

# Reyan Ahmed

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**Research Area:** Graph Algorithms, Network Visualization, Data Science

## Education

2016-2021 Ph.D. in Computer Science – University of Arizona  
Thesis: Multi-level Graph Spanners  
Adviser: Stephen Kobourov

2014-2016 M.Sc. in Computer Science – Bangladesh University of Engineering and Technology  
Thesis: Online Algorithms for Facility Assignment Problem  
Adviser: Md. Saidur Rahman

2008-2012 Bachelor's in Computer Science – Bangladesh University of Engineering and Technology  
Thesis: On acyclic colorings of graphs  
Adviser: Md. Saidur Rahman

## Job Experience

Sep 2023-  
Current Assistant Professor of Practice  
University of Arizona

July 2021-  
June 2023 Visiting Assistant Professor  
Colgate University

Summer 2021, Instructor  
Summer 2020 University of Arizona

Jan 2020-  
May 2021 Graduate Research Associate  
University of Arizona

Aug 2016-  
Dec 2019 Graduate Research Assistant  
University of Arizona

Summer 2018, Optimization Software Engineer Intern  
Summer 2019 Hexagon Mining

Summer 2017 Graduate Teaching Assistant  
University of Arizona

Nov 2015 -  
Jan 2016 Web Developer  
Bangladesh University of Engineering and Technology

Feb 2013 -  
Mar 2015 Software Engineer  
Reve Systems, Bangladesh

## Honors and Awards

- Received torch medal from Nico Butterfield '23 for making a meaningful impact at Colgate.
- CS Spring 2021 Graduate Scholarship (Research) Award, University of Arizona, 2021.
- Best paper award, Graph Drawing via Gradient Descent, (GD)<sup>2</sup>, The 28th International Symposium on Graph Drawing and Network Visualization, 2020.
- Galileo Circle Scholarship, University of Arizona, 2020.
- Won 3rd place in the Graph Drawing Competition at the 26th Symposium on Graph Drawing, 2018.
- Best paper award, Online Facility Assignment, The 12th International Workshop on Algorithms and Computation, 2018.
- Placed in 5th position in the Fake News Challenge (in a field of 50 international teams), 2017.
- Dean's list award, Bangladesh University of Engineering and Technology, 2012.
- Board Scholarship, Bangladesh University of Engineering and Technology, 2010.
- Received gold medal, Secondary school certificate, Bangladesh International School, Jeddah, 2005.

## Journal Publications

- Kathryn Gray, Mingwei Li, **Reyan Ahmed**, Md. Khaledur Rahman, Ariful Azad, Stephen Kobourov, Katy Börner, **Scalable Methods for Readable Tree Layouts**, *IEEE Transactions on Visualization and Computer Graphics*, (also arXiv:2305.09925), 2023.
- **Reyan Ahmed**, Felice De Luca, Sabin Devkota, Stephen Kobourov, Mingwei Li, **Multicriteria Scalable Graph Drawing via Stochastic Gradient Descent, (SGD)<sup>2</sup>**, *IEEE Transactions on Visualization and Computer Graphics*, (also arXiv:2112.01571), 2022.
- **Reyan Ahmed**, Patrizio Angelini, Faryad Darabi Sahneh, Alon Efrat, David Glickenstein, Martin Gronemann, Niklas Heinsohn, Stephen G. Kobourov, Richard Spence, Joseph Watkins, and Alexander Wolff. **Multi-level Steiner trees**, *J. Exp. Algorithmics*, 2019.
- **Reyan Ahmed**, Md. Saidur Rahman, Stephen Kobourov, **Online facility assignment**, *Theoretical Computer Science*, 2019.

## Conference Publications

- Mohammad Shamim Ahsan, **Reyan Ahmed**, and Md. Saidur Rahman, **Randomized Algorithm for Online K-Server Problem on a Line**, *In 9th International Conference on Information and Communication Technology for Competitive Strategies*, 2024.
- **Reyan Ahmed**, Keaton Hamm, Stephen Kobourov, Mohammad Javad Latifi Jebelli, Faryad Darabi Sahneh, and Richard Spence. **Multi-priority graph sparsification**, *In International Workshop on Combinatorial Algorithms*, 2023.
- **Reyan Ahmed**, Stephen Kobourov, Myroslav Kryven, **An FPT Algorithm for Bipartite Vertex Splitting**, *In Proceedings of the 30th International Symposium on Graph Drawing and Network Visualization*, (also arXiv:2208.12898), 2022.
- Kathryn Gray, Mingwei Li, **Reyan Ahmed**, Stephen Kobourov, **Visualizing Evolving Trees**, *In Proceedings of the 30th International Symposium on Graph Drawing and Network Visualization*, (also arXiv:2106.08843), 2022.
- **Reyan Ahmed**, Greg Bodwin, Keaton Hamm, Stephen Kobourov, and Richard Spence. **On additive spanners in weighted graphs with local error**, *In Proceedings of the 47th International Workshop on Graph-Theoretic Concepts in Computer Science*, (also arXiv:2103.09731), 2021.

