

# Brandon M. Booth

Assistant Professor of Computer Science @ University of Memphis  
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## Education

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**PhD in Computer Science** 2014–2020

*University of Southern California*

Advisor: Shrikanth S. Narayanan

Title: *Improving Modeling of Human Experience and Behavior:*

*Methodologies for Enhancing the Quality of Human-produced Data and Annotations of Subjective Constructs*

**M.S in Computer Science** 2008–2011

*University of Southern California*

Emphasis on Game Development

**B.S. Computer Science and B.S. in Applied Mathematics** 2003–2007

*University of Colorado Boulder*

## Professional Appointments

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### Academic

**Assistant Professor of Computer Science** 2023–present

*Department of Computer Science*

University of Memphis

**Research Scientist II** 2022–2023

*Institute of Cognitive Science*

University of Colorado Boulder

**Research Scientist** 2020–2022

*Institute of Cognitive Science*

University of Colorado Boulder

**Research Assistant** 2015–2020

*Signal Analysis and Interpretation Laboratory*

University of Southern California

### Industry and Research

**Senior Software Engineer** 2012–2015

*Applied Minds*

Burbank, CA, USA

**Graphics and Core Software Engineer** 2012 Spring

*Seed Studio Inc.*

Los Angeles, CA, USA

**Game and Engine Software Engineer** 2008–2011

*Heavy Iron Studios*

Los Angeles, CA, USA

**Programming Intern** 2007 Summer

*Wideload Games Inc.*

Chicago, IL, USA

**Software Engineer**  
*Applied Math Department*  
University of Colorado Boulder

2004-2005

## Teaching

**Assistant Professor of Computer Science**  
*University of Memphis*  
Memphis, TN, USA

2023-present

**Guest Lecturer and Teaching Assistant**  
*University of Southern California*  
Los Angeles, CA, USA

2014-2015

**Game Programming Instructor**  
*Art Institute of Los Angeles*  
Los Angeles, CA, USA

2011 Summer/Fall

## Awards and Honors

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**2023:** ACM ICMI CONFERENCE: Outstanding Reviewer Award

**2023:** IEEE ICASSP CONFERENCE: Outstanding Reviewer Award

**2021:** ACM ICMI CONFERENCE: Top 5% Best Reviewer Award

**2021:** ACM UMAP CONFERENCE: Best Reviewer Award

**2019:** USC STEVENS CENTER FOR INNOVATION: Commercialization Award (TILES Audio Recorder)

**2018:** AUDIO/VISUAL EMOTION CHALLENGE (AVEC) WORKSHOP: Gold-standard Emotion Sub-challenge Winner

## External Funding

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### In Preparation/Under Review

**CogniVideo: An AI-enabled Adaptive Web-based Video Player for Personalized Self-regulated Learning**

2024

*Agency:* The Learning Academy (Tools Competition)

*PI:* **Booth** (PI), Kuhlmann (PI University of Memphis)

*Amount:* \$50k (requested)

*Status:* Under review

**Exploring In-the-Moment Motivation Profiles and Learning Behaviors during Mathematics Learning in MATHia**

2024

*Agency:* Institute of Educational Sciences

*PI:* Williams (PI University of Memphis), Windsor (Co-PI), Pavlik (Co-PI), **Booth** (Co-PI), Kuhlmann (Co-PI)

*Amount:* \$688.6k (requested)

*Status:* Under review

**Modeling High-stakes Selection using Forced Ordinal Preferences to Uncover Implicit and Algorithmic Biases: The Case of Automated Video Interviews**

2023

*Agency:* National Science Foundation (NSF 23-561)

*PI:* **Booth** (PI), D'Mello (Co-PI University of Colorado Boulder), Hickman (Co-PI Virginia Tech)

*Amount:* \$591.7k (requested)

*Status:* Under review

## Hybrid Human-Agent Tutoring (HAT) Platform to Accelerate Middle School Math Achievement for Low Income Students

2022

Agency: Schmidt Foundation (Learning Engineering Virtual Institute)

PI: D'Mello (PI University of Colorado Boulder), **Booth** (Senior Personnel)

Amount: \$12.5M (requested)

Status: Under review

### Funded

## Emotional State and Calibrated Trust in Human-Agent Teams: A Systematic Literature Review and Accompanying Meta-Analysis

