

# Charu C. Aggarwal

## Work Address

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## Personal Address

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## Professional Interest

- Specializations: Data mining, data streams, scalable data analytics, outlier analysis, social network analysis, recommender systems

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## Biography

Charu Aggarwal is a Distinguished Research Staff Member (DRSM) at the IBM T. J. Watson Research Center in Yorktown Heights, New York. He completed his B.Tech. from IIT Kanpur in 1993 and his Ph.D. from Massachusetts Institute of Technology in 1996. His research interests include data mining, with an emphasis in data streams and scalable data analytics. He has published over 400 papers, authored 5 books, edited 11 books, and has applied for or been granted over 80 patents. According to *Google Scholar*, his h-index is 97. Because of the commercial value of the aforementioned patents, he has received several invention achievement awards and has thrice been designated a Master Inventor by IBM. 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 an associate editor of the *IEEE Transactions on Knowledge and Data Engineering* from 2004 to 2008, and an associate editor of the *ACM Transactions on Knowledge Discovery and Data Mining* till 2017. He is an action editor of the *Data Mining and Knowledge Discovery Journal*, and an associate editor of the *Knowledge and Information Systems Journal*. He served as program co-chair/general co-chair of IEEE Big Data Conference (2014), IEEE ICDM Conference (2015), CIKM Conference (2015), ACM KDD Conference (2016). He has served as editor-in-chief of the *ACM SIGKDD Explorations*, and is an editor-in-chief of the *ACM Transactions on Knowledge Discovery from Data* and of the *ACM Books*. He is a fellow of the ACM, SIAM, and the IEEE for contributions to knowledge discovery and data mining algorithms. He is a recipient of the IEEE ICDM Research Contributions Award (2015) and the ACM SIGKDD Innovations Award (2019), which are the two highest awards for influential research contributions in the field of data mining.

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## Education

### Massachusetts Institute of Technology

Cambridge, MA

- Ph.D. in Operations Research, April 1996.
- **Thesis Title:** Faster Algorithms for Some Network Flow Problems.
- **Thesis Advisor:** Professor James B. Orlin

### Indian Institute of Technology, Kanpur

Kanpur, India

- Bachelor of Technology in Computer Science and Engineering, May 1993.
- Graduated with grade point average of 10.0 out of 10.0

- Received award for best finishing undergraduate in the department of Computer Science at IIT Kanpur.

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## Experience

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

- Research staff member at IBM Research (1996-2014).
- Distinguished Research Staff Member at IBM Research (2014-present).
- Primary Interests in streaming data, large scale graphs and social networks, and privacy/uncertainty issues with scale.
- Designed algorithms for large scale and streaming data analytics, streaming uncertain data, privacy, high dimensional data analytics and text data.
- Broader Interests in data mining, business intelligence, social networks, privacy, and data streams.

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

- Research and teaching assistant
- Research in Network Flows, Dynamic Data Structures, and Genetic Algorithms for Combinatorial Optimization
- Twice served as teaching assistant for the course 15.082 (Network Flow Algorithms)

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## Honors

- **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.
- **SIAM Fellow** for “*contribution to knowledge discovery and data mining algorithms.*”, 2015.
- **ACM Fellow** for “*contribution to knowledge discovery and data mining algorithms.*”, 2013.
- **EDBT 2014 Test of Time Award**, EDBT Conference, 2014.
- **Best Paper Award**, ASONAM Conference, 2011.
- **IEEE Fellow** for “*contributions to knowledge discovery and data mining algorithms*”.
- **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 (IIT Kanpur).
- 1990-1991 academic proficiency award (IIT Kanpur).
- 1989-1990 academic proficiency award (IIT Kanpur).

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## Invited Keynote Talks

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Invited Keynote Speaker, SIGIR Conference, 2018.

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

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

Invited Keynote Speaker, ASONAM Conference, 2014.

