

Nigel Bosch

Curriculum Vitae

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School of Information Sciences and Department of Educational Psychology
501 E Daniel St, University of Illinois Urbana–Champaign, Champaign, IL 61820
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Education

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| 2017 | PhD, Computer Science
University of Notre Dame, Notre Dame, IN 46556 |
| 2016 | MS, Computer Science
University of Notre Dame, Notre Dame, IN 46556 |
| 2012 | BS, Computer Science
Abilene Christian University, Abilene, TX 79699 |

Appointments

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| 2019–present | Assistant Professor, School of Information Sciences (75%)
Assistant Professor, Department of Educational Psychology (25%)
Faculty Affiliate, National Center for Supercomputing Applications
Faculty Affiliate, Illinois Informatics
University of Illinois Urbana–Champaign |
| 2020–present | Discovery Partners Institute (DPI) Affiliate |
| 2017–2019 | Postdoctoral Researcher, National Center for Supercomputing Applications
University of Illinois Urbana–Champaign |

Awards

Publication Awards

- LAK 2022 Finalist for Best Short Paper Award (International Conference on Learning Analytics & Knowledge)
- EDM 2020 Finalist for Best Paper Award (International Conference on Educational Data Mining)
- AIED 2018 Best Student Paper Award (International Conference on Artificial Intelligence in Education)
- UMAP 2017 Best Student Paper Award (Conference on User Modeling, Adaptation, and Personalization)
- EDM 2017 Best Student Paper Award (International Conference on Educational Data Mining)
- AIED 2015 Best Paper Award (International Conference on Artificial Intelligence in Education)

- EDM 2015 Best Student Paper Award (International Conference on Educational Data Mining)
- IUI 2015 Finalist for Best Paper Award (International Conference on Intelligent User Interfaces)
- ICSE 2014 ACM Distinguished Paper Award (International Conference on Software Engineering)

Other Awards

- Jeanneret Award for Excellence in the Study of Individual or Group Assessment (Society for Industrial and Organizational Psychology), 2024
- College of Education Distinguished Scholar, 2023
- Outstanding SPIN (Students Pushing INnovation) mentor, summer 2018, academic year 2019–2020
- Outstanding reviewer, IEEE Face & Gesture (FG) conference, 2019
- Teachers Ranked as Excellent (University of Illinois teaching award) – fall 2018, fall 2019, spring 2020, fall 2020, fall 2021, spring 2023

Grants

Grants as Principal Investigator (PI)

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| 2020–2024 | Collaborative Research: Exploring Algorithmic Fairness and Potential Bias in K-12 Mathematics Adaptive Learning (\$987,015; collaborative total: \$1,500,000). National Science Foundation (NSF DUE #2000638). PI. |
| 2020–2021 | Supporting Self-regulated Learning in Online Education via Automatically Personalized Interventions (\$14,997). Technology Innovation in Educational Research and Design (TIER-ED, a University of Illinois initiative). PI. |

Grants as Co-PI

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| 2023–2026 | Collaborative Research: Examining Elementary Mathematics Teachers' Behaviors and Learning with an Online Professional Development Platform (\$1,499,999). National Science Foundation (NSF ECR #2301272). Co-PI. |
| 2022–2025 | FairFL-MC: A Metacognitive Calibration Intervention Powered by Fair and Private Machine Learning (\$850,000). National Science Foundation (NSF IIS #2202481). Co-PI. |
| 2021–2026 | Towards a Wearable Alcohol Biosensor: Examining the Accuracy of BAC Estimates from New-Generation Transdermal Technology using Large-Scale Human Testing and Machine Learning Algorithms (\$2,222,481). National Institutes of Health (NIH #R01AA028488). Co-I. |
| 2020–2022 | Assessing Eye Movement Scanpaths in Source Code Comprehension (\$151,998). Sandia National Laboratories. Co-PI. |
| 2019–2023 | Advancing Computational Grounded Theory for Audiovisual Data from STEM Classrooms (\$1,313,855). National Science Foundation (NSF DRL #1920796). Co-PI. |
| 2018–2022 | Underrepresented Student Learning in Online Introductory STEM College Courses (\$1,399,194). Institute of Education Sciences (IES #R305A180211). Co-PI. |

Other Grants

- 2018–2019 National Study of Learning Mindsets Early Career Fellowship (\$8000 + travel). Mindset Scholars Network and University of Texas at Austin Population Research Center.
- 2016 National Science Foundation Travel Award (\$1449). 24th ACM Conference on User Modeling, Adaptation and Personalization (UMAP).
- 2015 National Science Foundation Travel Award (\$2398). 17th ACM International Conference on Multimodal Interaction (ICMI).
- 2015 National Science Foundation Travel Award (\$1250). 20th ACM Conference on Intelligent User Interfaces (IUI 2015).
- 2015 National Science Foundation Travel Award (\$1000). 8th International Conference on Educational Data Mining (EDM 2015) and 17th International Conference on Artificial Intelligence in Education (AIED 2015).
- 2015 University of Notre Dame Professional Development and Graduate Student Union Conference Presentation Grant (\$2600). 8th International Conference on Educational Data Mining (EDM 2015) and 17th International Conference on Artificial Intelligence in Education (AIED 2015).
- 2013 National Science Foundation Travel Award (\$1300). Doctoral Consortium at 16th International Conference on Artificial Intelligence in Education (AIED 2013).