- **Reyan Ahmed**, Greg Bodwin, Keaton Hamm, Stephen Kobourov, Faryad Darabi Sahneh, and Richard Spence. **Multi-level Weighted Additive Spanners**, *In Proceedings of the 20th International Symposium on Experimental Algorithms*, (also arXiv:2102.05831), 2021.
- **Reyan Ahmed**, Felice De Luca, Sabin Devkota, Stephen Kobourov, and Mingwei Li. **Graph Drawing via Gradient Descent, (GD)<sup>2</sup>**, *In Proceedings of the 28th International Symposium on Graph Drawing and Network Visualization*, (also arXiv:2008.05584), 2020. (**best paper award**)
- **Reyan Ahmed**, Greg Bodwin, Stephen Kobourov, Faryad Darabi Sahneh, and Richard Spence. **Weighted Additive Spanners**, *In Proceedings of the 46th International Workshop on Graph-Theoretic Concepts in Computer Science*, (also arXiv:2002.07152), 2020.
- **Reyan Ahmed**, Keaton Hamm, Stephen Kobourov, Faryad Darabi Sahneh, and Richard Spence. **Kruskal-based approximation algorithm for the multi-level Steiner tree problem**, *In Proceedings of the 28th Annual European Symposium on Algorithms*, (also arXiv:2002.06421), 2020.
- Sabin Devkota, **Reyan Ahmed**, Felice De Luca, Kate Isaacs, Stephen Kobourov. **Stress-Plus-X (SPX) Graph Layout**, *In Proceedings of the 27th International Symposium on Graph Drawing and Network Visualization*, (also arXiv:1908.01769), 2019.
- **Reyan Ahmed**, Keaton Hamm, Mohammad Javad Latifi Jebelli, Stephen Kobourov, Faryad Darabi Sahneh, and Richard Spence. **Approximation algorithms and an integer program for multi-level graph spanners**, *In Proceedings of the 18th International Symposium on Experimental Algorithms* (also arXiv:1904.01135), 2019.
- **Reyan Ahmed**, Patrizio Angelini, Faryad Darabi Sahneh, Alon Efrat, David Glickenstein, Martin Gronemann, Niklas Heinsohn, Stephen G. Kobourov, Richard Spence, Joseph Watkins, and Alexander Wolff. **Multi-level Steiner trees**, *In Proceedings of the 17th International Symposium on Experimental Algorithms* (also arXiv:1804.02627), 2018.
- **Reyan Ahmed**, Md. Saidur Rahman and Stephen Kobourov, **Online Facility Assignment**, *In Proceedings of the 12th International Workshop on Algorithms and Computation*, 2018. (**best paper award**)
- **Reyan Ahmed**, Md. Mazharul Islam and Md. Saidur Rahman, **On acyclic colorings of graphs**. *In Proceedings of the 15th International Conference on Computer and Information Technology*, 2012.

#### Other Publications

- **Reyan Ahmed**, Debajyoti Mondal, and Rahnuma Islam Nishat, **Subsetwise and Multi-Level Additive Spanners with Lightness Guarantees**, arXiv:2411.07505, 2025.
- **Reyan Ahmed**, Cesim Erten, Stephen Kobourov, Jonah Lotz, Jacob Miller, and Hamlet Taraz, **Size should not matter: Scale-invariant stress metrics**, arXiv:2408.04688, 2024.
- Alvin Chiu, Mithun Ghosh, **Reyan Ahmed**, Kwang-Sung Jun, Stephen Kobourov, Michael T. Goodrich, **Graph Sparsifications using Neural Network Assisted Monte Carlo Tree Search**, arXiv:2311.10316, 2023.
- **Reyan Ahmed**, Mithun Ghosh, Kwang-Sung Jun, Stephen Kobourov, **Nearly Optimal Steiner Trees using Graph Neural Network Assisted Monte Carlo Tree Search**, arXiv:2305.00535, 2023.
- Kathryn Gray, Mingwei Li, **Reyan Ahmed**, Md Khaledur Rahman, Ariful Azad, Stephen Kobourov, Katy Börner, **A Map-based Interactive System for Visualizing Large Networks with Semantic Zooming**, *Presented at AVI 2022 workshop on Map-based Interfaces and Interactions (MAPII)*, 2022.
- **Reyan Ahmed**, Md Asadullah Turja, Faryad Darabi Sahneh, Mithun Ghosh, Keaton Hamm, Stephen Kobourov, **Computing Steiner Trees using Graph Neural Networks**, arXiv:2108.08368, 2021.
- Saad Al Muttakee, **Reyan Ahmed**, and Md. Saidur Rahman. **New Results and Bounds on Online Facility Assignment Problem**, arXiv:2009.01446, 2020.

