

Suma P. Bhat

Department of Electrical and Computer Engineering
University of Illinois
322 Coordinated Science Laboratory
1308 W. Main Street
Urbana, IL 61801

Phone: (217) 244-6187
Email: spbhat2@illinois.edu

Education

- Ph.D. Electrical and Computer Engineering, University of Illinois, Urbana-Champaign, 2010.
- M.A. South and Southeast Asian Studies, University of California, Berkeley, 2000.
- M.E. Electrical Engineering, Indian Institute of Science, India, 1996.
- B.S. Statistics, Mangalore University, India, 1992.

Academic Positions

- Assistant Professor (tenure-track), Department of Electrical and Computer Engineering, University of Illinois, Urbana-Champaign, January 2020-present.
- Research Assistant Professor, Department of Electrical and Computer Engineering, University of Illinois, Urbana-Champaign, May 2015–December 2019.
- Faculty Affiliate, Department of Computer Science, University of Illinois, Urbana-Champaign, November 2020-present.
- Faculty Affiliate, Department of Educational Psychology, University of Illinois, Urbana-Champaign, January 2020-present.
- Faculty Affiliate, National Center for Supercomputing Applications, University of Illinois, Urbana-Champaign, September 2016-present.
- Post-doctoral Fellow, Beckman Institute, University of Illinois, 2010.

Fellowships, & Awards

- Beckman Foundation Post-doctoral Fellowship, 2012-2015.

Research Interests

Natural language processing, Human-computer interaction, Learning analytics, Biomedical language processing.

Professional Activities

Journal reviewer: Journal of the American Medical Informatics Association, Journal of Educational Data Mining, Speech Communication, Transactions of the Association for Computational Linguistics.

Program Committee Member:

American Medical Informatics Association (AMIA) 2018.

Association for the Advancement of Artificial Intelligence (AAAI) 2018, 2019.

Association for Computational Linguistics (ACL) 2015.

Educational Data Mining (EDM) 2019.

Empirical Methods for Natural Language Processing (EMNLP) 2015, 2016, 2017, 2018.

International Joint Conference on Natural Language Processing (IJCNLP) 2016.

North American Association for Computational Linguistics (NAACL) 2019.

Workshop for Innovative Use of NLP for Building Educational Applications (BEA) 2015, 2016, 2019.

Students

Ph.D. Advisees

Hongyu Gong (graduated in May 2020)

Tarek Sakakini (graduated in June 2020)

Wanzheng Zhu (expected graduation 2021)

Ziheng Zeng (expected graduation 2023)

M.S. Advisees

Jianing Zhou (CS, expected graduation 2021)

Ph.D. Co-advised

Jiaqi Mu (2019, advisor: Pramod Viswanath)

Genevieve Henricks (2018, advisor: Michelle Perry)

Undergraduate Mentees

Sarah Liu (ECE class of 2019, now software developer in Microsoft Inc.)

Khushi Arora (ECE class of 2020)

Akriti Jain (ECE class of 2020)

Vyom Thakkar (ECE, class of 2020 currently pursuing M.S. in ECE, UIUC)

Kshitij Gupta (CS class of 2021)

Jay Huang (ECE class of 2021)

Daniel Polyakov (ECE class of 2021)

Pooja Bhagchandani (ECE class of 2022)

Neha Prabhu (CS class of 2022)

Sreenidhi Vijayraghavan (CS class of 2023)

High School Mentees

Aditya Mohan (CS major at UC Berkeley, class of 2022)

Aayush Bhat (CS major at University of Illinois, Urbana-Champaign, class of 2024)

Siddarth Vaidyanathan (CS+Statistics major at University of California, Berkeley, class of 2024)

Srihari Nanniyur (senior at St. Francis High School, CA)

Abhinav Ganesh (senior at Obra D. Tompkins High School, TX)

Divya Krishnan (senior at Ridge High School, NJ)

Sridevi Pulugurtha (senior at TERRA Environmental Research Institute, FL)

Teaching

Introduction to Computing (ECE 120), a required course for incoming undergraduate students in the ECE department: Fall 2015, Fall 2016, Fall 2017, Fall 2020.