Publications

Peer-reviewed Journal Publications

- Bosch, N.**, Chan, A. S., Davis, J. L., Gutiérrez, R., He, J., Karahalios, K., Koyejo, S., Loui, M. C., Mendenhall, R., Sanfilippo, M. R., Tong, H., Varshney, L. R., & Wang, Y. (in press). Artificial intelligence, social responsibility, and the roles of the university. *Communications of the ACM*. DOI: [10.1145/3640541](https://doi.org/10.1145/3640541)
- Stinar, F., Xiong, Z., & **Bosch, N.** (in press). An approach to improve k-anonymization practices in educational data mining. *Journal of Educational Data Mining*.
- Valdiviejas, H., Azevedo, R. F. L., **Bosch, N.**, & Perry, M. (in press). Automatic detection of metacognitive language and student achievement in an online STEM college course. *Online Learning*.
- Zhang, Y., Paquette, L., & **Bosch, N.** (in press). Using permutation tests to identify statistically sound and nonredundant sequential patterns in educational event sequences. *Journal of Educational and Behavioral Statistics*.
- Hickman, L., Saef, R., Ng, V., Woo, S. E., Tay, L., & **Bosch, N.** (2024). Developing and evaluating language-based machine learning algorithms for inferring applicant personality in video interviews. *Human Resource Management Journal*, 34(2), 255-274. DOI: [10.1111/1748-8583.12356](https://doi.org/10.1111/1748-8583.12356)
- Jeng, A., **Bosch, N.**, & Perry, M. (2024). Phatic expressions influence perceived helpfulness in online peer help-giving: A mixed methods study. *Learning and Instruction*, 91, 101893:1-11. DOI: [10.1016/j.learninstruc.2024.101893](https://doi.org/10.1016/j.learninstruc.2024.101893)

- Ariss, T., Fairbairn, C. E., & **Bosch, N.** (2023). Examining new-generation transdermal alcohol biosensor performance across laboratory and field contexts. *Alcoholism: Clinical & Experimental Research*, 47(1), 50-59. DOI: [10.1111/acer.14977](https://doi.org/10.1111/acer.14977)
- Baker, R. S., Hutt, S., **Bosch, N.**, Ocumpaugh, J., Biswas, G., Paquette, L., Andres, J. M. A., Nasiar, N., & Munshi, A. (2023). Detector-driven classroom interviewing: Focusing qualitative researcher time by selecting cases in situ. *Educational Technology Research and Development*. DOI: [10.1007/s11423-023-10324-y](https://doi.org/10.1007/s11423-023-10324-y)
- Belitz, C., Ocumpaugh, J., Ritter, S., Baker, R. S., Fancsali, S. E., & **Bosch, N.** (2023). Constructing categories: Moving beyond protected classes in algorithmic fairness. *Journal of the Association for Information Science and Technology*, 74(6), 663-668. DOI: [10.1002/asi.24643](https://doi.org/10.1002/asi.24643)
- Booth, B. M., **Bosch, N.**, & D'Mello, S. K. (2023). Engagement detection and its applications in learning: A tutorial & selective review. *Proceedings of the IEEE*, 111(10), 1398-1422. DOI: [10.1109/JPROC.2023.3309560](https://doi.org/10.1109/JPROC.2023.3309560)
- Jeng, A., Williams-Dobosz, D., **Bosch, N.**, & Perry, M. (2023). Direct and indirect ways of being helpful in online peer help-giving interactions. *Computers & Education*, 205, 104894:1-15. DOI: [10.1016/j.compedu.2023.104894](https://doi.org/10.1016/j.compedu.2023.104894)
- Jeng, A., **Bosch, N.**, & Perry, M. (2023). Sense of belonging predicts perceived helpfulness in online peer help-giving interactions. *The Internet and Higher Education*, 57, 100901:1-14. DOI: [10.1016/j.iheduc.2022.100901](https://doi.org/10.1016/j.iheduc.2022.100901)
- Zhang, Y., Paquette, L., Baker, R. S., **Bosch, N.**, Ocumpaugh, J., & Biswas, G. (2023). How are feelings of difficulty and familiarity linked to learning behaviors and gains in a complex science learning task? *European Journal of Psychology of Education*, 38, 777-800. DOI: [10.1007/s10212-022-00616-x](https://doi.org/10.1007/s10212-022-00616-x)
- Bosch, N.** & D'Mello, S. K. (2022). Can computers outperform humans in detecting user zone-outs? Implications for intelligent interfaces. *ACM Transactions on Computer-Human Interaction (TOCHI)*, 29(2), 1-33. DOI: [10.1145/3481889](https://doi.org/10.1145/3481889)
- Hickman, L., **Bosch, N.**, Ng, V., Saef, R., Tay, L., & Woo, S. E. (2022). Automated video interview personality assessments: Reliability, validity, and generalizability investigations. *Journal of Applied Psychology*, 107(8), 1323-1351. DOI: [10.1037/apl0000695](https://doi.org/10.1037/apl0000695)
- Zhang, Y., Paquette, L., **Bosch, N.**, Ocumpaugh, J., Biswas, G., Hutt, S., & Baker, R. S. (2022). The evolution of metacognitive strategy use in an open-ended learning environment: Do prior domain knowledge and motivation play a role? *Contemporary Educational Psychology*, 69, 102064:1-14. DOI: [10.1016/j.cedpsych.2022.102064](https://doi.org/10.1016/j.cedpsych.2022.102064)
- Bosch, N.** & Paquette, L. (2021). What's next? Sequence length and impossible loops in state transition measurement. *Journal of Educational Data Mining*, 13(1), 1-23. DOI: [10.5281/zenodo.5048423](https://doi.org/10.5281/zenodo.5048423)
- Bosch, N.** (2021). Identifying supportive student factors for mindset interventions: A two-model machine learning approach. *Computers & Education*, 167, 104190:1-15. DOI: [10.1016/j.compedu.2021.104190](https://doi.org/10.1016/j.compedu.2021.104190)
- Bosch, N.** (2021). AutoML feature engineering for student modeling yields high accuracy, but limited interpretability. *Journal of Educational Data Mining*, 13(2), 55-79. DOI: [10.5281/zenodo.5275314](https://doi.org/10.5281/zenodo.5275314)

