 15:1–15, 42, 2025.
2. Zhenyu Yang, Ge Zhang, Jia Wu, Jian Yang, Quan Z. Sheng, Shan Xue, Chuan Zhou, Charu Aggarwal, Hao Peng, Wenbin Hu, Edwin R. Hancock, and Pietro Lio. State of the Art and Potentialities of Graph-level Learning. *ACM Computing Surveys* 57(2): 28:1–28:40, 2025.
3. Zhimeng Guo, Zongyu Wu, Teng Xiao, Charu Aggarwal, Hui Liu, and Suhang Wang. Counterfactual Learning on Graphs: A Survey. *Machine Intelligence Research*, 22(1): 17–59, 2025.
4. Zahra Zamanzadeh Darban, Geoffrey I. Webb, Shirui Pan, Charu Aggarwal, and Mahsa Salehi. CARLA: Self-supervised contrastive representation learning for time series anomaly detection. *Pattern Recognition*, 157: 110874, 2025.

5. Zitai Qiu, Jia Wu, Jian Yang, Xing Su, and Charu Aggarwal. Heterogeneous Social Event Detection via Hyperbolic Graph Representations. *IEEE Transactions on Big Data*, 11(1): 115–129, 2025.
6. Yuying Zhao, Yu Wang, Yunchao Liu, Xueqi Cheng, Charu Aggarwal, and Tyler Derr. Fairness and Diversity in Recommender Systems: A Survey. *ACM Transactions on Intelligent Systems and Technology*, 16(1): 2:1-2:28, 2025.
7. Zhiqian Chen, Fanglan Chen, Lei Zhang, Taoran Ji, Kaiqun Fu, Liang Zhao, Feng Chen, Lingfei Wu, Charu Aggarwal, and Chang-Tien Lu. Bridging the Gap between Spatial and Spectral Domains: A Unified Framework for Graph Neural Networks. *ACM Computing Surveys*, 56(5): 126:1–126:42, 2024.
8. Ke Sun, Feng Xia, Jiaying Liu, Bo Xu, Vidya Saikrishna, and Charu Aggarwal. Attributed Graph Force Learning. *IEEE Transactions on Neural Networks and Learnng Systems*, 35(4): 4502–4515, 2024.
9. Ciyuan Peng, Tao Tang, Qiuyang Yin, Xiaomei Bai, Suryani Lim, and Charu Aggarwal. Physics-Informed Explainable Continual Learning on Graphs. *IEEE Transactions on Neural Networks and Learning Systems*, 35(9): 11761–11772, 2024.
10. Jaykumar Kakkad, Jaspal Jannu, Kartik Sharma, Charu Aggarwal, and Sourav Medya. A Survey on Explainability of Graph Neural Networks. *IEEE Data Engineering Bulletin*, 46(2): 35-63, 2023.
11. Yiqi Wang, Yao Ma, Wei Jin, Chaozhuo Li, Charu Aggarwal, and Jiliang Tang. Customized Graph Neural Networks. *IEEE Data Engineering Bulletin*, 46(2): 108-125, 2023.
12. Kunpeng Liu, Yanjie Fu, Le Wu, Xiaolin Li, Charu Aggarwal, and Hui Xiong. Automated Feature Selection: A Reinforcement Learning Perspective. *IEEE Transactions on Knowledge and Data Engineering*, 35(3): 2272-2284, 2023.
13. Jianxin Li, Lifang He, Hao Peng, Peng Cui, Charu Aggarwal, and Philip S. Yu. Guest Editorial Introduction to the Special Issue on Anomaly Detection in Emerging Data-Driven Applications: Theory, Algorithms, and Applications. *IEEE Transactions on Knowledge and Data Engineering*, 35(12): 11982-11983, 2023.
14. Falih Gozi Febrinanto, Feng Xia, Kristen Moore, Chandra Thapa, and Charu Aggarwal. Graph Lifelong Learning: A Survey. *IEEE Computational Intelligence Magazine*, 18(1): 32-51, 2023.
15. Feng Xia, Leman Akoglu, Charu Aggarwal, and Huan Liu. Deep Anomaly Analytics: Advancing the Frontier of Anomaly Detection. *IEEE Intelligent Systems*, 38(2): 32-35, 2023.
16. Jing Ren, Feng Xia, Ivan Lee, Azadeh Noori Hoshyar, and Charu Aggarwal. Graph Learning for Anomaly Analytics: Algorithms, Applications, and Challenges. *ACM Transactions on Intelligent Systems and Technology*, 14(2): 28:1-28:29, 2023.
17. Kunpeng Liu, Yanjie Fu, Le Wu, Xiaolin Li, Charu Aggarwal, and Hui Xiong. Automated Feature Selection: A Reinforcement Learning Perspective. *IEEE Transactions on Knowledge and Data Engineering*, 35(3): 2272-2284, 2023.
18. Zhiqiang Hu, Roy Ka-Wei Lee, Charu Aggarwal, and Aston Zhang. Text Style Transfer: A Review and Experimental Evaluation. *ACM SIGKDD Explorations*, 24(1): 14-45, 2022.
19. Nurendra Choudhary, Charu Aggarwal, Karthik Subbian, and Chandan K. Reddy. Self-supervised Short-text Modeling through Auxiliary Context Generation. *ACM Transactions on Intelligent Systems and Technology*, 13(3): 51:1-51:21, 2022.
20. Debmalya Mandal, Sourav Medya, Brian Uzzi, and Charu C. Aggarwal. MetaLearning with Graph Neural Networks: Methods and Applications. *ACM SIGKDD Explorations*, 23(2): 13-22, 2021.
21. Ling Duan, Shuai Ma, Charu Aggarwal, and Saket Sathe. Improving spectral clustering with deep embedding, cluster estimation and metric learning. *Knowledge and Information Systems*, pp. 1–20, 2021.