Data Science and Engineering (ECE 365), junior/senior-level technical elective, Fall 2019, Spring 2020, Spring 2021.

Mathematical Models of Language (ECE 594), graduate-level course, Spring 2021.

Grants

Current Research

Co-PI: COVID-19 Risk Mitigation: Interactive Automatic Counselor, University of Illinois at Urbana-Champaign, 2020-2021, \$5,000. PI: Dan Morrow.

Co-PI: Using Conversational Agents to Support Older Adult Learning for Health, Technology Innovation in Educational Research and Design Program, 2020-2021, \$13,602. PI: Dan Morrow.

Co-PI: Supporting Self-regulated Learning in Online Education via Automatically Personalized Interventions, Technology Innovation in Educational Research and Design Program, 2020-2021, \$14,997. PI: Nigel Bosch.

Lead PI: Using Study Partners to Broaden Participation, Institute for Inclusion, Diversity, Equity, and Access, Grainger College of Engineering (UIUC), 2020-2021, \$13,000.

Lead PI: Improving Feedback and Efficiency: Automated Grading of Post Simulation Written Chart Notes, The Jump Applied Research for Community Health through Engineering and Simulation program, 2020-2021, \$75,000.

Co-PI: Underrepresented Student Learning in Online Introductory STEM College Courses, Institute of Education Sciences, 2018-2021, \$1,399,194. PI: Michelle Perry.

Lead PI: Collaborative Research; BystanderBots: Automated Bystander Intervention for Cyberbullying Mitigation, National Science Foundation EAGER, 2017-2021, \$200,000.

Co-PI: IBM-ILLINOIS Center for Cognitive Computing Systems Research (C3SR),

2016-2021.

Completed Research

Lead PI: A Nuanced Model for Recognizing Levels of Conflict in Decision Making Using Natural Language Processing, Social and Behavioral Sciences Research Initiative (SBSRI) Small Grants Program, 2017-2020, \$12,400.

Co-PI: Interactive Technology Support for Patient Medication Self-Management (Round 2 funding), Jump Applied Research for Community Health through Engineering and Simulation (ARCHES), UIC/OSF Hospital, 2018-2019, \$52,224. PI: Daniel Morrow.

Collaborator: The Role of Gesture in Mathematics Learning: From Research to Practice. National Science Foundation, Science of Learning Collaborative Network, 2016-2019, \$747,903. PI: Susan Goldin-Meadow.

Co-PI: Understanding Learning Behavior Patterns in MOOCs to Support Early Interventions, Illinois Learning Sciences Design Initiative, 2016-2017, \$15,000. PI: Michelle Perry.

Co-PI: Interactive Technology Support for Patient Medication Self-management. Jump Applied Research for Community Health through Engineering and Simulation (ARCHES), UIC/OSF Hospital, 2016-2017, \$113,958. PI: Daniel Morrow.

Publications

Peer-Reviewed Journal Articles

1. S. Yoon and S. Bhat. (2018). A Comparison of Grammatical Proficiency Measures in the Automated Assessment of Spontaneous Speech, *Speech Communication*, Volume 99, May, 221–230.
2. R. W. Crues, G. Henricks, M. Perry, S. Bhat, C. Anderson, N. Shaik and L. Angrave. (2018). How does Gender, Learning Goals, and Forum Participation Predict Persistence in a Computer Science MOOC? *ACM Transactions on Computing Education*, 18(4).
3. K. Zechner, S. Yoon, S. Bhat, and C. Leong. (2017). Comparative Evaluation of Automated Scoring of Syntactic Competence of Non-native Speakers. *Computers in Human Behavior*, Volume 76, November, 672–682.

4. S. Bhat, and S. Yoon. (2015). Automatic Assessment of Syntactic Complexity of Spontaneous Speech Scoring. *Speech Communication* (67), 42–57.
5. R. Girju, B. Beamer, A. Rozovskaya, A. Fister, and S. Bhat. (2010). A Knowledge-rich Approach to Identifying Semantic Relations Between Nominals. *Information Processing & Management* 46(5), 589–610.