- Bosch, N.** & D'Mello, S. K. (2021). Automatic detection of mind wandering from video in the lab and in the classroom. *IEEE Transactions on Affective Computing*, 12(4), 974-988. DOI: [10.1109/TAFFC.2019.2908837](https://doi.org/10.1109/TAFFC.2019.2908837)
- Gurrieri, L., Fairbairn, C. E., Sayette, M. A., & **Bosch, N.** (2021). Alcohol narrows physical distance between strangers. *Proceedings of the National Academy of Sciences*, 118(20), e2101937118:1-3. DOI: [10.1073/pnas.2101937118](https://doi.org/10.1073/pnas.2101937118)
- Williams-Dobosz, D., Jeng, A., Azevedo, R. F. L., **Bosch, N.**, Ray, C., & Perry, M. (2021). Ask for help: Online help-seeking and help-giving as indicators of cognitive and social presence for students underrepresented in chemistry. *Journal of Chemical Education*, 98(12), 3693-3703. DOI: [10.1021/acs.jchemed.1c00839](https://doi.org/10.1021/acs.jchemed.1c00839)
- Zhang, Y., Paquette, L., Baker, R. S., Ocumpaugh, J., **Bosch, N.**, Biswas, G., & Munshi, A. (2021). Can strategic behavior facilitate confusion resolution? The interplay between confusion and metacognitive strategies in Betty's Brain. *Journal of Learning Analytics*, 8(3), 28-44. DOI: [10.18608/jla.2021.7161](https://doi.org/10.18608/jla.2021.7161)
- Fairbairn, C. E., Kang, D., & **Bosch, N.** (2020). Using machine learning for real-time BAC estimation from a new-generation transdermal biosensor in the laboratory. *Drug and Alcohol Dependence*, 216, 108205:1-108205:8. DOI: [10.1016/j.drugalcdep.2020.108205](https://doi.org/10.1016/j.drugalcdep.2020.108205)
- Hutt, S., Krasich, K., Mills, C., **Bosch, N.**, White, S., Brockmole, J. R., & D'Mello, S. K. (2019). Automated gaze-based mind wandering detection during computerized learning in classrooms. *User Modeling and User-Adapted Interaction*, 29(4), 821-867. DOI: [10.1007/s11257-019-09228-5](https://doi.org/10.1007/s11257-019-09228-5)
- Wammes, J. D., Ralph, B. C. W., Mills, C., **Bosch, N.**, Duncan, T. L., & Smilek, D. (2019). Disengagement during lectures: Media multitasking and mind wandering in university classrooms. *Computers & Education*, 132, 76-89. DOI: [10.1016/j.compedu.2018.12.007](https://doi.org/10.1016/j.compedu.2018.12.007)
- Bosch, N.** & Paquette, L. (2018). Metrics for discrete student models: Chance levels, comparisons, and use cases. *Journal of Learning Analytics*, 5(2), 86-104. DOI: [10.18608/jla.2018.52.6](https://doi.org/10.18608/jla.2018.52.6)
- Bosch, N.** & D'Mello, S. K. (2017). The affective experience of novice computer programmers. *International Journal of Artificial Intelligence in Education*, 27(1), 181-206. DOI: [10.1007/s40593-015-0069-5](https://doi.org/10.1007/s40593-015-0069-5)
- Monkaresi, H., **Bosch, N.**, Calvo, R. A., & D'Mello, S. K. (2017). Automated detection of engagement using video-based estimation of facial expressions and heart rate. *IEEE Transactions on Affective Computing*, 8(1), 15-28. DOI: [10.1109/TAFFC.2016.2515084](https://doi.org/10.1109/TAFFC.2016.2515084)
- Bosch, N.**, D'Mello, S. K., Ocumpaugh, J., Baker, R. S., & Shute, V. (2016). Using video to automatically detect learner affect in computer-enabled classrooms. *ACM Transactions on Interactive Intelligent Systems (TiiS)*, 6(2), 17:1-17:26. DOI: [10.1145/2946837](https://doi.org/10.1145/2946837)
- Shute, V. J., D'Mello, S. K., Baker, R., Cho, K., **Bosch, N.**, Ocumpaugh, J., Ventura, M., & Almeda, V. (2015). Modeling how incoming knowledge, persistence, affective states, and in-game progress influence student learning from an educational game. *Computers & Education*, 86, 224-235. DOI: [10.1016/j.compedu.2015.08.001](https://doi.org/10.1016/j.compedu.2015.08.001)