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## Representative Publications

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The following is a list of representative publications, which is selected both on a combination of recent research interest, and historical impact. For publications authored more than five years earlier, an approximate citation count according to *Google Scholar* is provided:

1. **(Textbook)** Charu C. Aggarwal. Recommender Systems: The Textbook, Springer, 2016 (> 500 citations).
2. **(Textbook)** Charu C. Aggarwal. Data Mining: The Textbook, Springer, 2015 (> 700 citations).
3. **(Monograph, Textbook)** Charu C. Aggarwal. Outlier Analysis, Springer, 2013 (first edition is a monograph, and second edition (2017) is a textbook) (> 1000 citations).
4. **(Edited Book)** Charu C. Aggarwal. Data Streams: Models and Algorithms, Springer, 2007. (> 650 citations)
5. Charu C. Aggarwal, Jiawei Han, Jianyong Wang, Philip Yu. A Framework for Clustering Evolving Data Streams. *Very Large Databases (VLDB) Conference*, pp. 81–92, 2003. (> 2000 citations)
6. Charu C. 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. (> 1200 citations)
7. Charu C. Aggarwal, Jiawei Han, Jianyong Wang, Philip S. Yu. A Framework For Projected Clustering of High Dimensional Data Streams. *Very Large Databases (VLDB) Conference*, pp. 852–863, 2004. (> 600 citations)
8. Dakshi Agrawal, Charu C. Aggarwal. On the Design and Quantification of Privacy Preserving Data Mining Algorithms. *ACM Principles on Databases Systems (PODS Conference)*, pp. 247–255, 2001. (> 1300 citations)
9. Charu C. Aggarwal. On  $k$ -anonymity and the curse of dimensionality. *Very Large Databases (VLDB) Conference*, pp. 901–909, 2005. (> 700 citations)
10. Charu C. 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. (> 1300 citations)
11. Alexander Hinneburg, Charu C. Aggarwal, Daniel A. Keim. What is the nearest neighbor in high dimensional space? *Very Large Databases (VLDB) Conference*, pp. 506–515, 2000. (> 650 citations)
12. Charu C. Aggarwal, Philip S. Yu. Outlier Detection for High Dimensional Data. *ACM SIGMOD Conference on Management of Data*, pp. 37–46, 2001. (> 1300 citations)

13. Charu C. Aggarwal, Philip S. Yu. A Condensation Approach to Privacy Preserving Data Mining. *Conference on Extending Database Technology (EDBT)*, pp. 183–199, 2004. (> 420 citations)  
**EDBT 2014 Test-of-time award**
14. Ramesh C. Agarwal, Charu C. Aggarwal, V. V. V. Prasad. A Tree Projection Algorithm for Generation of Frequent Itemsets. *Journal of Parallel and Distributed computing*. 61(3), pp. 360–371, 2001. (> 920 citations)
15. Charu C. Aggarwal, Philip S. Yu. Finding Generalized Projected Clusters in High dimensional spaces. *ACM SIGMOD Conference on Management of Data*, pp. 70–81, 2000. (> 700 citations)

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## Citations

Google Scholar citations to my articles (PDF Document Clickable Link):

[http://scholar.google.com/citations?user=x\\_wsduUAAAAJ&hl=en](http://scholar.google.com/citations?user=x_wsduUAAAAJ&hl=en)

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## Authored Textbooks (for Classroom Teaching)

1. Charu C. Aggarwal. Linear Algebra and Optimization for Machine Learning: A Textbook, *Springer*, 2020.
2. Charu C. Aggarwal. Neural Networks and Deep Learning: A Textbook, *Springer*, 2018.
3. Charu C. Aggarwal. Machine Learning for Text, *Springer*, 2018.
4. Charu C. 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 suggestion of the publisher]
5. Charu C. Aggarwal. Recommender Systems: The Textbook, *Springer*, 2016.
6. Charu C. Aggarwal. Data Mining: The Textbook, *Springer*, 2016. (Features in Springer’s list of their top-20 best sellers in Computer Science)