22. Pengyang Wang, Xiaolin Li, Yu Zheng, Charu Aggarwal, and Yanjie Fu. Spatiotemporal Representation Learning for Driving Behavior Analysis: A Joint Perspective of Peer and Temporal Dependencies. *IEEE TKDE Journal*, 2021.
23. Yuxiang Ren, Charu Aggarwal, and Jiawei Zhang. ActiveIter: Meta Diagram based Active Learning in Social Networks Alignment, *IEEE Transactions on Knowledge and Data Engineering*, 33(5), pp. 1848–860, 2021.
24. W. Jin, Y Li, H Xu, Y Wang, S. Ji, C. Aggarwal, and J. Tang. Adversarial Attacks and Defenses on Graphs. *ACM SIGKDD Explorations*, 22(2), pp. 19–34, 2020.
25. Michele Dallachiesa, Charu Aggarwal, and Themis Palpanas. Improving Classification Quality in Uncertain Graphs. *Journal on Data and Information Quality*, 11(1): 3:1-3:20, 2019.
26. Saket Sathe and Charu Aggarwal. Subspace histograms for outlier detection in linear time. *Knowledge and Information Systems*, 56(3), pp. 691–715, 2018.
27. Suhang Wang, Charu Aggarwal, and Huan Liu. Random-Forest-Inspired Neural Networks. *ACM TIST*, 9(6). pp. 69:1-69:25, 2018.
28. Xindong Wu and Charu Aggarwal. Editorial: TKDD Special Issue on Interactive Data Exploration and Analytics. *ACM TKDD*, 12(1), 1:1, 2018.
29. Charu Aggarwal. Classification in Streams. *Encyclopedia of Database Systems*, (2nd ed.), 2018.
30. Charu Aggarwal. Counterterrorism, Social Network Analysis in. *Encyclopedia of Social Network Analysis and Mining*. 2nd Ed. 2018.
31. Charu Aggarwal. Privacy in Social Networks, Current and Future Research Trends on. *Encyclopedia of Social Network Analysis and Mining*. 2nd Ed. 2018.
32. Charu Aggarwal, Amotz Bar-Noy, and Simon Shamoun. On sensor selection in linked information networks. *Computer Networks*, 126, pp. 100–113, 2017.
33. Karthik Subbian, and Charu Aggarwal: Mining Social Streams: Models and Applications. *IEEE Data Engineering Bulletin*, 40(3), pp. 100–109, 2017.
34. Weike Pan, Qiang Yang, Charu Aggarwal, and Christoph Koch. Big Data. *IEEE Intelligent Systems*, 32(2), pp. 7-8, 2017.
35. Guo-Jun Qi, Wei Liu, Charu Aggarwal, and Thomas S. Huang. Joint Intermodal and Intramodal Label Transfers for Extremely Rare or Unseen Classes. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 39(7), pp. 1360–1373, 2017.
36. Arijit Khan and Charu Aggarwal. Toward query-friendly compression of rapid graph streams. *Social Network Analysis and Data Mining*, 7(1), 23:1-23:19, 2017.
37. Jingdong Wang, Guo-Jun Qi, Nicu Sebe, and Charu C. Aggarwal. Guest Editorial: Big Media Data: Understanding, Search, and Mining. *IEEE Transactions on Big Data*, 3(1), 36, 2017.
38. Charu Aggarwal. Introduction to Special Issue on the Best Papers from KDD 2016. *TKDD*, 11(4), 39:1-39:3, 2017.
39. Liang Duan, Shuai Ma, Charu Aggarwal, Tiejun Ma, and Jinpeng Huai. An Ensemble Approach to Link Prediction. *IEEE Transactions on Knowledge and Data Engineering*, 29(11), pp. 2402–2416, 2017.
40. Charu Aggarwal. Graph Clustering. *Encyclopedia of Machine Learning and Data Mining*, pp. 570–579, 2017.
41. Jiliang Tang, Yi Chang, Charu Aggarwal, and Huan Liu. A Survey of Signed Network Mining in Social Media. *ACM Computing Surveys*, 49(3): 42:1-42:37, 2016.
42. Peng Cui, Huan Liu, Charu Aggarwal, and Fei Wang. Online Behavioral Analysis and Modeling [Guest Editorial]. *IEEE Intelligent Systems* 31(1): 2-4, 2016.