Peer-reviewed Published Conference Proceedings

- Bosch, N.**, Williams-Dobosz, D., & Perry, M. (in press). Measuring help-seeking in online course discussion forums with privacy-preserving large language models. *Proceedings of the 16th International Conference of the Learning Sciences - CSCL 2024*.
- Bosch, N.**, Reyes Denis, T., & Perry, M. (in press). Teacher learning online: Detecting patterns of engagement. *Proceedings of the 18th International Conference of the Learning Sciences - ICLS 2024*.
- Belitz, C., Lee, H., Nasiar, N., Fancsali, S. E., Ritter, S., Almoubayyed, H., Baker, R. S., Ocumpaugh, J., & **Bosch, N.** (2024). Hierarchical dependencies in classroom settings influence algorithmic bias metrics. *Proceedings of the 14th International Conference on Learning Analytics & Knowledge (LAK '24)*, pp. 210-218. DOI: [10.1145/3636555.3636869](https://doi.org/10.1145/3636555.3636869)
- Jiang, L., Belitz, C., & **Bosch, N.** (2024). Synthetic dataset generation for fairer unfairness research. *Proceedings of the 14th International Conference on Learning Analytics & Knowledge (LAK '24)*, pp. 200-209. DOI: [10.1145/3636555.3636868](https://doi.org/10.1145/3636555.3636868)
- Hur, P., Machaka, N., Krist, C., & **Bosch, N.** (2023). Informing expert feature engineering through automated approaches: Implications for coding qualitative classroom video data. *Proceedings of the 13th International Conference on Learning Analytics & Knowledge (LAK '23)*, pp. 630-636. DOI: [10.1145/3576050.3576090](https://doi.org/10.1145/3576050.3576090)
- Jeng, A., **Bosch, N.**, & Perry, M. (2023). Perceived helpfulness of phatic expressions in online help-giving interactions. *Proceedings of the 17th International Conference of the Learning Sciences - ICLS 2023*, pp. 1780-1781.
- Pinto, J., Paquette, L., & **Bosch, N.** (2023). Interpretable neural networks vs. expert-defined models for learner behavior detection. *Companion Proceedings 13th International Conference on Learning Analytics & Knowledge (LAK23)*, pp. 105-107.
- Zong, R., Zhang, Y., Stinar, F., Shang, L., Zeng, H., **Bosch, N.**, & Wang, D. (2023). A crowd-AI collaborative approach to address demographic bias for student performance prediction in online education. *Proceedings of the 11th AAAI Conference on Human Computation and Crowdsourcing (HCOMP 2023)*, pp. 198-210. DOI: [10.1609/hcomp.v11i1.27560](https://doi.org/10.1609/hcomp.v11i1.27560)
- Denny, P., Becker, B. A., **Bosch, N.**, Prather, J., Reeves, B., & Whalley, J. (2022). Novice reflections during the transition to a new programming language. *Proceedings of the 53rd ACM Technical Symposium on Computer Science Education (SIGCSE)*, pp. 948-954. DOI: [10.1145/3478431.3499314](https://doi.org/10.1145/3478431.3499314)
- Hur, P., Lee, H., Bhat, S., & **Bosch, N.** (2022). Using machine learning explainability methods to personalize interventions for students. *Proceedings of the 15th International Conference on Educational Data Mining (EDM 2022)*, pp. 438-445. DOI: [10.5281/zenodo.6853181](https://doi.org/10.5281/zenodo.6853181)
- Hur, P. & **Bosch, N.** (2022). Tracking individuals in classroom videos via post-processing OpenPose data. *Proceedings of the 12th International Conference on Learning Analytics & Knowledge (LAK '22)*, pp. 465-471. DOI: [10.1145/3506860.3506888](https://doi.org/10.1145/3506860.3506888)
- Jiang, L. & **Bosch, N.** (2022). Mining and assessing anomalies in students' online learning activities with self-supervised machine learning. *Proceedings of the 15th International Conference on Educational Data Mining (EDM 2022)*, pp. 549-554. DOI: [10.5281/zenodo.6852948](https://doi.org/10.5281/zenodo.6852948)