Published Conference Papers

6. H. Gong, A. Valido, K. Ingram, G. Fanti, S. Bhat, and D. Espelage (2020). Abusive Language Detection in Heterogeneous Contexts: Dataset Collection and the Role of Supervised Attention. To appear in AAAI.
7. H. Gong, L. Song, and S. Bhat (2020). Rich Syntactic and Semantic Information Helps Unsupervised Text Style Transfer. In *Proceedings of the 13th International Conference on Natural Language Generation*, pp. 113–119.
8. T. Sakakini, J. Y. Lee, A. Duri, R. F.L. Azevedo, V. Sadauskas, K. Gu, S. Bhat, D. Morrow, J. Graumlich, S. Walayat, M. Hasegawa-Johnson, T. Huang, A. Willemsen-Dunlap, and D. Halpin (2020). Context-Aware Automatic Text Simplification of Health Materials in Low-Resource Domains. In *Proceedings of the 11th International Workshop on Health Text Mining and Information Analysis*, pp. 115–126.
9. H. Gong, S. Bhat, and P. Viswanath (2020). Enriching Word Embeddings with Temporal and Spatial Information. In *Proceedings of the 24th Conference on Computational Natural Language Learning*, pp. 1-11.
10. W. Zhu, and S. Bhat (2020), GRUEN for Evaluating Linguistic Quality of Generated Text. In *Findings of the Association for Computational Linguistics: EMNLP 2020*, pp. 94–108.
11. W. Zhu, H. Gong, J. Shen, C. Zhang, J. Shang, S. Bhat, and J. Han (2020). FUSE: Multi-Faceted Set Expansion by Coherent Clustering of Skip-grams. In *Proceedings of ECML-PKDD 2020*.
12. D. Morrow, R. F. L. Azevedo, L. Sari, K. Gu, T. Sakakini, M. Hasegawa-Johnson, S. Bhat, J. Graumlich, T. Huang, A. Hariharan, Y. Shao, and E. Cox. (2020). Closing the Loop in Computer Agent/Patient Communication. In *Proceedings of the 2020 Human Factors and Ergonomics Society Annual Meeting, Chicago, IL*.

13. F. Brahman, N. Varghese, S. Bhat and S. Chaturvedi. (2020). Effective Forum Curation via Multi-task Learning. In *Proceedings of the Educational Data Mining Conference 2020*. (Short paper, 22% acceptance rate)
14. V. Jay, G. Henricks, C. Anderson, L. Angrave, N. Bosch, N. Shaik, D. Williams-Dobosz, S. Bhat, and M. Perry. (2020). Online Discussion Forum Help-Seeking Behaviors of Students Underrepresented in STEM. In *Proceedings of the 2020 International Conference of the Learning Sciences*.
15. G. Henricks, S. Bhat, and M. Perry, Gender and Gendered Discourse in Online STEM College Courses.(2020). In *Proceedings of the 2020 International Conference of the Learning Sciences*.
16. H. Gong, K. Gupta, A. Jain, and S. Bhat. (2020). Illinimet: Illinois system for metaphor detection with contextual and linguistic information. In *Proceedings of the Second Workshop on Figurative Language Processing*.
17. O. Anjum, H. Gong, S. Bhat, J. Xiong, and W. Hwu. (2019). PaRE: A Paper-Reviewer Matching Approach Using a Common Topic Space. In *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing*. (Long paper, 24% acceptance rate)
18. T. Sakakini, H. Gong, J. Y. Lee, R. Schloss, J. Xiong, and S. Bhat. (2019). Equipping Educational Applications with Domain Knowledge. In *Proceedings of the Workshop on Innovative Use of NLP for Building Educational Applications*. (Long paper)
19. R. F. L. Azevedo, D. Morrow, K. Gu, T. Huang, M. Hasegawa-Johnson, P. Soni, S. Tang, T. Sakakini, S. Bhat, A. Willemsen-Dunlap, and J. Graumlich. (2019). The Influence of Computer Agent Characteristics on User Preferences in Health Contexts. In *Proceedings of the 2019 Human Factors and Ergonomics Society Health Care Symposium*.
20. H Gong, S. Bhat, L. Wu, J. Xiong and W. Hwu. (2019). Reinforcement Learning Based Text Style Transfer without Parallel Training Corpus, In *Proceedings of the 17th (2019) Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL)*. (Long paper, 26% acceptance rate)
21. H. Gong, Y. Li, S. Bhat, and P. Viswanath. (2019). Context-Sensitive Malicious Spelling Error Correction. In *Proceedings of the Web Conference (WWW), 2019*. (Short paper, 18% acceptance rate)