43. Peng Cui, Huan Liu, Charu Aggarwal, and Fei Wang. Uncovering and Predicting Human Behaviors. *IEEE Intelligent Systems* 31(2): 77-88, 2016.

44. Karthik Subbian, Charu Aggarwal, and Jaideep Srivastava. Mining Influencers Using Information Flows in Social Streams. *ACM Transactions on Knowledge Discovery from Data*, 10(3), 26, 2016.

45. Shiyu Chang, Guo-Jun Qi, Yingzhen Yang, Charu Aggarwal, Jiayu Zhou, Meng Wang, and Thomas S. Huang. Large-scale supervised similarity learning in networks. *Knowledge and Information Systems*, 48(3): pp. 707–740, 2016.

46. Hessam Zakerzadeh, Charu Aggarwal and Ken Barker. Managing dimensionality in data privacy anonymization. *Knowledge and Information Systems Journal*, 49(1): pp. 341–373, 2016.

47. Tahseen Al-Khateeb, Mohammad M. Masud, Khaled Al-Naami, Sadi Evren Seker, Ahmad M. Mustafa, Latifur Khan, Zouheir Trabelsi, Charu Aggarwal, and Jiawei Han. Recurring and Novel Class Detection Using Class-Based Ensemble for Evolving Data Stream. *IEEE Transactions on Knowledge and Data Engineering*, 28(10): 2752-2764, 2016.

48. Charu Aggarwal, Yao Li, and Philip S. Yu. On the anonymizability of graphs. *Knowledge and Information Systems*, 45(3), pp. 571–588, 2015.

49. Charu Aggarwal and Saket Sathe. Theoretical Foundations and Algorithms for Outlier Ensembles. *ACM SIGKDD Explorations*, 17(1), pp. 24–47, 2015.

50. Guo-Jun Qi, Charu Aggarwal, and Thomas S. Huang. Breaking the Barrier to Transferring Link Information across Networks. *IEEE Transactions on Knowledge and Data Engineering*, 27(7), pp. 1741–1753, 2015.