- Prather, J., Margulieux, L., Whalley, J., Denny, P., Reeves, B. N., Becker, B. A., Singh, P., Powell, G., & **Bosch, N.** (2022). Getting by with help from my friends: Group study in introductory programming understood as socially shared regulation. *Proceedings of the 18th ACM Conference on International Computing Education Research (ICER 2022)*, pp. 164–176. DOI: [10.1145/3501385.3543970](https://doi.org/10.1145/3501385.3543970)
- Stinar, F. & **Bosch, N.** (2022). Algorithmic unfairness mitigation in student models: When fairer methods lead to unintended results. *Proceedings of the 15th International Conference on Educational Data Mining (EDM 2022)*, pp. 606-611. DOI: [10.5281/zenodo.6853135](https://doi.org/10.5281/zenodo.6853135)
- Belitz, C., Jiang, L., & **Bosch, N.** (2021). Automating procedurally fair feature selection in machine learning. *Proceedings of the AAAI/ACM Conference on AI, Ethics, and Society (AIES '21)*, pp. 379-389. DOI: [10.1145/3461702.3462585](https://doi.org/10.1145/3461702.3462585)
- Bosch, N.**, Zhang, Y., Paquette, L., Baker, R. S., Ocumpaugh, J., & Biswas, G. (2021). Students' verbalized metacognition during computerized learning. *Proceedings of the 2021 CHI Conference on Human Factors in Computing Systems (CHI '21)*, pp. 680:1-680:12. DOI: [10.1145/3411764.3445809](https://doi.org/10.1145/3411764.3445809)
- Hutt, S., Ocumpaugh, J., Andres, J. M. A. L., Munshi, A., **Bosch, N.**, Baker, R. S., Zhang, Y., Paquette, L., Slater, S., & Biswas, G. (2021). Who's stopping you? Using microanalysis to explore the impact of science anxiety on self-regulated learning operations. *Proceedings of the Annual Meeting of the Cognitive Science Society*, pp. 1409-1415.
- Hutt, S., Ocumpaugh, J., Andres, J. M. A. L., **Bosch, N.**, Paquette, L., Biswas, G., & Baker, R. S. (2021). Investigating SMART models of self-regulation and their impact on learning. *Proceedings of the 14th International Conference on Educational Data Mining (EDM 2021)*, pp. 580-587.
- Jiang, L. & **Bosch, N.** (2021). Predictive sequential pattern mining via interpretable convolutional neural networks. *Proceedings of the 14th International Conference on Educational Data Mining (EDM 2021)*, pp. 761-766.
- Bosch, N.**, Crues, R. W., Shaik, N., & Paquette, L. (2020). “Hello, [REDACTED]”: Protecting student privacy in analyses of online discussion forums. *Proceedings of the 13th International Conference on Educational Data Mining (EDM 2020)*, pp. 39-49.
- D'Angelo, C., Dyer, E., Krist, C., Rosenberg, J., & **Bosch, N.** (2020). Advancing computational grounded theory for audiovisual data from mathematics classrooms. *Proceedings of the 14th International Conference on Learning Sciences (ICLS 2020)*, pp. 2393-2394.
- Dyer, E., D'Angelo, C., **Bosch, N.**, Krist, C., & Rosenberg, J. (2020). Analyzing learning with speech analytics and computer vision methods: Technologies, principles, and ethics. *Proceedings of the 14th International Conference on Learning Sciences (ICLS 2020)*, pp. 2651-2653.
- Gliser, I., Mills, C., **Bosch, N.**, Smith, S., Smilek, D., & Wammes, J. D. (2020). The sound of inattention: Predicting mind wandering with automatically derived features of instructor speech. In I. I. Bittencourt, M. Cukurova, K. Muldner, R. Luckin, & E. Millán (Eds.), *Proceedings of the 21st International Conference on Artificial Intelligence in Education (AIED 2020)*, pp. 204-215. DOI: [10.1007/978-3-030-52237-7_17](https://doi.org/10.1007/978-3-030-52237-7_17)
- Hoang, L., Boyce, R. D., **Bosch, N.**, Stottlemeyer, B. A., Brochhausen, M., & Schneider, J. (2020). Automatically classifying the evidence type of drug-drug interaction research papers as a step