2022

Agency: Toyota Research Institute

PI: Hirshfield (PI University of Colorado Boulder), D'Mello (Co-PI UCB), **Booth** (Co-PI)

Amount: \$54k awarded

Start date: November 14th, 2022

### Not Awarded

## Responsive Approaches In Science Exhibits (RAISE): Optimizing Productive Struggle for Empowered Learning

2021

Agency: National Science Foundation (NSF 20-607)

PI: Kipling (PI Boston Museum of Science), D'Mello (Co-PI University of Colorado Boulder), May (Co-PI Boston Museum of Science), Rappolt-Schlichtmann (Co-PI EdTogether), **Booth** (Senior Personnel)

Amount: \$2M (requested)

Review: Highly Competitive

## Publications

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Acceptance rates (AR) and five-year impact factors (IF) reported where available.

### In Press/Submitted

#### Book Chapters

**2024:** Jacobs J., Suresh A., **Booth B.**, Sumner T., Bush J., Brown C., D'Mello S. "Automating feedback from recorded instructional observations: Using AI to detect and support dialogic teaching." In S. Kelly (Ed), Research Handbook on Classroom Observation. Edward Elgar Publishing, 2024. [submitted]

#### Journals

**2024:** **Booth B.**, Narayanan S. "People Make Mistakes: Obtaining Accurate Ground Truth from Continuous Annotations of Subjective Constructs." Behavior Research Methods, 2023. [in revision] (IF=6.0)

#### Conferences

**2024:** **Booth B.M.**, Jacobs J., Bush J.B., Milne B., Fischaber T., D'Mello S.K. "Human-tutor Coaching Technology (HTCT): Automated Discourse Analytics in a Coached Tutoring Model." LAK24: 14th International Learning Analytics and Knowledge Conference, 2024. [accepted]

### Journals

**2023:** Paromita P., Mundnich K., **Booth B.M.**, Narayanan S.S., Chaspari T. "Modeling Inter-individual Differences in Ambulatory-based Multimodal Signals via Metric Learning: A Case study of personalized well-being estimation of healthcare workers." Frontiers in Digital Health, 2023.

**2023:** **Booth B.**, Bosch N., D'Mello S. "Engagement Detection and its Applications in Learning: A Tutorial and Selective Review." Proceedings of the IEEE, Special Issue on Affective Computing. IEEE, 2023. (IF=14.9)

**2022:** D'Mello S., **Booth B.** "Affect Detection from Wearables in the 'Real' Wild: Fact, Fantasy, or Somewhere Inbetween?" IEEE Intelligent Systems, 2022. (IF=6.7)

**2022:** Yau J., Girault B., Feng T., Mundnich K., Nadarajan A., **Booth B.**, Hsieh E., Narayanan S. "TILES-2019, A Longitudinal Physiologic and Behavioral Data Set of Medical Residents in an Intensive Care Unit." Nature Scientific

Data, 2022. (IF=6.7)

**2022: Booth B.**, Vrzakova H., Mattingly S., Martinez G., Faust L., D'Mello S. "Toward Robust Stress Prediction in the Age of Wearables: Modeling Perceived Stress in a Longitudinal Study with Information Workers." *Transactions on Affective Computing*, 2022. (IF=10.7)

**2022:** Huggins-Manley, C., **Booth B.**, D'Mello S. "Toward Argument-based Fairness with an Application to AI-Enhanced Educational Assessments." *Journal of Educational Measurement*, 2022. (IF=1.5)

**2022:** Tay L., Woo S., Hickman L., **Booth B.**, D'Mello S. "A Conceptual Framework for Investigating and Mitigating Machine Learning Bias (MLMB) in Psychological Assessment." *Advances in Methods and Practices in Psychological Science*, 2022.