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## Authored Books (for Researchers)

1. Charu C. Aggarwal and Saket Sathé. Outlier Ensembles: An Introduction, *Springer*, 2017.
2. Manish Gupta, Jing Gao, Charu C. Aggarwal and Jiawei Han. Outlier Detection for Temporal Data, *Morgan and Claypool*, 2014.
3. Charu C. Aggarwal. Outlier Analysis, *First Edition*, *Springer*, 2013. (This book received a designation for being among the “Best publications of 2013” by ACM Computing Reviews. The book features consistently in Springer’s list of their top-100 best sellers in Computer Science. The second edition (see above) is being published as a textbook at the specific request of the publisher.)

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## Edited Books

1. Chandan K. Reddy, Charu C. Aggarwal (editors) Healthcare Data Analytics, *CRC Press*, 2015.
2. Charu C. Aggarwal (editor). Data Classification: Algorithms and Applications, *CRC Press*, 2014.
3. Charu C. Aggarwal, Jiawei Han (editors) Frequent Pattern Mining, *Springer*, 2014.
4. Charu C. Aggarwal, Chandan Reddy (Editors). Data Clustering: Algorithms and Applications, *CRC Press*, August 2013.
5. Charu C. Aggarwal (Editor). Managing and Mining Sensor Data, *Springer*, January 2013.
6. Charu C. Aggarwal, ChengXiang Zhai (Editors). Mining Text Data, *Springer*, 2012.
7. Charu C. Aggarwal (Editor). Social Network Data Analytics, *Springer*, 2011.

8. Charu C. Aggarwal, Haixun Wang (Editors). Managing and Mining Graph Data, *Springer*, 2010.
9. Charu C. Aggarwal (Editor). Managing and Mining Uncertain Data, *Springer*, 2009.
10. Charu C. Aggarwal, Philip S. Yu (Editors). Privacy-Preserving Data Mining: Models and Algorithms, Springer, 2008.
11. Charu C. Aggarwal (Editor). Data Streams: Models and Algorithms, Springer, 2007.

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## Journal Publications

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1. Pengyang Wang, Xiaolin Li, Yu Zheng, Charu C. Aggarwal, and Yanjie Fu. Spatiotemporal Representation Learning for Driving Behavior Analysis: A Joint Perspective of Peer and Temporal Dependencies. *IEEE TKDE Journal*, 2020.
2. Yuxiang Ren, Charu C. Aggarwal, and Jiawei Zhang. ActiveIter: Meta Diagram based Active Learning in Social Networks Alignment, *IEEE TKDE Journal*, 2020.
3. Michele Dallachiesa, Charu C. Aggarwal, and Themis Palpanas. Improving Classification Quality in Uncertain Graphs. *Journal on Data and Information Quality*, 11(1): 3:1-3:20, 2019.
4. Saket Sathe and Charu C. Aggarwal. Subspace histograms for outlier detection in linear time. *Knowledge and Information Systems*, 56(3), pp. 691–715, 2018.
5. Suhang Wang, Charu C. Aggarwal, and Huan Liu. Random-Forest-Inspired Neural Networks. *ACM TIST*, 9(6). pp. 69:1-69:25, 2018.
6. Xindong Wu and Charu C. Aggarwal. Editorial: TKDD Special Issue on Interactive Data Exploration and Analytics. *ACM TKDD*, 12(1), 1:1, 2018.
7. Charu C. Aggarwal. Classification in Streams. *Encyclopedia of Database Systems*, (2nd ed.), 2018.
8. Charu C. Aggarwal. Counterterrorism, Social Network Analysis in. *Encyclopedia of Social Network Analysis and Mining*. 2nd Ed. 2018.
9. Charu C. Aggarwal. Privacy in Social Networks, Current and Future Research Trends on. *Encyclopedia of Social Network Analysis and Mining*. 2nd Ed. 2018.
10. Charu C. Aggarwal, Amotz Bar-Noy, Simon Shamoun: On sensor selection in linked information networks. *Computer Networks*, 126, pp. 100–113, 2017.
11. Karthik Subbian, and Charu C. Aggarwal: Mining Social Streams: Models and Applications. *IEEE Data Engineering Bulletin*, 40(3), pp. 100–109, 2017.
12. WeiKe Pan, Qiang Yang, Charu C. Aggarwal, and Christoph Koch. Big Data. *IEEE Intelligent Systems*, 32(2), pp. 7-8, 2017.
13. Guo-Jun Qi, Wei Liu, Charu C. Aggarwal, 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.
14. Arijit Khan, Charu C. Aggarwal. Toward query-friendly compression of rapid graph streams. *Social Network Analysis and Data Mining*, 7(1), 23:1-23:19, 2017.
15. 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.
16. Charu C. Aggarwal. Introduction to Special Issue on the Best Papers from KDD 2016. *TKDD*, 11(4), 39:1-39:3, 2017.
17. Liang Duan, Shuai Ma, Charu C. 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.
18. Charu C. Aggarwal. Graph Clustering. *Encyclopedia of Machine Learning and Data Mining*, pp. 570–579, 2017.

