NIGEL BOSCH

Curriculum Vitae

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School of Information Sciences and Department of Educational Psychology
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Education

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

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

2012–2017 Graduate Research Assistant
Emotive Computing Lab, University of Notre Dame

Grants

Grants as Principal Investigator (PI)

2020–2023 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

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.

2019–2022 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).

Awards

Publication Awards

- 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

- Outstanding reviewer, IEEE Face & Gesture (FG) conference, 2019
- Outstanding SPIN (Students Pushing INnovation) mentor, summer 2018, academic year 2019–2020

Publications

Peer-reviewed Journal Publications

Bosch, N., & D'Mello, S. K. (in press). Can computers outperform humans in detecting user zone-outs? Implications for intelligent interfaces. *ACM Transactions on Computer-Human Interaction (TOCHI)*.

Hickman, L., Saef, R., Ng, V., Woo, S. E., Tay, L., & **Bosch, N.** (in press). Developing and evaluating language-based machine learning algorithms for inferring applicant personality in video interviews. *Human Resource Management Journal*.

Hickman, L., **Bosch, N.**, Ng, V., Saef, R., Tay, L., & Woo, S. E. (in press). Automated video interview personality assessments: Reliability, validity, and generalizability investigations. *Journal of Applied Psychology*.

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.

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.

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.

Bosch, N. (2021). AutoML feature engineering for student modeling yields high accuracy, but limited interpretability. *Journal of Educational Data Mining, 13*(2), 55–79.

Fairbairn, C. E., & **Bosch, N.** (2021). A new generation of transdermal alcohol biosensing technology: Practical applications, machine learning analytics, and questions for future research. *Addiction, 116*(10), 2912–2920.

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.

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.

Bosch, N. (2021). Identifying supportive student factors for mindset interventions: A two-model machine learning approach. *Computers & Education, 167*, 104190:1–15.

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*, 108205:1–8.

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.

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.

Bosch, N., & Paquette, L. (2018). Metrics for discrete student models: Chance levels, comparisons, and use cases. *Journal of Learning Analytics, 5*(2), 86–104.

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.

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.

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).

Shute, V. J., D'Mello, S. K., Baker, R., Cho, K., **Bosch, N.**, Ocumpaugh, J., … 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.

Peer-reviewed Published Conference Proceedings

Hur, P., & **Bosch, N.** (in press). Tracking individuals in classroom videos via post-processing OpenPose data. *Proceedings of the 12th International Conference on Learning Analytics & Knowledge (LAK '22)*.

Denny, P., Becker, B. A., **Bosch, N.**, Prather, J., Reeves, B., & Whalley, J. (in press). Novice reflections during the transition to a new programming language. *Proceedings of the 53rd ACM Technical Symposium on Computer Science Education (SIGCSE)*.

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)*, 379–389. New York, NY: ACM.

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)*, 761–766. International Educational Data Mining Society.

Hutt, S., Ocumpaugh, J., Andres, J. Ma. 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)*, 580–587. International Educational Data Mining Society.

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)*, 680:1–12. New York, NY: ACM.

Williams-Dobosz, D., Azevedo, R. F. L., Jeng, A., Thakkar, V., Bhat, S., **Bosch, N.**, & Perry, M. (2021). A social network analysis of online engagement for college students traditionally underrepresented in STEM. *Proceedings of the 11th International Conference on Learning Analytics & Knowledge (LAK '21)*, 207–215. New York, NY: ACM.

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). International Educational Data Mining Society.

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). International Educational Data Mining Society.

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). International Educational Data Mining Society.

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). International Educational Data Mining Society.

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). Springer.

D'Angelo, C., Dyer, E., Krist, S., 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). International Society of the Learning Sciences.

Dyer, E., D'Angelo, C., **Bosch, N.**, Krist, S., & 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). International Society of the Learning Sciences.

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). International Society of the Learning Sciences.

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). ACM.

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). IEEE.

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). Springer.

Bosch, N., Huang, E., Angrave, L., & Perry, M. (2019). Modeling improvement for underrepresented minorities in online STEM education. In *Proceedings of the 27th Conference on User Modeling, Adaptation and Personalization (UMAP 2019)* (pp. 327–335). ACM.