22. Z. Zeng, S. Chaturvedi, S. Bhat, and D. Roth. (2019). DiAd: Domain Adaptation for Learning at Scale, In *Proceedings of the 9th International Learning Analytics and Knowledge (LAK) Conference 2019*. (Long paper, 32% acceptance rate)
23. H. Gong, J. Mu, S. Bhat, and P. Viswanath. (2018). Preposition Sense Disambiguation and Representation. In *Proceedings of the Conference on Empirical Methods in Natural Language Processing (EMNLP)*. (Long paper, 26% acceptance rate)
24. R. F. L. Azevedo, T. Sakakini, J. Y. Lee, V. Sadauskas, K. Gu, Y. Zhang, D. Morrow, S. Bhat, M. Hasegawa-Johnson, T. S. Huang, A. Willemsen-Dunlap, D. J. Halpin, and J. Graumlich. (2018). Using Conversational Agents to Explain Medication Instructions to Older Adults. *Proceedings of the AMIA Annual Symposium*. San Francisco, CA: American Medical Informatics Association.
25. H. Gong, T. Sakakini, S. Bhat, and J. Xiong. (2018). Document Similarity for Texts of Varying Lengths via Hidden Topics. In *Proceedings of the Annual Meeting of the Association for Computational Linguistics*. (Long paper, 25% acceptance rate)
26. R. W. Crues, N. Bosch, M. Perry, L. Angrave, N. Shaik, and S. Bhat. (2018). Refocusing the Lens on Engagement in MOOCs. In R. Luckin, K. R. Koedinger, & S. Klemmer (Eds.), *Proceedings of the 5th (2018) ACM Conference on Learning@Scale*. New York, NY: ACM. (Long paper, 22% acceptance rate)
27. R. W. Crues, N. Bosch, C. J. Anderson, M. Perry, S. Bhat, and N. Shaik. (2018). Who They Are and What They Want: Understanding the Reasons for MOOC Enrollment. In K. E. Boyer & M. V. Yudelson (Eds.), *Proceedings of the 11th International Conference on Educational Data Mining (EDM 2018)*. International Educational Data Mining Society. (Long paper, 16% acceptance rate)
28. H. Gong, S. Bhat, and P. Viswanath. (2018) Embedding Syntax and Semantics of Prepositions via Tensor Decomposition. In *Proceedings of the 16th Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL)*. (Long paper, 32% acceptance rate)
29. N. Bosch, R. W. Crues, G. Henricks, M. Perry, L. Angrave, N. Shaik, S. Bhat, and C. J. Anderson. (2018). Modeling Key Differences in Underrepresented