19. Jiliang Tang, Yi Chang, Charu C. Aggarwal, and Huan Liu. A Survey of Signed Network Mining in Social Media. *ACM Computing Surveys*, 49(3): 42:1-42:37, 2016.
20. Karthik Subbian, Charu C. Aggarwal, and Jaideep Srivastava. Mining Influencers Using Information Flows in Social Streams. *ACM Transactions on Knowledge Discovery from Data*, 10(3), 26, 2016.
21. Shiyu Chang, Guo-Jun Qi, Yingzhen Yang, Charu C. Aggarwal, Jiayu Zhou, Meng Wang, Thomas S. Huang: Large-scale supervised similarity learning in networks. *Knowledge and Information Systems*, 48(3): pp. 707–740, 2016.
22. Hessam Zakerzadeh, Charu C. Aggarwal and Ken Barker. Managing dimensionality in data privacy anonymization. *Knowledge and Information Systems Journal*, 49(1): pp. 341–373, 2016.
23. Charu C. Aggarwal, Yao Li, and Philip S. Yu. On the anonymizability of graphs. *Knowledge and Information Systems*, 45(3), pp. 571–588, 2015.
24. Charu C. Aggarwal and Saket Sathe. Theoretical Foundations and Algorithms for Outlier Ensembles. *ACM SIGKDD Explorations*, 17(1), pp. 24–47, 2015.
25. Guo-Jun Qi, Charu C. 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.
26. Charu C. Aggarwal and Karthik Subbian. Evolutionary Network Analysis: A Survey. *ACM Computing Surveys*, 47(1): 10:1-10:36, 2014.
27. Manish Gupta, Jing Gao, Charu C. Aggarwal, and Jiawei Han. Outlier Detection for Temporal Data: A Survey. *IEEE Transactions on Knowledge and Data Engineering*, 26(9), pp. 2250–2267, 2014.
28. Charu C. 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”**)
29. Charu C. 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”**)
30. Dong Wang, Lance M. Kaplan, Tarek F. Abdelzaher, Charu C. Aggarwal. On Credibility Estimation Tradeoffs in Assured Social Sensing. *IEEE Journal on Selected Areas in Communications*, 31(6), pp. 1026–1037, 2013.
31. Charu C. Aggarwal. On the Analytical Properties of High Dimensional Randomization, *IEEE Transactions on Knowledge and Data Engineering*, 25(7), pp. 1628–1642, 2013.
32. Charu C. Aggarwal, Peixiang Zhao. Towards graphical models for text processing. *Knowledge and Information Systems*, 36(1), pp. 1–21, 2013.
33. Mohammad M. Masud, Qing Chen, Latifur Khan, Charu C. Aggarwal, Jing Gao, Jiawei Han, Ashok N. Srivastava, 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.
34. Charu C. Aggarwal. Mining Text and Social Streams: A Review. *ACM SIGKDD Explorations*, 15(2), pp. 9–19, 2013.
35. Charu C. Aggarwal, 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”**.)
36. Guojun Qi, Charu C. Aggarwal, Qi Tian, Heng Ji, 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.