51. Charu Aggarwal and Karthik Subbian. Evolutionary Network Analysis: A Survey. *ACM Computing Surveys*, 47(1): 10:1-10:36, 2014.

52. Manish Gupta, Jing Gao, Charu Aggarwal, and Jiawei Han. Outlier Detection for Temporal Data: A Survey. *IEEE Transactions on Knowledge and Data Engineering*, 26(9), pp. 2250–2267, 2014.

53. Charu Aggarwal, Yuchen Zhao, and Philip S. Yu. On the use of side-information for mining text data, *IEEE Transactions on Knowledge and Data Engineering*, 26(6), pp. 1415–1429, 2014. (**Special Issue on "Best of IEEE ICDE, 2012"**)

54. Charu Aggarwal, Yan Xie, and Philip S. Yu. A Framework for Dynamic Link Prediction in Heterogeneous Networks, *Statistical Analysis and Data Mining*, 7(1): pp. 14–33, 2014. (**Special Issue on "Best of SIAM Conference On Data Mining, 2012"**)

55. Dong Wang, Lance M. Kaplan, Tarek F. Abdelzaher, and Charu Aggarwal. On Credibility Estimation Tradeoffs in Assured Social Sensing. *IEEE Journal on Selected Areas in Communications*, 31(6), pp. 1026–1037, 2013.

56. Charu C. Aggarwal. On the Analytical Properties of High Dimensional Randomization, *IEEE Transactions on Knowledge and Data Engineering*, 25(7), pp. 1628–1642, 2013.

57. Charu Aggarwal and Peixiang Zhao. Towards graphical models for text processing. *Knowledge and Information Systems*, 36(1), pp. 1–21, 2013.

58. Mohammad M. Masud, Qing Chen, Latifur Khan, Charu Aggarwal, Jing Gao, Jiawei Han, Ashok N. Srivastava, and Nikunj C. Oza. Classification and Adaptive Novel Class Detection of Feature-Evolving Data Streams. *IEEE Transactions on Knowledge and Data Engineering*, 25(7), pp. 1484–1497, 2013.

59. Charu Aggarwal. Mining Text and Social Streams: A Review. *ACM SIGKDD Explorations*, 15(2), pp. 9–19, 2013.

60. Charu Aggarwal and Nan Li. On Supervised Mining of Dynamic Content-based Networks, *Journal of Statistical Analysis and Data Mining*, 5(1), pp. 16–34, 2012. (**Special Issue on "Best of SIAM Conference on Data Mining, 2011".**)

61. Guojun Qi, Charu Aggarwal, Qi Tian, Heng Ji, and Thomas S. Huang. Exploring Content and Context Links in Social Media: A Latent Space Method. *IEEE Transactions on Pattern Recognition and Machine Intelligence*, 34(5), pp. 850–862, 2012.

62. Charu Aggarwal. A segment-based framework for modeling and mining data streams. *Knowledge and Information Systems (KAIS) Journal*, 30(1), pp. 1–29, 2012.

63. Yizhou Sun, Charu Aggarwal, and Jiawei Han. Relation Strength-Aware Clustering of Heterogeneous Information Networks with Incomplete Attributes. *PVLDB Journal*, 5(5), pp. 394–405, 2012.

64. Charu Aggarwal. Outlier Ensembles: Position Paper, *ACM SIGKDD Explorations*, 14(2), pp. 49–58, 2012.

65. Charu Aggarwal: On the equivalence of PLSI and projected clustering. *SIGMOD Record*, 41(4), pp. 45–50, 2012.

66. Charu Aggarwal and Philip S. Yu. On the Network Effect in Web 2.0 Applications, *Electronic Commerce and Applications*, 11(2), pp. 142–152, 2012.

67. Fei Wang, Hanghang Tong, Philip S. Yu, and Charu Aggarwal. Guest editorial: special issue on data mining technologies for computational social science. *Data Mining and Knowledge Discovery*, 25(3), pp. 415–419, 2012.

68. Peixiang Zhao, Charu Aggarwal, and Min Wang. gSketch: On Query Estimation in Graph Streams. *PVLDB Journal*, 5(3), pp. 193–204, 2011.