- toward computer supported evidence curation. *Proceedings of the American Medical Informatics Association (AMIA) Annual Meeting*, pp. 554-562.
- Hur, P., **Bosch, N.**, Paquette, L., & Mercier, E. (2020). Harbingers of collaboration? The role of early-class behaviors in predicting collaborative problem solving. *Proceedings of the 13th International Conference on Educational Data Mining (EDM 2020)*, pp. 104-114.
- Jay, V., Henricks, G. M., Anderson, C. J., Angrave, L., **Bosch, N.**, Williams-Dobosz, D., Shaik, N., Bhat, S., & Perry, M. (2020). Online discussion forum help-seeking behaviors of students underrepresented in STEM. *Proceedings of the 14th International Conference on Learning Sciences (ICLS 2020)*, pp. 809-810.
- Sanyal, D., **Bosch, N.**, & Paquette, L. (2020). Feature selection metrics: Similarities, differences, and characteristics of the selected models. *Proceedings of the 13th International Conference on Educational Data Mining (EDM 2020)*, pp. 212-223.
- Valdiviejas, H. & **Bosch, N.** (2020). Using association rule mining to uncover rarely occurring relationships in two university online STEM courses: A comparative analysis. *Proceedings of the 13th International Conference on Educational Data Mining (EDM 2020)*, pp. 686-690.
- Zhang, Y., Paquette, L., Baker, R. S., Ocumpaugh, J., **Bosch, N.**, Munshi, A., & Biswas, G. (2020). The relationship between confusion and metacognitive strategies in Betty's Brain. *Proceedings of the 10th International Conference on Learning Analytics and Knowledge (LAK20)*, pp. 276-284. DOI: [10.1145/3375462.3375518](https://doi.org/10.1145/3375462.3375518)
- Andres, A., Ocumpaugh, J., Baker, R. S., Slater, S., Paquette, L., Jiang, Y., **Bosch, N.**, Munshi, A., Moore, A. L., & Biswas, G. (2019). Affect sequences and learning in Betty's Brain. In C. Brooks, R. Ferguson, & H. U. Hoppe (Eds.), *Proceedings of the 9th International Conference on Learning Analytics & Knowledge (LAK19)*, pp. 383-390. DOI: [10.1145/3303772.3303807](https://doi.org/10.1145/3303772.3303807)
- Bosch, N.**, Huang, E., Angrave, L., & Perry, M. (2019). Modeling improvement for underrepresented minorities in online STEM education. *Proceedings of the 27th Conference on User Modeling, Adaptation and Personalization (UMAP 2019)*, pp. 327-335. DOI: [10.1145/3320435.3320463](https://doi.org/10.1145/3320435.3320463)
- Huang, E., Valdiviejas, H., & **Bosch, N.** (2019). I'm sure! Automatic detection of metacognition in online course discussion forums. *Proceedings of the 8th International Conference on Affective Computing and Intelligent Interaction (ACII 2019)*, pp. 241-247. DOI: [10.1109/ACII.2019.8925506](https://doi.org/10.1109/ACII.2019.8925506)
- Mills, C., **Bosch, N.**, Krasich, K., & D'Mello, S. K. (2019). Reducing mind wandering during vicarious learning from an intelligent tutoring system. In S. Isotani, E. Millán, A. Ogan, P. Hastings, B. McLaren, & R. Luckin (Eds.), *Proceedings of the 20th International Conference on Artificial Intelligence in Education (AIED 2019)*, pp. 296-307. DOI: [10.1007/978-3-030-23204-7_25](https://doi.org/10.1007/978-3-030-23204-7_25)
- Bosch, N.**, Mills, C., Wammes, J. D., & Smilek, D. (2018). Quantifying classroom instructor dynamics with computer vision. In C. Rosé, R. Martínez-Maldonado, H. U. Hoppe, R. Luckin, M. Mavrikis, K. Porayska-Pomsta, B. McLaren, & B. du Boulay (Eds.), *Proceedings of the 19th International Conference on Artificial Intelligence in Education (AIED 2018)*, pp. 30-42. DOI: [10.1007/978-3-319-93843-1_3](https://doi.org/10.1007/978-3-319-93843-1_3)
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- Bosch, N.** & D’Mello, S. K. (2013). Programming with your heart on your sleeve: Analyzing the affective states of computer programming students. In H. C. Lane, K. Yacef, J. Mostow, & P. Pavlik (Eds.), *Proceedings of the 16th International Conference on Artificial Intelligence in Education (AIED 2013)*, pp. 908-911. DOI: [10.1007/978-3-642-39112-5_143](https://doi.org/10.1007/978-3-642-39112-5_143)
- Mills, C., D’Mello, S. K., Lehman, B., **Bosch, N.**, Strain, A., & Graesser, A. (2013). What makes learning fun? Exploring the influence of choice and difficulty on mind wandering and engagement during learning. In H. C. Lane, K. Yacef, J. Mostow, & P. Pavlik (Eds.), *Proceedings of the 16th International Conference on Artificial Intelligence in Education (AIED 2013)*, pp. 71-80. DOI: [10.1007/978-3-642-39112-5_8](https://doi.org/10.1007/978-3-642-39112-5_8)

Book Chapters

- Hutt, S., Baker, R. S., Ocumpaugh, J., Munshi, A., Andres, J. M. A. L., Karumbaiah, S., Slater, S., Biswas, G., Paquette, L., **Bosch, N.**, & van Velsen, M. (2022). Quick Red Fox: An app supporting a new paradigm in qualitative research on AIED for STEM. *Artificial Intelligence in STEM Education*, pp. 319-332.
- Paquette, L. & **Bosch, N.** (2020). The invisible breadcrumbs of digital learning: How learner actions inform us of their experience. *Handbook of Research on Digital Learning*, pp. 302-316. DOI: [10.4018/978-1-5225-9304-1.ch019](https://doi.org/10.4018/978-1-5225-9304-1.ch019)
- D’Mello, S. K., **Bosch, N.**, & Chen, H. (2018). Multimodal-multisensor affect detection. *The Handbook of Multimodal-Multisensor Interfaces, Volume 2: Signal Processing, Architectures, and Detection of Emotion and Cognition*, pp. 167-202. DOI: [10.1145/3107990.3107998](https://doi.org/10.1145/3107990.3107998)

Peer-reviewed Workshop Papers

- Lee, H., Hur, P., Bhat, S., & **Bosch, N.** (2021). Promoting self-regulated learning in online learning by triggering tailored interventions. In R. S. Baker, C. Mills, & U. Boser (Eds.), *CEUR Workshop Proceedings: Joint Workshops at the International Conference on Educational Data Mining*, 1-8.
- Bosch, N.** & Paquette, L. (2017). Unsupervised deep autoencoders for feature extraction with educational data. *Deep Learning with Educational Data Workshop at the 10th International Conference on*

Educational Data Mining.

- Bosch, N.** & D’Mello, S. K. (2014). Co-occurring affective states in automated computer programming education. In E. Walker & C. K. Looi (Eds.), *Proceedings of the Workshop on AI-supported Education for Computer Science (AIEDCS) at the 12th International Conference on Intelligent Tutoring Systems*, pp. 21-30.
- Bosch, N.** & D’Mello, S. K. (2013). Sequential patterns of affective states of novice programmers. In E. Walker & C. K. Looi (Eds.), *Proceedings of the First Workshop on AI-supported Education for Computer Science (AIEDCS 2013)*, pp. 1-10.