37. Charu C. Aggarwal. A segment-based framework for modeling and mining data streams. *Knowledge and Information Systems (KAIS) Journal*, 30(1), pp. 1–29, 2012.
38. Yizhou Sun, Charu C. Aggarwal, Jiawei Han. Relation Strength-Aware Clustering of Heterogeneous Information Networks with Incomplete Attributes. *PVLDB Journal*, 5(5), pp. 394–405, 2012.
39. Charu C. Aggarwal. Outlier Ensembles: Position Paper, *ACM SIGKDD Explorations*, 14(2), pp. 49–58, 2012.
40. Charu C. Aggarwal: On the equivalence of PLSI and projected clustering. *SIGMOD Record*, 41(4), pp. 45–50, 2012.
41. Charu C. Aggarwal, Philip S. Yu. On the Network Effect in Web 2.0 Applications, *Electronic Commerce and Applications*, 11(2), pp. 142–152, 2012.
42. Fei Wang, Hanghang Tong, Philip S. Yu, and Charu C. Aggarwal. Guest editorial: special issue on data mining technologies for computational social science. *Data Mining and Knowledge Discovery*, 25(3), pp. 415–419, 2012.
43. Peixiang Zhao, Charu C. Aggarwal, Min Wang. gSketch: On Query Estimation in Graph Streams. *PVLDB Journal*, 5(3), pp. 193–204, 2011.
44. Charu C. Aggarwal, Chen Chen, Jiawei Han. The Inverse Classification Problem. *Journal of Computer Science and Technology*, 25(3), pp. 458–468, 2010.
45. Charu C. Aggarwal, Philip S. Yu. On clustering massive text and categorical data streams. *Knowledge and Information Systems (KAIS) Journal*, 24(2), pp. 171–196, 2010.
46. Charu C. Aggarwal, Yao Li, Philip S. Yu, Ruoming Jin. On Dense Pattern Mining in Graph Streams. *PVLDB Journal*, 3(1): pp. 975–984, 2010.
47. Charu C. Aggarwal, Yuchen Zhao, 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.”**
48. Charu C. Aggarwal, Yan Xie, Philip S. Yu. GConnect: A Connectivity Index for Massive Disk-resident Graphs. *PVLDB Journal*, 2(1), pp. 862–873, 2009.
49. Charu C. Aggarwal, On Classification and Segmentation of Massive Audio Data Streams, *Knowledge and Information Systems*, 20(2), pp. 137–156, 2009.
50. Charu C. Aggarwal, Philip S. Yu. A Survey of Uncertain Data Algorithms and Applications, *IEEE Transactions on Knowledge and Data Engineering*, 21(5), pp. 609–623, 2009.
51. Jianyong Wang, Youzhu Zhang, Lizhu Zhou, George Karypis, Charu C. Aggarwal. CONTOUR: An Efficient Algorithm for Discovering Discriminating Subsequences, *Data Mining and Knowledge Discovery Journal*, 18(1), pp. 1–29, Feb 2009.
52. Charu C. Aggarwal, 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.
53. Charu C. Aggarwal, 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.
54. Charu C. Aggarwal. Towards Exploratory Test Instance Centered Diagnosis in High Dimensional Classification. *IEEE Transactions on Knowledge and Data Engineering*, 19(8), pp. 1001–1015, August, 2007.
55. Mohammed J. Zaki, Charu C. Aggarwal: XRules: An effective algorithm for structural classification of XML data. *Machine Learning Journal* 62(1-2): 137–170, 2006.

