

Brandon M. Booth

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Last Updated: March 26, 2025

Education

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

Academic

Assistant Professor of Computer Science 2023–present

Department of Computer Science (full time)

University of Memphis

Research Scientist II 2022–2023

Institute of Cognitive Science (full time)

University of Colorado Boulder

Research Scientist 2020–2022

Institute of Cognitive Science (full time)

University of Colorado Boulder

Research Assistant 2015–2020

Signal Analysis and Interpretation Laboratory (part time)

University of Southern California

Industry and Research

Senior Software Engineer 2012–2015

Applied Minds (full time)

Burbank, CA, USA

Graphics and Core Software Engineer 2012 Spring

Seed Studio Inc. (full time)

Los Angeles, CA, USA

Game and Engine Software Engineer 2008–2011

Heavy Iron Studios (full time)

Los Angeles, CA, USA

Programming Intern 2007 Summer

Wideload Games Inc. (full time)

Chicago, IL, USA

Software Engineer

2004-2005

Applied Math Department (part time)
University of Colorado Boulder

Teaching

Assistant Professor of Computer Science

2023-present

University of Memphis (full time)
Memphis, TN, USA

Guest Lecturer and Teaching Assistant

2014-2015

University of Southern California (part time)
Los Angeles, CA, USA

Game Programming Instructor

2011 Summer/Fall

Art Institute of Los Angeles (part time)
Los Angeles, CA, USA

Awards and Honors

2025: UOFM DIVISION OF RESEARCH AND INNOVATION: First-time Principal Investigator Award

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

In Preparation/Under Review

Planning Grant: Tracing Middle School Students Self-Regulated Learning in Autonomous Video-Based Learning Environments with Digital Data from Khan Academy

2025

Agency: Bill and Melinda Gates Foundation (BMGF)

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

Amount: \$10k (requested)

Status: In preparation

Developing Self-regulated, Engaged, Adaptive Learners: Transforming Post-secondary Instruction Through GenAI

2025

Agency: Institute of Educational Sciences (IES)

PI: Sabatini (PI University of Memphis), Rus (Co-PI), Pavlik (Co-PI), Kuhlmann (Co-PI), **Booth** (Co-PI)

Amount: \$1,698,859 (requested)

Status: Under review

CyberTraining: Implementation: Small: Empowering Trustworthy AI for Multidisciplinary Sciences on GPU Cyberinfrastructure

2025

Agency: National Science Foundation (CyberTraining)

PI: Huang (PI University of Memphis), **Booth** (Co-PI)

Amount: \$500k (requested)

Status: Under review

Collaborative Research: HCC: Small: Enhancing Human-AI Collaboration in High-stakes Selection: Integrating Human Preferences with Ratings in Video Assessments	2025
<i>Agency:</i> National Science Foundation (CISE)	
<i>PI:</i> Booth (PI), Hickman (Co-PI Virginia Tech), D'Mello (Co-PI University of Colorado Boulder)	
<i>Amount:</i> \$326,769 (requested)	
<i>Status:</i> Under review	
Funded	
NSF Student Travel Grant for 2024 ACM International Conference on Multimodal Interaction (ACM ICMI)	2024
<i>Agency:</i> National Science Foundation (IIS #2430047)	
<i>PI:</i> Booth (PI)	
<i>Amount:</i> \$12.2k awarded	
<i>Period:</i> 2024-2025	
Emotional State and Calibrated Trust in Human-Agent Teams: A Systematic Literature Review and Accompanying Meta-Analysis	2022
<i>Agency:</i> Toyota Research Institute	
<i>PI:</i> Hirshfield (PI University of Colorado Boulder), D'Mello (Co-PI UCB), Booth (Co-PI)	
<i>Amount:</i> \$54k awarded	
<i>Period:</i> 2022-2023	
Hybrid Human-Agent Tutoring (HAT) Platform to Accelerate Middle School Math Achievement for Low Income Students	2022
<i>Agency:</i> Various non-profits (withheld at request of funders)	
<i>PI:</i> D'Mello (PI University of Colorado Boulder), Sumner (Co-PI UCB), Booth (Senior Personnel)	
<i>Amount:</i> \$8.9M awarded	
<i>Period:</i> 2022-2027	
Not Awarded	
A Clinical Trial of Virtual Reality Using Cue Exposure: An Innovative Technology for Tobacco Cessation Among African American Dual Users	2025
<i>Agency:</i> National Institutes of Health (NIH)	
<i>PI:</i> El Hajj (Lead PI), Booth (Co-I), Brodt (Co-I), Jiang (Co-I), Haddad (Co-I)	
<i>Amount:</i> \$385,834 (requested)	
Exploring In-the-Moment Motivation Profiles and Learning Behaviors During Mathematics Learning in MATHia	2025
<i>Agency:</i> National Science Foundation	
<i>PI:</i> Williams (PI University of Memphis), Windsor (Co-PI), Pavlik (Co-PI), Booth (Co-PI), Kuhlmann (Co-PI)	
<i>Amount:</i> \$1,498,693 (requested)	
Longitudinally Predicting and Tracing Self-Regulated Learning Across STEM Gateway Courses to Enhance Persistence and Success in STEM Majors	2025
<i>Agency:</i> National Science Foundation (ECR Core)	
<i>PI:</i> Kuhlmann (PI University of Memphis), DeYonker (Co-PI), Booth (Co-PI), Abell (Co-PI), Sabatini (Co-PI), Johnson (Co-PI)	
<i>Amount:</i> \$1,260,981 (requested)	
US Spanish: A Gamified Introduction Through an App	2025
<i>Agency:</i> National Endowment for the Humanities (NEH)	
<i>PI:</i> Ortega-Santos (PI University of Memphis), Toledo (Co-PI), Vann (Co-PI), Booth (Co-PI)	
<i>Amount:</i> \$27.6k (requested)	