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 Learning Analytics & Knowledge Conference (LAK19)* (pp. 383–390). ACM.

Bosch, N., Crues, R. W., & Shaik, N. (2018). Diverse learners, diverse motivations: Exploring the sentiment of learning objectives. In K. E. Boyer & M. V. Yudelson (Eds.), *Proceedings of the 11th International Conference on Educational Data Mining (EDM 2018)* (pp. 553–556). International Educational Data Mining Society.

Crues, R. W., **Bosch, N.**, Anderson, C. J., Perry, M., Bhat, S., & Shaik, N. (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)* (pp. 176–186). International Educational Data Mining Society.

Crues, R. W., **Bosch, N.**, Perry, M., Angrave, L., Shaik, N., & Bhat, S. (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* (10 pages). ACM.

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. du Boulay (Eds.), *Proceedings of the 19th International Conference on Artificial Intelligence in Education (AIED 2018)* (pp. 30–42). Springer.

Jiang, Y., **Bosch, N.**, Baker, R. S., Paquette, L., Ocumpaugh, J., Andres, J. M. A. L., … Biswas, G. (2018). Expert feature-engineering vs. deep neural networks: Which is better for sensor-free affect detection? In C. Rosé, R. Martínez-Maldonado, H. U. Hoppe, R. Luckin, M. Mavrikis, K. Porayska-Pomsta, … B. du Boulay (Eds.), *Proceedings of the 19th International Conference on Artificial Intelligence in Education (AIED 2018)* (pp. 198–211). Springer.

Paquette, L., **Bosch, N.**, Mercier, E., Jung, J., Shehab, S., & Tong, Y. (2018). Matching data-driven models of group interactions to video analysis of collaborative problem solving on tablet computers. In J. Kay & R. Luckin (Eds.), *Proceedings of the 13th International Conference of the Learning Sciences (ICLS) 2018, Volume 1* (pp. 312–319). International Society of the Learning Sciences.

Bosch, N., Crues, R. W., Henricks, G. M., Perry, M., Angrave, L., Shaik, N., … Anderson, C. J. (2018). Modeling key differences in underrepresented students' interactions with an online STEM course. In *Proceedings of TechMindSociety '18*. ACM.

Stewart, A., **Bosch, N.**, Chen, H., Donnelly, P. J., & D'Mello, S. K. (2017). Face forward: Detecting mind wandering from video during narrative film comprehension. In E. André, R. S. Baker, X. Hu, M. M. T. Rodrigo, & B. du Boulay (Eds.), *Proceedings of the 18th International Conference on Artificial Intelligence in Education (AIED 2017)* (pp. 359–370). Springer.

Stewart, A., **Bosch, N.**, & D'Mello, S. K. (2017). Generalizability of face-based mind wandering detection across task contexts. In X. Hu, T. Barnes, A. Hershkovitz, & L. Paquette (Eds.), *Proceedings of the 10th International Conference on Educational Data Mining (EDM 2017)* (pp. 88–95). International Educational Data Mining Society.

Khan, S., Suendermann-Oeft, D., Evanini, K., Williamson, D. M., Paris, S., Qian, Y., Huang, Y., **Bosch, N.**, D'Mello, S. K., Loukina, A., & Davis, L. (2017). MAP: Multimodal assessment platform for interactive communication competency. In S. Shehata & J. P.-L. Tan (Eds.), *Practitioner Track Proceedings of the 7th International Learning Analytics & Knowledge Conference (LAK17)* (pp. 6–12). SoLAR.

Hutt, S., Mills, C., **Bosch, N.**, Krasich, K., Brockmole, J., & D'Mello, S. K. (2017). Out of the fr-"eye"-ing pan: Towards gaze-based models of attention during learning with technology in the classroom. In *Proceedings of the 2017 Conference on User Modeling, Adaptation, and Personalization (UMAP 2017)* (pp. 94–103). ACM.

D'Mello, S. K., Mills, C., Bixler, R., & **Bosch, N.** (2017). Zone out no more: Mitigating mind wandering during computerized reading. In X. Hu, T. Barnes, A. Hershkovitz, & L. Paquette (Eds.), *Proceedings of the 10th International Conference on Educational Data Mining (EDM 2017)* (pp. 8–15). International Educational Data Mining Society.