**2021: Booth B.**, Hickman L., Subburaj S., Tay L., Woo S., D'Mello S. "Integrating Psychometrics and Computing Perspectives on Bias and Fairness in Affective Computing: A Case Study of Automated Video Interviews." *Signal Processing Magazine, Special Issue on Affective Computing. IEEE*, 2021. (IF=11.1)

**2021:** Feng T., **Booth B.**, Baldwin-Rodriguez B., Osorno F., Narayanan S. "A Multimodal Analysis of Physical Activity, Sleep, and Work Shift in Nurses with Wearable Sensor Data." *Nature Scientific Reports*, 2021. (IF=4.4)

**2020:** Ravuri V., Paromita P., Mundnich K., Nadarajan A., **Booth B.**, Narayanan S., Chaspari T. "Investigating Group-specific Models of Hospital Workers' Well-being: Implications for Algorithmic Bias." *International Journal of Semantic Computing*, 2020.

**2020:** K. Mundnich, **B. M. Booth**, M. L'Hommedieu, J. L'Hommedieu, M. Wildman, T. Feng, B. Girault, S. Skaaden, A. Nadarajan, J. L. Villatte, T. H. Falk, K. Lerman, E. Ferrara, and S. Narayanan, "TILES-2018, A Longitudinal Physiologic and Behavioral Data Set of Hospital Workers", *Nature Scientific Data*, 2020. (IF=6.7)

**2019:** Mundnich K., **Booth B.M.**, Girault B., Narayanan S., "Generating Labels for Regression of Subjective Constructs using Triplet Embeddings", *Pattern Recognition Letters*, 2019. (IF=4.8)

**2019: B. M. Booth**, K. Mundnich, T. Feng, A. Nadarajan, T. H. Falk, J. L. Villatte, E. Ferrara, and S. Narayanan, "Multimodal Human and Environmental Sensing for Longitudinal Behavioral Studies in Naturalistic Settings: Framework for Sensor Selection, Deployment, and Management", *Journal of Medical Internet Research*, vol. 21, no. 8, e12832, 2019. (IF=6.0)

## Conferences

**2023:** Moulder B., **Booth B.**, Abitino A., D'Mello S. "Recurrence Quantification Analysis of Eye Gaze Dynamics During Team Collaboration." *LAK23: 13th International Learning Analytics and Knowledge Conference*, 2023.

**2021: Booth B.**, Hickman L., Subburaj S., Tay L., Woo S., D'Mello S. "Bias and Fairness in Multimodal Machine Learning: A Case Study of Automated Video Interviews.", *International Conference on Multimodal Interaction*, 2021. (AR=20% for oral)

**2020:** Ravuri, V., Paromita P., Mundnich K., Nadarajan A., **Booth B.**, Narayanan S., Chaspari T., "Group-specific models of healthcare workers' well-being using iterative participant clustering." *2020 Second International Conference on Transdisciplinary AI (TransAI). IEEE*, 2020.

**2020: Brandon M. Booth** and Shrikanth S. Narayanan, "Fifty Shades of Green: Towards a Robust Measure of Inter-annotator Agreement for Continuous Signals", In *2020 International Conference on Multimodal Interaction*, 2020. (AR=38%)

**2020: Brandon M. Booth** and Shrikanth S. Narayanan, "Trapezoidal Segment Sequencing: A Novel Approach for Fusion of Human-produced Continuous Annotations", In *2020 IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP)*, IEEE, 2020.

**2020:** G. Hadjiantonis, P. Paromita, K. Mundnich, A. Nadarajan, **B.M. Booth**, S. Narayanan, T. Chaspari, "Dynamical Systems Modeling of Day-to-day Signal-based Patterns of Emotional Self-regulation and Stress Spillover in Highly-demanding Health Professions", In *Engineering in Medicine and Biology Society (EMBC), 2020 42nd Annual International Conference of the IEEE*, IEEE, 2020.

**2020:** Tiantian Feng, **Brandon M. Booth**, Shrikanth Narayanan. "Modeling Behavior as Mutual Dependency Between Physiological Signals and Indoor Location in Large-scale Wearable Sensor Study", In *2020 IEEE International Conference*

on Acoustics, Speech, and Signal Processing (ICASSP), 2020.

**2019: Brandon M. Booth**, Shrikanth S. Narayanan. "Trapezoidal Segmented Regression: A Novel Continuous-scale Real-time Annotation Approximation Algorithm", In Affective Computing Intelligent Interaction (ACII), 2019. (AR=29%)

**2019: Brandon M. Booth**, Tiantian Feng, Abhishek Jangalwa, Shrikanth S. Narayanan. "Toward Robust Interpretable Human Movement Pattern Analysis in a Workplace Setting." IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP), 2019.

