

Nigel Bosch

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Last Updated: February 16, 2018

Education

PhD, Computer Science (January 2017)
MS, Computer Science (May 2016)
Advisor: Dr. Sidney D'Mello
University of Notre Dame
Notre Dame, IN 46556

BS, Computer Science (May 2012)
Abilene Christian University
Abilene, TX 79699

Professional experience

2017 – Present: **Postdoctoral researcher**. National Center for Supercomputing Applications, University of Illinois Urbana-Champaign

2012 – 2017: **Graduate research assistant**. Emotive Computing Lab, University of Notre Dame

2010 – 2012: **Software development intern**. Milsoft Utility Solutions, Abilene, TX

Funding

2016: **Travel award (\$1449)**. 24th ACM Conference on User Modeling, Adaptation and Personalization (UMAP). National Science Foundation.

2015: **Travel award (\$2398)**. 17th ACM International Conference on Multimodal Interaction (ICMI). National Science Foundation.

2015: **Travel award (\$1250)**. 20th ACM Conference on Intelligent User Interfaces (IUI 2015). National Science Foundation.

2015: **Travel award (\$1000)**. 8th International Conference on Educational Data Mining (EDM 2015) and 17th International Conference on Artificial Intelligence in Education (AIED 2015). National Science Foundation.

2015: **Travel award (\$2600)**. 8th International Conference on Educational Data Mining (EDM 2015) and 17th International Conference on Artificial Intelligence in Education (AIED 2015). University of Notre Dame Professional Development and Graduate Student Union Conference Presentation Grant.

2013: **Travel award (\$1300)**. Doctoral Consortium at 16th International Conference on Artificial Intelligence in Education (AIED 2013). National Science Foundation.

Awards

UMAP 2017 best student paper award. 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). New York, NY: ACM.

EDM 2017 best student paper award. 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.

AIED 2015 best paper award. Bosch, N., D’Mello, S., 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). Berlin Heidelberg: Springer-Verlag.

EDM 2015 best student paper award. Kai, S., Paquette, L., Baker, R., Bosch, N., D’Mello, S., 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.

IUI 2015 honorable mention for best paper award. Bosch, N., D’Mello, S., 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). New York, NY: ACM.

ICSE 2014 ACM distinguished paper award. Rodeghero, P., McMillan, C., McBurney, P. W., Bosch, N., & D’Mello, S. (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). New York, NY: ACM.

Publications

Peer-reviewed published conference proceedings

- Paquette, L., Bosch, N., Mercier, E., Jung, J., Shehab, S., & Tong, Y. (in press). 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)*. International Society of the Learning Sciences, Inc.
- Bosch, N., Crues, R. W., Henricks, G. M., Perry, M., Angrave, L., Shaik, N., ... Anderson, C. J. (in press). Modeling key differences in underrepresented students' interactions with an online STEM course. In *Proceedings of TechMindSociety '18*. New York, NY: 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). Berlin Heidelberg: 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.
- Kahn, S., Suendermann-Oeft, D., Evanini, K., Williamson, D. M., Paris, S., Qian, Y., ... 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). New York, NY: 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). New York, NY: 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). Menlo Park, CA: 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). New York, NY: 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). New York, NY: ACM.
- Bosch, N., Chen, H., Baker, R., Shute, V., & D’Mello, S. (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). New York, NY: ACM.
- Bosch, N., D’Mello, S., 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). New York, NY: ACM.
- Kai, S., Paquette, L., Baker, R., Bosch, N., D’Mello, S., 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., 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). Berlin Heidelberg: Springer-Verlag.
- 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). New York, NY: ACM.
- Bosch, N., D’Mello, S., 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). Berlin Heidelberg: Springer-Verlag.

- Chen, Y., Bosch, N., & D’Mello, S. (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. (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). New York, NY: ACM.
- Bosch, N., & D’Mello, S. (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). Switzerland: Springer International Publishing.
- Bosch, N., Chen, Y., & D’Mello, S. (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). Switzerland: Springer International Publishing.
- Mills, C., Bosch, N., Graesser, A., & D’Mello, S. (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). Switzerland: Springer International Publishing.
- Bosch, N., & D’Mello, S. (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). Berlin Heidelberg: Springer-Verlag.
- Bosch, N., D’Mello, S., & 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). Berlin Heidelberg: Springer-Verlag.
- Mills, C., D’Mello, S., 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). Berlin Heidelberg: Springer-Verlag.

Journal publications

- 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. (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., 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.

Book chapters

D’Mello, S. K., Bosch, N., & Chen, H. (in press). Multimodal, multisensory affect detection. In S. Oviatt, B. Schuller, P. Cohen, D. Sonntag, G. Potamianos, & A. Krüger (Eds.), *The Handbook of Multimodal-Multisensor Interfaces*. ACM Books/Morgan Claypool.

Peer-reviewed workshop papers

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. (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).

Bosch, N., & D’Mello, S. (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).

Professional activities

Professional memberships (past and current)

- Association for Computing Machinery
- International Artificial Intelligence in Education Society
- International Educational Data Mining Society

Journal reviews

- British Journal of Educational Technology (BJET)
- IEEE Access

- IEEE Transactions on Affective Computing (TAFCC)
- IEEE Transactions on Learning Technologies (TLT)
- Image and Vision Computing (IMAVIS)
- International Journal of Human-Computer Interaction (IJHCI)

Conference reviews

- International Conference of the Learning Sciences (ICLS), 2018
- IEEE Conference on Automatic Face and Gesture Recognition (FG), 2017, 2018
- AAAI Conference on Artificial Intelligence, 2016
- International Conference on Intelligent Tutoring Systems (ITS), 2016
- ACM International Conference on Multimodal Interaction (ICMI), 2014-2017
- ACM CHI Conference on Human Factors in Computing Systems, 2017
- International Conference on Affective Computing and Intelligent Interaction (ACII), 2015, 2017
- International Conference on Artificial Intelligence in Education (AIED), 2017, 2018
- International Conference on Educational Data Mining (EDM), 2014, 2015, 2017
- International Workshop on Empathetic Computing, 2014, 2015

Service

- Illinois Science Olympiad State Tournament judge, 2017
- 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

Mentorship

Undergraduate students

- Yuxuan Chen
- Timothy Pusateri
- Huili Chen
- Jianan Wang
- Jacob Beiter
- Yurui Tong

High school students

- Gustavo Van Overberghe
- Connor Sullivan

Technical skills

Programming languages. Bash, C, C++, C#, Java, JavaScript, PHP, Python, R, Swift

Markup/query languages. CSS, HTML, SQL, XML

Platforms. Android, iOS/watchOS, Unix (Linux, Solaris, OSX), Windows, Web

Methodologies. Web development, distributed computing, machine learning, deep learning

Software tools. Apache, Chrome DevTools, Excel, Git, Keras, Mercurial, MySQL, Node.js, numpy/scipy, PostgreSQL, RapidMiner, scikit-learn, SPSS, SVN, TensorFlow, WEKA