D'Mello, S. K., Kopp, K., Bixler, R., & **Bosch, N.** (2016). Attending to attention: Detecting and combating mind wandering during computerized reading. In *Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems* (pp. 1661–1669). ACM.

Bosch, N., D'Mello, S. K., Baker, R. S., Ocumpaugh, J., Shute, V., Ventura, M., … Zhao, W. (2016). Detecting student emotions in computer-enabled classrooms. In *Proceedings of the 25th International Joint Conference on Artificial Intelligence (IJCAI 2016)* (pp. 4125–4129). AAAI Press.

Bosch, N. (2016). Detecting student engagement: Human versus machine. In *Proceedings of the 2016 Conference on User Modeling, Adaptation, and Personalization (UMAP 2016)* (pp. 317–320). ACM.

Dillon, J., **Bosch, N.**, Chetlur, M., Wanigasekara, N., Ambrose, G. A., Sengupta, B., & D'Mello, S. K. (2016). Student emotion, co-occurrence, and dropout in a MOOC context. In T. Barnes, M. Chi, & M. Feng (Eds.), *Proceedings of the 9th International Conference on Educational Data Mining (EDM 2016)* (pp. 353–357). International Educational Data Mining Society.

Stewart, A., **Bosch, N.**, Chen, H., Donnelly, P. J., & D'Mello, S. K. (2016). Where's your mind at? Video-based mind wandering detection during film viewing. In *Proceedings of the 2016 Conference on User Modeling, Adaptation, and Personalization (UMAP 2016)* (pp. 295–296). ACM.

Bosch, N., Chen, H., Baker, R., Shute, V., & D'Mello, S. K. (2015). Accuracy vs. availability heuristic in multimodal affect detection in the wild. In *Proceedings of the 17th International Conference on Multimodal Interaction (ICMI 2015)* (pp. 267–274). ACM.

Bosch, N., D'Mello, S. K., Baker, R., Ocumpaugh, J., Shute, V. J., Ventura, M., … Zhao, W. (2015). Automatic detection of learning-centered affective states in the wild. In *Proceedings of the 2015 International Conference on Intelligent User Interfaces (IUI 2015)* (pp. 379–388). ACM.

Kai, S., Paquette, L., Baker, R., **Bosch, N.**, D'Mello, S. K., Ocumpaugh, J., … Ventura, M. (2015). Comparison of face-based and interaction-based affect detectors in Physics Playground. In C. Romero, M. Pechenizkiy, J. Boticario, & O. Santos (Eds.), *Proceedings of the 8th International Conference on Educational Data Mining (EDM 2015)* (pp. 77–84). International Educational Data Mining Society.

Mills, C., D'Mello, S. K., **Bosch, N.**, & Olney, A. (2015). Mind wandering during learning with an intelligent tutoring system. In C. Conati, N. T. Heffernan, A. Mitrovic, & M. Felisa Verdejo (Eds.), *Proceedings of the 17th International Conference on Artificial Intelligence in Education (AIED 2015)* (pp. 267–276). Springer.

Bosch, N. (2015). Multimodal affect detection in the wild: Accuracy, availability, and generalizability. In *Proceedings of the 17th International Conference on Multimodal Interaction (ICMI 2015 doctoral consortium)* (pp. 645–649). ACM.

Bosch, N., D'Mello, S. K., Baker, R., Ocumpaugh, J., & Shute, V. J. (2015). Temporal generalizability of face-based affect detection in noisy classroom environments. In C. Conati, N. T. Heffernan, A. Mitrovic, & M. Felisa Verdejo (Eds.), *Proceedings of the 17th International Conference on Artificial Intelligence in Education (AIED 2015)* (pp. 44–53). Springer.

Chen, Y., **Bosch, N.**, & D'Mello, S. K. (2015). Video-based affect detection in noninteractive learning environments. In C. Romero, M. Pechenizkiy, J. Boticario, & O. Santos (Eds.), *Proceedings of the 8th International Conference on Educational Data Mining (EDM 2015)* (pp. 440–443). International Educational Data Mining Society.