**2019:** Wildman M., Eulogio R., Singh R., Ramirez E., Foschini L., Nadarajan A., **Booth B.**, Mundnich K., Ferrara E., Lerman K., Narayanan S. "Comparison of Heart Rate Measurement Between the Fitbit Charge 2 and OMSignal Smart Garments: A Free Living Study", Society for Behavioral Medicine (SBM), 2019.

**2018: Brandon M. Booth**, Karel Mundnich, and Shrikanth S. Narayanan. "Fusing Annotations with Majority Vote Triplet Embeddings." In Proceedings of the 8th International Workshop on Audio/Visual Emotion Challenge, ACM, 2018. **[winner of gold-standard emotion sub-challenge]**

**2018: Brandon M. Booth**, Taylor J. Seamans, Shrikanth S. Narayanan. "An Evaluation of EEG-based Metrics for Engagement Assessment of Distance Learners." In Engineering in Medicine and Biology Society (EMBC), 2018 40th Annual International Conference of the IEEE, IEEE, 2018.

**2018:** Tiantian Feng, Amrutha Nadarajan, Colin Vaz, **Brandon Booth**, and Shrikanth Narayanan. "TILES audio recorder: an unobtrusive wearable solution to track audio activity." In Proceedings of the 4th ACM Workshop on Wearable Systems and Applications, pp. 33-38. ACM, 2018. **[Patent pending]**

**2018: Brandon M. Booth**, Karel Mundnich, and Shrikanth S. Narayanan. "A Novel Method for Human Bias Correction of Continuous-time Annotations." In Acoustics, Speech and Signal Processing (ICASSP), 2018 IEEE International Conference on, IEEE, 2018.

**2017: Brandon M. Booth**, Asem M. Ali, Shrikanth S. Narayanan, Ian Bennett, and Aly A. Farag. "Toward active and unobtrusive engagement assessment of distance learners." In Affective Computing and Intelligent Interaction (ACII), 2017 Seventh International Conference on, pp. 470-476. IEEE, 2017.

**2016:** Somandepalli, Krishna, Rahul Gupta, Md Nasir, **Brandon M. Booth**, Sungbok Lee, and Shrikanth S. Narayanan. "Online affect tracking with multimodal kalman filters." In Proceedings of the 6th International Workshop on Audio/Visual Emotion Challenge, pp. 59-66. ACM, 2016.

**2016: Brandon M. Booth**, Rahul Gupta, Pavlos Papadopoulos, Ruchir Travadi, and Shrikanth S. Narayanan. "Automatic Estimation of Perceived Sincerity from Spoken Language." In INTERSPEECH, pp. 2021-2025. 2016.

## Books

**2007:** John P. Flynt and **Brandon Booth**. "Unreal Tournament Game Programming for Teens." Boston, MA: Thomson Course Technology, 2007.

## Invited Talks

**February 2024:** Round table discussion. *Policy Talks 2024: A National Convening on Ethics, Narratives, and Artificial Intelligence*, The Center for Practical Ethics, University of Mississippi.

**April 2023:** Booth, B. *Introduction to Multimodal Machine Learning*, Introduction to Multimodal Machine Learning Course, Computer & Information Science & Engineering Department, University of Florida.

**September 2022:** Booth, B. *Machine Intelligence for Naturalistic Human Behavior and Experience Modeling*, Institute of Cognitive Science Colloquium, University of Colorado Boulder.

**February 2022:** Booth, B. *Integrating Psychometrics and Computing Perspectives on Bias and Fairness in Affective Computing*, Data Justice Lab Seminar Series, Texas A&M Institute of Data Science. (virtual event)

**April 2021:** Booth, B. *Integrating Psychometrics and Computing Perspectives on Bias and Fairness in Affective Computing: A Case Study of Automated Video Interviews*, AI Institute for Student-AI Teaming, University of Colorado Boulder. (virtual event)

**April 2021:** Booth, B. *Human Perception and Behavioral Machine Intelligence*, Tech Talk, Applied Invention, LLC.

(virtual event)

**November 2019:** Booth, B. *Why Data Scientists Should Get Their Hands Dirty*, Computer Science Colloquium, Colorado State University.