- Students' Interactions with an Online STEM Course. In *Proceedings of the TechMindSociety'18 conference*. New York, NY: ACM. (27% acceptance rate)
30. R. F. L., Azevedo, K. Gu, Y. Zhang, V. Sadauskas, T. Sakakini, D. Morrow, M. Hasegawa-Johnson, T. S. Huang, S. Bhat, A. Willemsen-Dunlap, D. J., Halpin, J. Graumlich, and W. Schuh. (2017). Using Computer Agents to Explain Clinical Test Results. *AMIA Annual Symposium Proceedings*. Washington, DC: American Medical Informatics Association.
 31. T. Sakakini, R. F. L. Azevedo, V. Sadauskas, K. Gu, Y. Zhang, S. Bhat, D. Morrow, M. Hasegawa-Johnson, T. S. Huang, A. Willemsen-Dunlap, D. J. Halpin, and J. Graumlich. (2017). Dr. Babel Fish: A Machine Translator to Simplify Providers' Language. In *AMIA Annual Symposium Proceedings*. Washington, DC: American Medical Informatics Association.
 32. Z. Zeng, S. Chaturvedi and S. Bhat. (2017). Learner Affect Through the Looking Glass: Characterization and Detection of Confusion in Online Courses, *Proceedings of the Educational Data Mining Conference 2017*. (Short paper, 42% acceptance rate)
 33. J. Mu, S. Bhat, and P. Viswanath. (2017). Representing Sentences as Low-Rank Subspaces. *Proceedings of the Annual Meeting of the Association for Computational Linguistics*, pages 629-634. (Short paper, 19% acceptance rate)
 34. T. Sakakini, S. Bhat, and P. Viswanath. (2017). MORSE: Semantic-ally Drive-n MORpheme SEgment-er, *Proceedings of the Annual Meeting of the Association for Computational Linguistics*, pages 552-561. (Long paper, 25% acceptance rate)
 35. J. Mu, S. Bhat, and P. Viswanath. (2017). Geometry of Polysemy. In *Proceedings of the International Conference on Learning Representation, ICLR*. (Long paper, 39% acceptance rate)
 36. H. Gong, S. Bhat, and P. Viswanath. (2017). Geometry of Compositionality. In *Proceedings of Thirty-First AAAI Conference on Artificial Intelligence (AAAI)*. (Long paper, 25% acceptance rate)
 37. S. Bhat, S. Yoon, and D. Napolitano. (2015). Automatic Detection of Grammatical Structures from Non-Native Speech. *Proceedings of the Workshop on Speech and Language Technology in Education*, Interspeech.
 38. S. Bhat, P. Chinprutthiwong and M. Perry. (2015). Seeing the Instructor in Two Video Styles: Preferences and Patterns. *Proceedings of the 8th Interna-*

- tional Conference on Educational Data Mining (EDM)*, 305–312. (Long paper, 16% acceptance rate)
39. B. Amnueypornsakul and S. Bhat. (2014). Machine-guided Solution to Mathematical Word Problems. *Proceedings of the Pacific Asia Conference on Language, Information and Computing (PACLIC)*.
 40. B. Amnueypornsakul, S. Bhat, P. Chinprutthiwong. (2014). Predicting Attrition Along the Way: The UIUC Model. *Proceedings of the Workshop on Analysis of Large Scale Social Interaction in MOOCs (EMNLP)*.
 41. S. Bhat, H. Xue and S. Yoon. (2014). Shallow Analysis Based Assessment of Syntactic Complexity for Automated Speech Scoring. *Proceedings of the Annual meeting of the Association of Computational Linguistics (ACL)*. (Long paper, 26% acceptance rate)
 42. S. Bhat, Statistical Stemming for Kannada. (2013). *Proceedings of the 4th Workshop on South and Southeast Asian Natural Language Processing*, International Joint Conference on Natural Language Processing.
 43. S. Bhat, G. Herman. (2013). Student Perceptions of Differences in Visual Communication Mode for an Online Course in Engineering. *Frontiers in Education*.
 44. S. Bhat. (2012). Morpheme Segmentation for Kannada Standing on the Shoulder of Giants. *Proceedings of the 3rd Workshop on South and Southeast Asian Natural Language Processing*, COLING.
 45. S. Yoon, S. Bhat. (2012). Assessment of ESL Learners' Syntactic Competence Based on Similarity Measures. *Proceedings of the Empirical Methods in Natural Language Processing and Computational Natural Language Learning (EMNLP-CoNLL)*.
 46. S. Yoon, S. Bhat and K. Zechner. (2012). Vocabulary Profile as a Measure of Vocabulary Sophistication. *Proceedings of 7th Workshop on Innovative Use of NLP for Building Educational Applications*.
 47. S. Bhat, M. Hasegawa-Johnson and R. Sproat. (2010). Automatic Fluency Assessment by Signal-Level Measurement of Spontaneous Speech. *INTER-SPEECH Satellite Workshop on Second Language Studies: Acquisition, Learning, Education and Technology*.