Invited Talks/Seminars

- *Privacy and Big Data in Postsecondary Education*. Building a Multidimensional Future: A Conversation on Big Data and Educational Measurement, National Council on Measurement in Education Annual Meeting. June 1, 2021.
- *Learning about Learning from Unstructured Classroom Data*. AAAI Spring Symposium on Artificial Intelligence for K–12 Education. March 22, 2021.
- *Hyperparameter Tuning in Machine Learning for Student Models*. Learning Analytics Learning Network. October 20, 2020.

Teaching and Mentorship

Teaching Activities

- Instructor, *Causal Inference with Machine Learning* (EPSY 590ML) – fall 2023
 - **Newly developed course**
- Instructor, *Concepts of Machine Learning* (IS 390CML) – spring 2022, fall 2022, spring 2023
 - **Newly developed course**
- Instructor, *Data, Statistical Models, and Information* (IS 542/507) – fall 2019, spring 2020, fall 2020, fall 2021
- Instructor, *Applied Machine Learning: Team Projects* (IS 590ML/557) – spring 2019, fall 2019, spring 2021, spring 2024
 - **Newly developed course**
- Instructor, *Foundations of Information Processing* (IS 452) – spring 2019
- Instructor, *Data Mining* (IS 590DT2/577) – fall 2018, fall 2020
- Co-instructor, *Machine Learning Team Projects* (IS 590ML) – fall 2018
- Information Sciences independent study advisor (IS 592/589) – fall 2019 (1), spring 2020 (3), fall 2020 (1), spring 2021 (2), summer 2021 (1), spring 2022 (2), summer 2022 (4)
- Information Sciences undergraduate independent study advisor (IS 389) – spring 2022 (1)
- Educational Psychology independent study advisor (EPSY 595) – fall 2020 (1), summer 2021 (1), spring 2022 (1), fall 2022 (1)
- Informatics independent study advisor (INFO 597) – fall 2020 (1)
- Informatics individual undergraduate research (INFO 199/399) – fall 2020 (1), spring 2021 (1), spring 2022 (1)
- Guest Lecturer, *AI Applications in Education* (CS 498)

- Guest Lecturer, *Research Design for Information Sciences* (IS 204)
- Guest Lecturer, *Advanced Topics: Machine Learning & Social Computing* (IS 590MSC)
- Guest Lecturer, *Introduction to Educational Data Mining* (CI 507EDM)
- Guest Lecturer, *Qualitative Analysis of Video Data* (CI 507AVD)

Doctoral Advising

- Clara Belitz – Information Sciences
- Lan Jiang – Information Sciences
- Paul Hur – Information Sciences (Secondary co-advisor with Michael Twidale)
- HaeJin Lee – Information Sciences
- Frank Stinar – Information Sciences
- Liang Tang – Information Sciences (Secondary co-advisor with Masooda Bashir)
- Destiny Williams-Dobosz – Educational Psychology (Secondary co-advisor with Michelle Perry)
- Hannah Valdiviejas (graduated 2023) – Educational Psychology (Secondary co-advisor with Michelle Perry)

Master's Students Mentored

- Sree Balasubramanian, MS in Information Management, 2022–2023, First employment: Analytics Rotation Program Manager at Genentech
- Rohan Salvi, MS in Information Management, 2022–2023
- Vel Wu, MS in Information Management, 2020, First employment: Data engineer at Groundhog Technologies
- Aditya Kadrekar, MS in Information Management, 2020, First employment: Data scientist at Cargill, Inc.
- Lan Jiang, MS in Information Management (2019–2020, First employment: PhD student at UIUC)
- Tre Tomaszewski, MS in Bioinformatics (2019–2020, First employment: PhD student at UIUC)
- Jinlin Zeng, MS in Information Management (2018–2019)

Undergraduate Students Mentored

- Ved Shah (2021, SPIN—*Students Pushing INnovation* intern)
- HaeJin Lee (2021, First employment: Graduate student at UIUC)
- Alistair Nunn (2020–2021)
- Zihan (Crescent) Xiong (2020–2022, First employment: Graduate student at UPenn)
- Debopam Sanyal (2019–2020, SPIN—*Students Pushing INnovation* intern, First employment: Graduate student at UIUC)
- Lauren Gregory (2019)
- Dean Lin (2018–2019, SPIN—*Students Pushing INnovation* intern)
- Eddie Huang (2018–2019, First employment: Graduate student at UIUC)
- Zhuoyue Wang (2018–2019, First employment: Graduate student at UC Berkeley)
- Yuxuan Chen (Notre Dame; 2013–2016, First employment: Graduate student at Columbia University)
- Huili Chen (Notre Dame; 2015–2016, First employment: Graduate student at Massachusetts Institute of Technology)

- Jianan Wang (Notre Dame; 2016)
- Jacob Beiter (Notre Dame; 2016)
- Timothy Pusateri (Notre Dame; 2015)

Professional Activities

Journal and Proceedings Editing

- Accessibility Production Editor, *Journal of Educational Data Mining* (2023–present)
- Co-editor, special issue of the *APA Technology, Mind, and Behavior* journal on “Understanding Involuntary Thought and Affect through Big Data and AI” (2023–present)
- Co-editor, special issue of the *Journal of Educational Data Mining* on extended follow-ups to the best papers from EDM 2022 (December 2022)
- Co-editor, *Proceedings of the 15th International Conference on Educational Data Mining (EDM 2022)*