Rodeghero, P., McMillan, C., McBurney, P. W., **Bosch, N.**, & D'Mello, S. K. (2014). Improving automated source code summarization via an eye-tracking study of programmers. In *Proceedings of the 36th International Conference on Software Engineering (ICSE 2014)* (pp. 390–401). ACM.

Bosch, N., & D'Mello, S. K. (2014). It takes two: Momentary co-occurrence of affective states during computerized learning. In S. Trausan-Matu, K. E. Boyer, M. Crosby, & K. Panourgia (Eds.), *Proceedings of the 12th International Conference on Intelligent Tutoring Systems (ITS 2014)* (pp. 638–639). Springer International Publishing.

Bosch, N., Chen, Y., & D'Mello, S. K. (2014). It's written on your face: Detecting affective states from facial expressions while learning computer programming. In S. Trausan-Matu, K. E. Boyer, M. Crosby, & K. Panourgia (Eds.), *Proceedings of the 12th International Conference on Intelligent Tutoring Systems (ITS 2014)* (pp. 39–44). Springer International Publishing.

Mills, C., **Bosch, N.**, Graesser, A., & D'Mello, S. K. (2014). To quit or not to quit: Predicting future behavioral disengagement from reading patterns. In S. Trausan-Matu, K. E. Boyer, M. Crosby, & K. Panourgia (Eds.), *Proceedings of the 12th International Conference on Intelligent Tutoring Systems (ITS 2014)* (pp. 19–28). Springer International Publishing.

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). Springer.

Bosch, N., D'Mello, S. K., & Mills, C. (2013). What emotions do novices experience during their first computer programming learning session? 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. 11–20). Springer.

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). Springer.

Book Chapters

Paquette, L., & **Bosch, N.** (2020). The invisible breadcrumbs of digital learning: How learner actions inform us of their experience. In M. Montebello (Ed.), *Handbook of Research on Digital Learning* (pp. 302–316). IGI Global.

D'Mello, S. K., **Bosch, N.**, & Chen, H. (2018). Multimodal, multisensory affect detection. In S. Oviatt, B. Schuller, P. Cohen, D. Sonntag, G. Potamianos, & A. Krüger (Eds.), *The Handbook of Multimodal-Multisensor Interfaces, Volume 2: Signal Processing, Architectures, and Detection of Emotion and Cognition* (pp. 167–202). ACM Books/Morgan Claypool.

Peer-reviewed Workshop Papers

Lee, H., Hur, P., Bhat, S., & **Bosch, N.** (2021). Promoting self-regulated learning in online learning by triggering tailored interventions. *W4U Workshop at the Educational Data Mining 2021 Conference*.

Bosch, N., & Paquette, L. (2017). Unsupervised deep autoencoders for feature extraction with educational data. In *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 and Tutoring Activities

- University of Illinois Urbana–Champaign
    - Instructor, *Concepts of Machine Learning* (IS 390CML) – Spring 2022
    - Instructor, *Data, Statistical Models, and Information* (IS 542/507) – Fall 2019, Spring 2020, Fall 2020, Fall 2021
    - Instructor, *Machine Learning Team Projects* (IS 590ML/557) – Spring 2019, Fall 2019, Spring 2021
    - 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)
    - Educational Psychology independent study advisor (EPSY 595) – Fall 2020 (1), Summer 2021 (1)
    - Informatics independent study advisor (INFO 597) – Fall 2020 (1)
    - Informatics individual undergraduate research (INFO 199/399) – Fall 2020 (1), Spring 2021 (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)
- Teachers Ranked as Excellent (University of Illinois teaching award) – Fall 2018, Fall 2019, Spring 2020, Fall 2020, Fall 2021
- Learning Analytics Learning Network tutorial event organizer/presenter – October 2020

Doctoral Advising

- Clara Belitz – Information Sciences
- Lan Jiang – Information Sciences
- Paul Hur – Information Sciences (Secondary co-advisor with Michael Twidale)

- HaeJin Lee – Information Sciences (Secondary co-advisor with Jana Diesner)
- Frank Stinar – Information Sciences
- Hannah Valdiviejas – Educational Psychology (Secondary co-advisor with Michelle Perry)
- Destiny Williams-Dobosz – Educational Psychology (Secondary co-advisor with Michelle Perry)