**July 2019:** Booth, B. *Identifying and Correcting Human-produced Artifacts in Continuous Annotations of Subjective Constructs*, Tech Talk, Evidation Health, Inc. (virtual event)

## Service

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**Review Services:** IEEE Transactions on Affective Computing, IEEE Signal Processing Magazine, IEEE Journal of Selected Topics in Signal Processing, Nature Scientific Data, Nature Mental Health, Journal of Medical Internet Research, Open Journal of Signal Processing, Frontiers in Computer Science, ACM Journal of User Modeling and User-Adapted Interaction, ACM Interactive Mobile Wearable and Ubiquitous Technologies Journal, ACM Transactions on Knowledge Discovery from Data Journal, ACM International Conference on Multimodal Interaction, IEEE International Conference on Acoustics Speech and Signal Processing, IEEE Conference on Affective Computing and Intelligent Interaction, ACM User Modeling Adaptation and Personalization, ACM Multimedia, IAPR International Conference on Biometrics, IEEE Engineering in Medicine and Biology Conference

**Program Committees:** 2024 Association for the Advancement of Artificial Intelligence, 2022 ACM International Conference on Multimodal Interaction, 2022 IEEE International Conference on Affective Computing and Intelligent Interaction (ACII), 2021-2022 ACM User Modeling Adaptation and Personalization (UMAP), 2021 ACII Outstanding Dissertation Award Committee

## Teaching and Mentorship

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### Courses Taught

**2023–2024:** **Introduction to Human-Computer Interaction** (co-instructor), University of Memphis. [undergraduate/graduate]

**2023–2024:** **Capstone Software Project** (co-instructor), University of Memphis. [undergraduate]

**2022-2023:** **Computer Science Colloquium** (teaching assistant), University of Colorado Boulder. [graduate]

**2016:** **Introduction to Computing** (teaching assistant, recitation lecturer), University of Southern California. [undergraduate]

**2015:** **Computer Graphics** (teaching assistant and guest lecturer), University of Southern California. [graduate]

**2011:** **Coding for Games**, (curriculum enhancement and teaching), Art Institute Los Angeles. [undergraduate]

**2011:** **Game Tools**, (full curriculum development and teaching), Art Institute Los Angeles. [undergraduate]

### Outreach

**2021-2022:** AI Club Research Mentor and Invited Speaker, *Rock Canyon High School*

**2020-2021:** Research Mentor, Boulder Valley School District Science Research Seminar, *Boulder Valley High School*.

**2020:** Robotics Mentor, *Colorado Early College Fort Collins*.

## Leadership and Teamwork

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**2024:** Doctoral Symposium Chair for the International Conference on Multimodal Interaction (ICMI '24)

**2023–2024:** Community Web Resources Coordinator for the Association for the Advancement in Affective Computing (AAAC).

**2023:** Special Session Organizer for the International Conference on Biomedical and Health Informatics (BHI '23): *Trustworthy and responsible data analytics for mental health*.

**2020–2022:** Project lead for a general purpose machine learning library compatible with Tensorflow, PyTorch, Scikit Learn, and other back-ends, used by *Emotive Computing Lab*.

**2018–2022:** Co-managed sensor testing, participant testing, installation, deployment, and monitoring for large-scale in situ study of hospital workers (TILES) through the *University of Southern California*. Developed website and hosting

services for public data set access.

**2014–2015:** Managed team of dozens of masters students to develop the multimodal *Experience Lab* for human behavior studies at the *University of Southern California*.

**2013:** NASA Sample Return Challenge participant, *Worcester Polytechnic Institute*.

- Worked with team of professional roboticists and engineers to develop an autonomous robot capable of locating, collecting, and returning various objects hidden in an unfamiliar environment

**2005–2007:** Science Olympiad judge for Colorado state-wide competitions

**2005–2007:** Competitor in the Mathematical Contest in Modeling, *University of Colorado Boulder*

- Modeled traffic flow at toll booths and proposed an optimal toll booth-to-lanes ratio. **Received honorable mention.**
- Explored and constructed measures of fairness for Congressional redistricting to avoid gerrymandering and proposed a fair district assignment. **Received meritorious award.**
- Modeled the spreading of AIDS in Africa and considered the impact of varying degrees of protection and United Nations aid. **Received honorable mention.**