56. Charu C. Aggarwal, Jiawei Han, Jianyong Wang, 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.
57. Charu C. 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.
58. Charu C. Aggarwal, Jiawei Han, Jianyong Wang, Philip S. Yu. On High Dimensional Projected Clustering of Data Streams. *Data Mining and Knowledge Discovery (DMKD) Journal*, 10(3), pp. 251–273, 2005.
59. Charu C. Aggarwal, Philip S. Yu. An efficient and effective algorithm for high dimensional outlier detection. *VLDB Journal*, 14(2), pp. 211–221, 2005.
60. Charu C. Aggarwal. On the use of Wavelet Decomposition for String Classification, *Data Mining and Knowledge Discovery (DMKD) Journal*, 10(2), pp. 117–139, 2005.
61. Charu C. Aggarwal. On Change Diagnosis in Evolving Data Streams. *IEEE Transactions on Knowledge and Data Engineering*, 17(5), pp. 587–600, 2005.
62. Charu C. Aggarwal. On Leveraging User Access Patterns for Topical Specific Crawling. *Data Mining and Knowledge Discovery (DMKD) Journal*, 9(2), pp. 123–146, 2004.
63. Charu C. Aggarwal. An Efficient Subspace Sampling Framework for High Dimensional Data Reduction, Selectivity Estimation, and Nearest Neighbor Search. *IEEE Transactions on Knowledge and Data Engineering*, 16(10), pp. 1247–1262, 2004.
64. Charu C. Aggarwal. A Human Computer Interactive Method for Projected Clustering. *IEEE Transactions on Knowledge and Data Engineering*, 16(4), pp. 448–460, 2004.
65. Charu C. Aggarwal, Stephen C. Gates, Philip S. Yu. On Using Partial Supervision for Text Categorization. *IEEE Transactions on Knowledge and Data Engineering* 16(2) pp. 245–255, 2004.
66. Srinivasan Parthasarathy, Charu C. Aggarwal. On the Use of Conceptual Reconstruction for Mining Massively Incomplete Data Sets. *IEEE Transactions on Knowledge and Data Engineering*, 15(6), pp. 1512–1521, 2003.
67. Charu C. Aggarwal. Towards Effective and Interpretable Data Mining by Visual Interaction. *ACM SIGKDD Explorations*, 3(2), pp. 11–22, 2002.
68. Charu C. Aggarwal, James B. Orlin. On Multiroute Maximum Flows in Networks. *Networks*, 39(1), pp. 43–52, 2002.
69. Charu C. Aggarwal, Zheng Sun, Philip S. Yu. Fast Algorithms for Online Generation of Profile Association Rules. *IEEE Transactions on Knowledge and Data Engineering*, 14(5), pp. 1017–1028, 2002.
70. Charu C. Aggarwal, Philip S. Yu. Redefining clustering for high dimensional applications. *IEEE Transactions on Knowledge and Data Engineering*, 14(2), pp. 210–225, 2002.
71. Charu C. Aggarwal, Cecilia Procopiuc, Philip S. Yu. Finding Localized Associations in Market Basket Data. *IEEE Transactions on Knowledge and Data Engineering*, 14(1), pp. 51–62, 2002.
72. Charu C. Aggarwal, Joel L. Wolf, Philip S. Yu. Adaptive Piggybacking Schemes for Video-on-demand Systems. *Multimedia Tools and Applications*, 16(3), pp. 231–250, 2002.
73. Charu C. Aggarwal. Re-designing distance functions and distance based applications for high dimensional data. *ACM SIGMOD Record*, 30(1), pp. 13–18, March 2001.
74. Charu C. Aggarwal, Fatima Al-Garawi, Philip Yu. On the Design of a Learning Crawler for Topical Resource Discovery. *ACM Transactions on Information Systems*, 19(3), pp. 286–309, 2001.