48. S. Bhat, R. Sproat, M. Hasegawa-Johnson and F. Davidson. (2010). Automatic Fluency Assessment Using Thin-Slices of Spontaneous Speech. *Language Technology Research Colloquium*.
49. S. Bhat, R. Sproat. (2009). Knowing the Unseen: Estimating Vocabulary Size over Unseen Samples. *Proceedings of the 47th Annual Meeting of the Association of Computational Linguistics (ACL)*, page 109–117.
50. S. Bhat, K. Church. (2008). Variable Selection for Ad Prediction. *Proceedings of the 2nd International Workshop on Data Mining and Audience intelligence For Advertising*.
51. B. Beamer, S. Bhat, B. Chee, A. Fister, A. Rozovskaya and R. Girju. (2007). UIUC: A Knowledge-rich Approach to Identifying Semantic Relations between Nominals. *Proceedings of the Semantic Evaluation Workshop (SemEval 2007)*.
52. S. Bhat and R. Sproat. (2007). Consistent Estimation of the Number of Unseen Elements. *Proceedings of the Fourth Midwest Computational Linguistics Colloquium*.

Conference Presentations

53. T. Sakakini, R. F.L. Azevedo, J. Y. Lee, A. Duri, V. Sadauskas, K. Gu, D. Morrow, S. Bhat, J. Graumlich, M. Hasegawa-Johnson, T. S. Huang, A. Willemsen-Dunlap, D. J. Halpin. (2019). An Online Study on the Evaluation of Dr. Babel Fish: an Unsupervised Machine Translation System for Simplifying Providers Language. *Proceedings of the Tech Mind Society '19 conference*.
54. V. Jay, G. M. Henricks, C. J. Anderson, L. Angrave, N. Bosch, D. Williams, N. Shaik, S. Bhat, and M. Perry. (2019). Patterns and Outcomes of Online Help-seeking Behavior for Students Underrepresented in STEM. Paper submitted to be presented at the annual meeting of the American Educational Research Association, San Francisco.
55. H. Gong, A. Valido, K. Ingram, S. Bhat, G. Fanti and D. Espelage. (2019). The Subtleties of Profanity in Abusive Language: Emergent Words and Meanings. Paper presented at the Fourth Workshop on Computational Methods in Online Misbehavior (Cybersafety 2019).
56. G. M. Henricks, M. Perry, and S. Bhat. (2019). Gendered Discourse in an Online STEM Course. Paper presented at the annual meeting of the American Educational Research Association, Toronto.

57. A. Valido, K. Ingram, D. L. Espelage, S. Bhat, G. Fanti. (2018). Understanding Prosocial Bystander Behavior in Cyberbullying. Poster presentation at the American Psychological Association Annual Meeting, San Francisco, CA.
58. G. M. Henricks, R. W. Crues, S. Bhat, and M. Perry. (2018). Predicting Learning by Using Students Perceptions of and Experiences with Statistics Online Course Videos. Poster presented at the annual meeting of the American Educational Research Association, New York, NY.
59. G. Henricks, R. W. Crues, S. Bhat, and M. Perry (2018). How Instructional Videos Affect Perceptions and Outcomes. Poster presented at the annual meeting of the American Educational Research Association.
60. R. W. Crues, G. M. Henricks, M. Perry, S. Bhat, C. J. Anderson, N. Shaik, and L. Angrave, (2018). How do Gender, Learning Goals, and Forum Participation Predict Persistence in a Computer Science MOOC? Paper presented at the 49th ACM Technical Symposium on Computer Science Education, Baltimore, MD.
61. R. W. Crues, G. M. Henricks, M. Perry, S. Bhat, C. J. Anderson, N. Shaik, and L. Angrave (2017). Using Closed- and Free-form Survey Responses in Parametric Models. Poster presented at the 10th International Conference on Educational Data Mining, Wuhan, China.
62. G. M. Henricks, S. Bhat, and M. Perry. (2016). Toward Impacting Learning Experiences in MOOCs. Poster presented at American Psychological Society Annual Convention, Chicago.

Patents

Computer-Implemented Systems and Methods for Scoring of Spoken Responses Based on Part of Speech Patterns (with S. Yoon), July 18, 2013, US Patent number 20130185057 A1.

Test Style Transfer Using Reinforcement Learning, with L. Wu, J. Xiong, H. Gong, and W. Hwu, filed on March 25, 2020, under process