69. Charu Aggarwal, Chen Chen, and Jiawei Han. The Inverse Classification Problem. *Journal of Computer Science and Technology*, 25(3), pp. 458–468, 2010.

70. Charu Aggarwal and Philip S. Yu. On clustering massive text and categorical data streams. *Knowledge and Information Systems (KAIS) Journal*, 24(2), pp. 171–196, 2010.

71. Charu Aggarwal, Yao Li, Philip S. Yu, and Ruoming Jin. On Dense Pattern Mining in Graph Streams. *PVLDB Journal*, 3(1): pp. 975–984, 2010.

72. Charu Aggarwal, Yuchen Zhao and Philip S. Yu. A framework for clustering massive graph streams. *Statistical Analysis and Data Mining Journal*, 3(6), pp. 399–416, 2010. **Special Issue for "Best of SIAM Conference on Data Mining, 2010."**

73. Charu Aggarwal, Yan Xie, and Philip S. Yu. GConnect. A Connectivity Index for Massive Disk-resident Graphs. *PVLDB Journal*, 2(1), pp. 862–873, 2009.

74. Charu Aggarwal. On Classification and Segmentation of Massive Audio Data Streams, *Knowledge and Information Systems*, 20(2), pp. 137–156, 2009.

75. Charu Aggarwal and Philip S. Yu. A Survey of Uncertain Data Algorithms and Applications, *IEEE Transactions on Knowledge and Data Engineering*, 21(5), pp. 609–623, 2009.

76. Jianyong Wang, Youzhu Zhang, Lizhu Zhou, George Karypis, and Charu Aggarwal. CONTOUR: An Efficient Algorithm for Discovering Discriminating Subsequences, *Data Mining and Knowledge Discovery Journal*, 18(1), pp. 1–29, Feb 2009.

77. Charu Aggarwal and Philip S. Yu. A Framework for Condensation-based Anonymization of String Data, *Data Mining and Knowledge Discovery Journal*, 16(3), pp. 251–275, July 2008.

78. Charu Aggarwal and Philip S. Yu. On Static and Dynamic Methods for Condensation-based Privacy-Preserving Data Mining. *ACM Transactions on Database Systems (ACM TODS Journal)*, 33(1), March 2008.

79. Charu Aggarwal. Towards Exploratory Test Instance Centered Diagnosis in High Dimensional Classification. *IEEE Transactions on Knowledge and Data Engineering*, 19(8), pp. 1001–1015, 2007.

80. Mohammed J. Zaki and Charu Aggarwal. XRules: An effective algorithm for structural classification of XML data. *Machine Learning Journal* 62(1-2): 137–170, 2006.

81. Charu Aggarwal, Jiawei Han, Jianyong Wang, and Philip S. Yu. A Framework for On Demand Classification of Evolving Data Streams. *IEEE Transaction on Knowledge and Data Engineering*, 18(5), pp. 577–589, 2006.

82. Charu Aggarwal. On the use of human-computer interaction for meaningful high-dimensional nearest neighbor search. *Data Mining and Knowledge Discovery Journal*, 13(1), pp. 89–117, 2006.

83. Charu Aggarwal, Jiawei Han, Jianyong Wang, and Philip S. Yu. On High Dimensional Projected Clustering of Data Streams. *Data Mining and Knowledge Discovery (DMKD) Journal*, 10(3), pp. 251–273, 2005.

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Students Mentored

1. Yuying Zhao, Vanderbilt University, (current thesis committee member)
2. Han Xu, Michigan State University, Ph.D. 2024 (Ph.D. thesis committee member)
3. Yao Ma, Michigan State University, Ph.D. 2021 (Ph.D. thesis committee member)
4. Tyler Derr, Michigan State University, Ph.D. 2020 (Ph.D. thesis committee member)
5. Ramakrishnan Kannan, Georgia Tech., Ph.D. 2016 (Ph.D. thesis committee member)
6. Shiyu Chang, University of Illinois at Urbana-Champaign, Ph.D. 2016 (also Ph.D. thesis committee and supervisor at IBM internship)
7. Jiliang Tang, Arizona State University, Ph.D. 2015 (also Ph.D. thesis committee and supervisor at IBM internship).
8. Karthik Subbian, University of Minnesota, Ph.D. 2014.