75. Charu C. Aggarwal, Joel L. Wolf, Philip S. Yu. The Maximum Factor Queue Length Batching Scheme for Video On Demand Systems. *IEEE Transactions on Computers*, 50(2), pp. 97-110, 2001.
76. Charu C. Aggarwal, Philip S. Yu. A New Approach to Online algorithms for generation of association rules. *IEEE Transactions on Knowledge and Data Engineering*, 13(4), pp. 527-540, 2001.
77. Charu C. Aggarwal, Philip S. Yu. Mining Associations with the Collective Strength Approach. *IEEE Transactions on Knowledge and Data Engineering*, 13(6), pp. 863-873, 2001.
78. Ramesh C. Agarwal, Charu C. Aggarwal, V. V. V. Prasad. A Tree Projection Algorithm for Generation of Frequent Itemsets. *Journal of Parallel and Distributed computing*. 61(3), pp. 360-371, 2001.
79. Charu C. Aggarwal, Philip S. Yu. Data Mining Techniques for Personalization. *IEEE Data Engineering Bulletin*, 23(1), pp. 4-9, 2000.
80. Charu C. Aggarwal, Joel L. Wolf, and Philip S. Yu. Design and Analysis of Permutation-Based Pyramid Broadcasting. *Multimedia Systems Journal*, 7(6), pp. 439-448, 1999.
81. Charu C. Aggarwal, Joel L. Wolf, and Philip S. Yu. Caching on the world wide web. *IEEE Transactions on Knowledge and Data Engineering*, 11(1) pp. 95-107, 1999.
82. Charu C. Aggarwal, Joel L. Wolf, Philip S. Yu. Using unbalanced Trees for indexing multidimensional objects. *Knowledge and Information Systems Journal*, 1(3), pp. 157-192, 1999.
83. Charu C. Aggarwal, Ravindra K. Ahuja, Jianxiu Hao, and James B. Orlin, Diagnosing Infeasibilities in Network Flow Problems, *Mathematical Programming*, 81, pp. 263-280, 1998, *Elsevier Science*, Amsterdam, Netherlands.
84. Charu C. Aggarwal, Joel L. Wolf, and Philip S. Yu. Optimization Issues in Multimedia Systems. *International Journal of Intelligent Systems on Multimedia Computing Systems*, December 1998. John Wiley and Sons.
85. Charu C. Aggarwal, James B. Orlin, and Ray P. Tai, Optimized Crossover for the Independent Set Problem. *Operations Research*, 45(2), pp. 226-234, 1997.
86. Charu C. Aggarwal, Nitesh Jain, and Phalguni Gupta, An efficient selection algorithm on the pyramid, *Information Processing Letters*, 53(1) pp. 37-47, 1995, *Elsevier Science*, Amsterdam, Netherlands.

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### Refereed Conferences with Published Proceedings

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1. Tyler Derr, Yao Ma, Wenqi Fan, Xiaorui Liu, Charu C. Aggarwal, Jiliang Tang: Epidemic Graph Convolutional Network. *WSDM Conference*, pp. 160-168, 2020.
2. Xianfeng Tang, Huaxiu Yao, Yiwei Sun, Charu Aggarwal, Prasenjit Mitra, and Suhang Wang. Joint Modeling of Local and Global Temporal Dynamics of Multivariate Time Series Forecasting with Missing Values. *AAAI Conference*, 2020.
3. Charu C. Aggarwal, Yao Li, and Philip S. Yu. On Supervised Change Detection in Graph Streams, *SIAM Conference on Data Mining*, 2020.
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## Funding Proposals

Co-PI on *Information Networks Academic Research Center*, Network Science Proposal, Army Research Labs, Joint proposal with UIUC, UCSB, and CUNY, 30 million dollars (2009).

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2. Manish Gupta, Jing Gao, Charu Aggarwal, Jiawei Han. Outlier Detection in Graph Data, *ASONAM Conference*, 2013.
3. Manish Gupta, Jing Gao, Charu Aggarwal, Jiawei Han. Outlier Detection in Temporal Data, *Conference on Information and Knowledge Management (CIKM)*, 2013.