Journal Reviews

- ACM Transactions on Computer–Human Interaction (TOCHI)
- ACM Transactions on Human–Robot Interaction (THRI)
- ACM Transactions on Knowledge Discovery from Data (TKDD)
- Addiction
- American Educational Research Association Open (AERA Open)
- American Educational Research Journal (AERJ)
- Behavior Research Methods (BRM)
- British Journal of Educational Technology (BJET)
- Computers & Education
- Contemporary Educational Psychology
- IEEE Transactions on Affective Computing (TAFFC)
- IEEE Transactions on Learning Technologies (TLT)
- Image and Vision Computing (IMAVIS)
- International Journal of Artificial Intelligence in Education (IJAIED)
- International Journal of Human–Computer Interaction (IJHCI)
- International Journal of STEM Education
- Journal of Educational Data Mining (JEDM)
- Journal of Educational Psychology
- Journal of Learning Analytics (JLA)
- Learning and Individual Differences
- Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)
- Psychometrika
- The Internet and Higher Education

Conference Reviews (Program Committee)

- AAAI Conference on Artificial Intelligence
- ACM CHI Conference on Human Factors in Computing Systems
- ACM Conference on Computer-Supported Cooperative Work and Social Computing
- ACM Conference on Fairness, Accountability, and Transparency (FAccT)
- Conference on Neural Information Processing Systems (NeurIPS)
- IEEE Conference on Automatic Face and Gesture Recognition (FG)
- IEEE Winter Conference on Applications of Computer Vision (WACV)
- International Conference of the Learning Sciences (ICLS)
- International Conference on Affective Computing and Intelligent Interaction (ACII)
- International Conference on Educational Data Mining (EDM)
- International Learning Analytics and Knowledge (LAK) Conference

Conference Associate Chair/Senior Program Committee

- ACM CHI Conference on Human Factors in Computing Systems
- ACM International Conference on Multimodal Interaction (ICMI)
- International Conference on Artificial Intelligence in Education (AIED)

Conference Chairing

- Accessibility Chair, Educational Data Mining (EDM) Conference, 2024
- Program Committee Co-chair, Educational Data Mining (EDM) Conference, 2022
- Industry Track Co-chair, Educational Data Mining (EDM) Conference, 2020

Workshop Organization

- Co-chair/organizer, *Fairness, Accountability, and Transparency in Educational Data* workshop held at the Educational Data Mining 2020 conference (<https://fatedm.inria.fr/>)

Workshop and Symposium Reviews

- AAAI Workshop on AI Education
- APA Technology, Mind, and Society (TMS)
- EDMGAMES Workshop at the Educational Data Mining Conference
- EuroCSS Workshop on Biases in Social Computing Data and Technology
- IJCAI Workshop on Artificial Intelligence in Affective Computing
- International Workshop on Empathetic Computing
- NeurIPS Workshop on Generative AI for Education (GAIED)
- Society of Research on Educational Effectiveness Spring Conference (SREE)

Grant/Fellowship Proposals Reviews and Panels

- Ad-hoc reviewer, UIUC Chancellor's Call to Action Research Projects, 2024
- Ad-hoc reviewer, Tools Competition (The Learning Agency), 2023–2024
- Panelist, Institute of Education Sciences (IES), 2021, 2023
- Ad-hoc reviewer, Natural Sciences and Engineering Research Council of Canada (NSERC), 2021–2022
- Ad-hoc reviewer, National Institutes of Health (NIH), 2021
- Panelist, National Science Foundation (NSF) Directorate for STEM Education, 2021–2023
- Ad-hoc reviewer, UIUC Technology Innovation in Educational Research and Design (TIER-ED) Pilot Projects, 2021
- Ad-hoc reviewer, UIUC Technology Innovation in Educational Research and Design (TIER-ED) Student Fellows, 2020
- Panelist, National Science Foundation (NSF) Directorate for Computer and Information Science and Engineering (CISE), 2020
- Ad-hoc reviewer, UIUC Campus Research Board, 2020–2022
- Ad-hoc reviewer, National Center for Supercomputing Applications (NCSA) Faculty Fellows, 2017

Professional Memberships (Past and Current)

- American Educational Research Association (AERA) Division C
- Association for the Advancement of Affective Computing (AAAC)
- Association for Computing Machinery (ACM)
- International Artificial Intelligence in Education Society
- International Educational Data Mining Society
- International Society of the Learning Sciences (ISLS)

Campus Committees

- Space Policy Taskforce, College of Education, UIUC, 2023–2024
- AI Curriculum Committee, School of Information Sciences, UIUC, 2023–2024
- Doctoral Studies Committee, School of Information Sciences, UIUC, 2022–2023
- MS/IM Program Committee, School of Information Sciences, UIUC, 2019–2022
- Research Advisory Committee, School of Information Sciences, UIUC, 2019–2023
- Admissions Committee, School of Information Sciences, UIUC, 2019
- University of Notre Dame Computer Science Graduate Student Board, 2014–2015, 2015–2016

Other Service and Outreach

- HackIllinois Mentor, 2023
- STEM For All Video Showcase Presenter (TERC), 2020, 2021, 2022
- Illinois Science Olympiad State Tournament Judge, 2017–2019
- Northern Indiana Regional Science and Engineering Fair Judge, 2015, 2016
- Notre Dame National Robotics Week Presenter, 2013