9. Guojun Qi, University of Illinois at Urbana-Champaign, Ph.D. 2012 (also Ph.D. thesis committee member and supervisor at IBM internship)
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13. Manish Gupta, University of Illinois at Urbana-Champaign, Ph.D. 2013 (also Ph.D. thesis committee member and supervisor at IBM internship)
14. Dong Wang, University of Illinois at Urbana-Champaign, Ph.D. 2013 (also Ph.D. thesis committee member).
15. Yan Xie, University of Illinois at Chicago, Ph.D. 2012 (also supervisor at IBM internship)
16. Michele Dallecheisa, University of Trento at Italy (supervisor at IBM, 2012)

Research Prototypes and Commercialization Experience

Large Language Models (LLMs) for Knowledge Graphs and Tabular Data: Led an effort in collaboration with RPI to develop foundation models for knowledge graphs and tabular data. Designed a state-of-the-art system for creating embeddings for knowledge graphs. Extended the approach to relational (tabular) data, where the knowledge graph structure was used in lieu of the schema for the tables in the data.

Unsupervised AutoAI Design: Guided an effort at IBM Research for extending IBM AutoAI capabilities to the unsupervised domain. Designed algorithms and guided implementation of models for clustering and outlier detection using metalearning. Achieved significant improvements over state-of-the-art for unsupervised metalearning. Several patents were obtained.

IBM Infosphere Stream Product Contribution: Designed and developed a research prototype for fraud detection in fast financial and insurance data streams. Designed the prototype as part of the development process of the IBM Infosphere Streams product platform (then known as System S during its research design period) for fast processing of incoming data. The approach can be flexibly used for any data mining or streaming application which requires summarization. Demonstrated the capability of the broad algorithm to handle a completely different application such as speaker-recognition. Received *IBM Outstanding Technical Achievement Award* and *IBM Research Division Award* for my work.

I also designed a number of real time algorithms for abnormality detection in data streams. Designed and developed a prototype implementation which can detect possible alarms for terrorist attacks from medical data streams. The broad technique is also usable for other business intelligence applications. The contributions to this project was recognized by an *IBM Corporate Award for Environmental Excellence* in 2003. Several patents were obtained.

Web Portal Personalization Product with Text Machine Learning: Led a research effort on text categorization, which was used to design and develop a system to personalize web portals. As a test case, the particular portal which was implemented using this scheme was the GMAC financial web site of the General Motors Corporation. I also designed and implemented the text categorizer and recommendation system in this service. The system provides effective personalization of a web portal, and improves the browsing experience of the customers. Eventually, this approach was generalized and transferred to the *IBM Websphere Portal Product*. Several patents were filed for the effort. The categorization and personalization portions of the work were patented and also published in IEEE Transactions on Knowledge and Data Engineering, 16(2), 2004, and VLDB Conference, 2002.

Interactive Miner and Profile Miner: The effort was designed to interactively query customer facing databases on the Web in order to discover interesting patterns. The system was designed for online and interactive generation of association rules with user specified constraints. Uses an OLAP-like preprocess once-query many methodology. Implemented and conceived main ideas behind the prototype. I also designed and developed a prototype, which computes profiles of customers with different kinds of buying behaviors. This approach is useful in e-commerce applications with fast click streams. An example would be an e-commerce merchant with large volumes of transactional behavior. This approach provides interactive mining ability with the use of a preprocess-one query-many paradigm. Several patents were obtained. The prototype was released by IBM as part of its Alphaworks suite of external releases and used extensively by the public.

Web Traffic Express 1.1 Product Contribution: Designed a caching algorithm for web objects. This was one of the earliest algorithms for web object caching. An algorithm was designed, which takes the sizes of the underlying data objects into account. The resulting algorithm was transferred to the IBM product *Web Traffic Express 1.1.*

Citizenship

United States Citizen