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## Patents

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80 patents have been filed. Of these, 64 have already been granted by the US patent office. The remaining are pending processing at the patent office. I have also been granted several invention plateaus by IBM for my patents. I have thrice been designated **Master Inventor** by IBM Research for the commercial value of my patents. About 20% of these patents have also been filed or granted internationally, depending upon scope. A list of the granted patents is below:

1. Charu C. Aggarwal. System and Method for Finding Important Nodes in a Network, US Patent 8,553,587, 2013.
2. Charu C. Aggarwal, Peixiang Zhao Query optimization over graph data streams, US Patent 392,398, 2013.
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## Students Mentored

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1. Ramakrishnan Kannan, Georgia Tech., Ph.D. 2016 (Ph.D. thesis committee member)
2. Shiyu Chang, University of Illinois at Urbana-Champaign, Ph.D. 2016 (also Ph.D. thesis committee and supervisor at IBM internship)
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8. Manish Gupta, University of Illinois at Urbana-Champaign, Ph.D. 2013 (also Ph.D. thesis committee member and supervisor at IBM internship)
9. Dong Wang, University of Illinois at Urbana-Champaign, Ph.D. 2013 (also Ph.D. thesis committee member).
10. Yan Xie, University of Illinois at Chicago, Ph.D. 2012 (also supervisor at IBM internship)
11. Yuchen Zhao, University of Illinois at Chicago, Ph.D. 2012.
12. Michele Dallecheisa, University of Trento at Italy (supervisor at IBM, 2012)
13. Karthik Subbian, University of Minnesota, Ph.D. 2014.

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## Research Prototypes and Commercialization Experience

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- **System S Streaming Fraud Detection Prototype:** 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 Streams product platform (then known as System

S during its research design period, and currently a commercial product) 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.

- **Streaming Anomaly Detection Prototype:** 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. Work was patented and also published in SIAM Conference on Data Mining, 2005.
- **Web Portal Personalization Assistant:** My research on text categorization 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 IGS offered 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*. 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:** The prototype was adapted from a research paper in the ICDE Conference, 1998. This is a technique 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. The prototype was released by IBM as an alphaworks release in order to allow the technology to receive public exposure.
- **Profile Miner:** My research on profile association rule mining was used to create this prototype. 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. The prototype was released by IBM as part of its alphaworks suite of releases. Work was patented and published in KDD Conference, 1998.
- **Web Traffic Express 1.1 Caching Algorithm:** 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 *Web Traffic Express 1.1*. and was published in *IEEE TKDE 1999*.

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## Journal Editorships and Editorial Boards

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- Editor-in-Chief, *ACM SIGKDD Explorations*, 2014-2018.
- Editor-in-Chief, *ACM Transactions on Knowledge Discovery from Data*, 2017–present.
- Editor-in-chief, *ACM Books*, 2019–present.
- Associate editor, *IEEE Transactions on Knowledge and Data Engineering*, 2003-2007.
- Associate editor, *IEEE Transactions on Big Data*, 2003-2007.
- Associate Editor, *ACM Transactions on Knowledge Discovery from Data*, 2011–2017.
- Action Editor, *Data Mining and Knowledge Discovery Journal*, 2005-present
- Advisory Board Member, Springer, *Lecture Notes in Social Networks*, 2013.
- Editorial Board, *Journal of Database Management Research*, 2009-2010, 2012-present.

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

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## Conference Organization and Other Professional Service

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- 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.
- Vice-President, SIAM Activity Group on Data Mining (this activity group is responsible for running all data mining activities at SIAM), 2011-2013.
- Member of **SIAM Industry Committee**
- Member of **IEEE ICDM Steering Committee**
- Regularly serve as senior program committee member or program committee member at major data mining and database conferences.

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## Citizenship

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- United States Citizen