- **Reyan Ahmed**, Greg Bodwin, Keaton Hamm, Mohammad Javad Latifi Jebelli, Stephen Kobourov, Faryad Darabi Sahneh, and Richard Spence. **Graph Spanners: A Tutorial Review**, *Computer Science Review*, 37, p.100253 (also arXiv:1909.03152), 2020.
- **Reyan Ahmed**, Keaton Hamm, Mohammad Javad Latifi Jebelli, Stephen Kobourov, Faryad Darabi Sahneh, and Richard Spence. **Multi-Level Graph Sketches via Single-Level Solvers**, arXiv:1905.00536, 2019.
- **Reyan Ahmed**, Felice De Luca, Sabin Devkota, Alon Efrat, Md Iqbal Hossain, Stephen Kobourov, Jixian Li, Sammi Abida Salma and Eric Welch, **L-Graphs and Monotone L-Graphs**, arXiv:1703.01544, 2017.

### Presentations

- Keynote speech in the 3rd International Conference on Computing Advancements 2024. Topic: Large Network Visualization using Graph Spanners.
- Workshop presentation in the 7th Workshop on Geometry and Machine Learning, CG Week 2023. Topic: Nearly Optimal Steiner Trees using Graph Neural Network Assisted Monte Carlo Tree Search.
- Conference presentation in the 20th International Symposium on Experimental Algorithms 2021 (virtual conference). Topic: Multi-level Weighted Additive Spanners.
- Conference presentation in the 28th International Symposium on Graph Drawing and Network Visualization 2020 (virtual conference). Topic: Graph Drawing via Gradient Descent, (GD)<sup>2</sup>.
- Conference presentation in the 28th Annual European Symposium on Algorithms, 2020 (virtual conference). Topic: Kruskal-based approximation algorithm for the multi-level Steiner tree problem.
- Conference presentation in the 46th International Workshop on Graph-Theoretic Concepts in Computer Science, 2020 (virtual conference). Topic: Weighted additive spanners.
- Invited speaker in the SIAM student seminar, the department of mathematics, the University of Arizona, 2020 (virtual presentation). Topic: Multi-level Graph Spanners.
- Poster presentation in TRIPODS conference, 2019. Topic: Approximation algorithms and an integer program for multi-level graph spanners.
- Conference presentation in the 12th International Workshop on Algorithms and Computation, 2018. Topic: Online facility assignment.

### Teaching

- Analysis of Discrete Structures: Summer 2020, 2021.
- Data Structures and Algorithms: Fall 2021, 2022, Spring 2022, 2023.
- Discrete Structures: Spring 2022.
- Graph Theory: Fall 2022.
- Data Visualization: Fall 2021, 2022, Spring 2023.
- Discrete Mathematics for Computer Science II: Fall 2023, 2024, Spring 2024, Summer 2024.
- Introduction to Computer Programming II: Spring 2024, 2025, Fall 2024.
- Introduction to Computer Programming I: Summer 2024.
- Discrete Mathematics for Computer Science II: Spring 2025.
- Web Programming: Spring 2025.

### Funding

- Graph Sparsifiers for Large Network Visualization, Algorithmic Foundations, NSF (under submission), 2024.
- Discretionary fund, the research council, Colgate University, 2023.

### **Professional Service**

- Program committee member, WALCOM 2025.
- Department statistic committee member, Fall 2023 to Spring 2025.
- Curriculum committee member, Fall 2023, Spring 2024.

### **Mentoring**

- Cesar Daniel Quihuis-Romero, the TA of the Month, February 2025.
- Minglai Yang, Undergraduate Student, University of Arizona, 2024-2025.
- Marissa Nicole Kroeger, the TA of the Month, February 2024.
- Jordan Ernesto Rodriguez, the TA of the Month, February 2024.
- Hamlet Amadeo Taraz, Undergraduate Student, University of Arizona, 2024.
- Mentored students in TRIPODS Machine Learning Literacy Project, 2020.
- Kathryn Gray, Ph.D. Student, University of Arizona, 2019.
- Ahmad Musa, Ph.D. Student, University of Arizona, 2018.

### **Community Engagement**

- Adviser of Bangladesh Student Association, University of Arizona, 2025.
- Reviewed Provost's Investment Fund at UoA in Fall 2023.
- Reviewed student research proposals at Colgate for Summer 2022, 2023.
- Completed Google summer of code 2022 with GeomScale.
- Peer-reviewed 14 conference/journal papers.
- Maintain web pages: [gama.cs.arizona.edu](http://gama.cs.arizona.edu), [walcom-conference.org](http://walcom-conference.org)
- Volunteer activities in Hack Arizona, 2019.