Master's Students Mentored

- University of Illinois Urbana–Champaign
    - 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

- University of Illinois Urbana–Champaign
    - HaeJin Lee (2021, First employment: Graduate student at UIUC)
    - Alistair Nunn (2020–2021)
    - Zihan Xiong (2020–present)
    - 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)

- University of Notre Dame
    - Yuxuan Chen (2013–2016, First employment: Graduate student at Columbia University)
    - Huili Chen (2015–2016, First employment: Graduate student at Massachusetts Institute of Technology)
    - Jianan Wang (2016)
    - Jacob Beiter (2016)
    - Timothy Pusateri (2015)

High School Students Mentored

- Connor Sullivan (2016)
- Gustavo Van Overberghe (2013–2014)

Professional Activities

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)

Journal Reviews

- ACM Transactions on Human–Robot Interaction (THRI)
- ACM Transactions on Knowledge Discovery from Data (TKDD)
- American Educational Research Journal (AERJ)
- Behavior Research Methods (BRM)
- British Journal of Educational Technology (BJET)
- Computers & Education
- Future Generation Computer Systems
- IEEE Access
- IEEE Transactions on Affective Computing (TAFFC)
- IEEE Transactions on Learning Technologies (TLT)
- Image and Vision Computing (IMAVIS)
- Information Sciences
- International Journal of Artificial Intelligence in Education (IJAIED)
- International Journal of Human–Computer Interaction (IJHCI)
- Journal of Educational Data Mining (JEDM)
- Journal of Learning Analytics (JLA)
- Learning and Individual Differences
- Pattern Recognition
- PLoS ONE
- Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies (IMWUT)
- Psychometrika

Conference Reviews

- AAAI Conference on Artificial Intelligence, 2016, 2021
- ACM CHI Conference on Human Factors in Computing Systems, 2017–2021
- ACM International Conference on Multimodal Interaction (ICMI), 2014–2021
- IEEE Conference on Automatic Face and Gesture Recognition (FG), 2018–2021
- IEEE Winter Conference on Applications of Computer Vision (WACV), 2020
- International Conference of the Learning Sciences (ICLS), 2018

- International Conference on Affective Computing and Intelligent Interaction (ACII), 2015, 2017, 2019
- International Conference on Artificial Intelligence in Education (AIED), 2017–2021
- International Conference on Educational Data Mining (EDM), 2014, 2015, 2017–2021

Conference Chairing

- 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, 2021
- APA Technology, Mind, and Society (TMS), 2019
- EDMGAMES Workshop at the Educational Data Mining Conference, 2019
- EuroCSS Workshop on Biases in Social Computing Data and Technology, 2018
- IJCAI Workshop on Artificial Intelligence in Affective Computing, 2017
- International Workshop on Empathetic Computing, 2014, 2015
- Society of Research on Educational Effectiveness Spring Conference (SREE), 2019, 2020

Grant/Fellowship Proposals Reviews and Panels

- Ad-hoc reviewer, National Institutes of Health (NIH), 2021
- Panelist, Institute of Education Sciences (IES), 2021
- Panelist, NSF Division of Graduate Education, 2021
- Panelist, National Science Foundation (NSF) Information & Intelligent Systems Division, 2020
- Ad-hoc reviewer, Technology Innovation in Educational Research and Design (TIER-ED) Pilot Projects, 2019 (2), 2021 (2)
- Ad-hoc reviewer, Technology Innovation in Educational Research and Design (TIER-ED) Student Fellows, 2020 (1)
- Ad-hoc reviewer, UIUC Campus Research Board, 2020 (3)

Service and Outreach

- STEM For All Video Showcase Presenter (TERC), 2020, 2021
- MS/IM Program Committee, School of Information Sciences, UIUC, 2019–2021
- Research Advisory Committee, School of Information Sciences, UIUC, 2019–2021
- Admissions Committee, School of Information Sciences, UIUC, 2019
- Illinois Science Olympiad State Tournament Judge, 2017–2019
- Northern Indiana Regional Science and Engineering Fair Judge, 2015, 2016
- University of Notre Dame Computer Science Graduate Student Board, 2014–2015, 2015–2016

- Notre Dame National Robotics Week Presenter, 2013