CogniVideo: An AI-enabled Adaptive Web-based Video Player for Personalized Self-regulated Learning	2024
<i>Agency:</i> The Learning Academy (Tools Competition)	
<i>PI:</i> Booth (PI), Kuhlmann (PI University of Memphis)	
<i>Amount:</i> \$50k (requested)	
Exploring In-the-Moment Motivation Profiles and Learning Behaviors During Mathematics Learning in MATHia	2024
<i>Agency:</i> Institute of Educational Sciences	
<i>PI:</i> Williams (PI University of Memphis), Windsor (Co-PI), Pavlik (Co-PI), Booth (Co-PI), Kuhlmann (Co-PI)	
<i>Amount:</i> \$688.6k (requested)	
Modeling High-stakes Selection using Forced Ordinal Preferences to Uncover Implicit and Algorithmic Biases: The Case of Automated Video Interviews	2023
<i>Agency:</i> National Science Foundation (NSF 23-561)	
<i>PI:</i> Booth (PI), D'Mello (Co-PI University of Colorado Boulder), Hickman (Co-PI Virginia Tech)	
<i>Amount:</i> \$591.7k (requested)	
Responsive Approaches In Science Exhibits (RAISE): Optimizing Productive Struggle for Empowered Learning	2021
<i>Agency:</i> National Science Foundation (NSF 20-607)	
<i>PI:</i> 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)	
<i>Amount:</i> \$2M (requested)	
<i>Review:</i> Highly Competitive	

Publications

Acceptance rates (AR), five-year impact factors (IF), or H5 indices (H5) reported where available.

Journals

2024: Kerschbaumer S., Voracek M., Aczél B., Anderson S.F., **Booth B.M.**, Buchanan E.M., Carlsson R., Heck D.W., Pauliina A., Hiekkaranta R.H., Karch J.D. "VALID: a checklist-based approach for improving validity in psychological research." *Adv. Meth. Pract. Psychol. Sci.* 2024. (H-index=42)

2024: Hickman L., Huynh C., Gass J., **Booth B.**, Kuruzovich J., Tay L. "Whither Bias Goals, I Will Go: An Integrative Systematic Review of Algorithmic Bias Mitigation." *Journal of Applied Psychology*, 2024. (H-index=340)

2024: **Booth B.**, Narayanan S. "People Make Mistakes: Obtaining Accurate Ground Truth from Continuous Annotations of Subjective Constructs." *Behavior Research Methods*, 2024. (IF=7.2)

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

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. (AR=30%)

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 and Book Chapters

- 2025:** 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, March 2025.
- 2007:** John P. Flynt and **Brandon Booth**. "Unreal Tournament Game Programming for Teens." Boston, MA: Thomson Course Technology, 2007.

Invited Talks

- October 2024:** *AI Ethics and Education Special Interest Group panel* invitee. American Education Research Association (virtual event)
- June 2024:** Windsor, A., **Booth, B.** *A Tutorial and Educational Applications for Generative AI*, West Tennessee STEM Hub for K-12 Educators, University of Memphis.
- 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

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, 2022-2024 ACM International Conference on Multimodal Interaction, 2022-2024 IEEE International Conference on Affective Computing and Intelligent Interaction (ACII), 2021-2024 ACM User Modeling Adaptation and Personalization (UMAP), 2021 ACII Outstanding Dissertation Award Committee

Teaching and Mentorship

Courses Taught

2023–2025: **Capstone Software Project**, University of Memphis. [undergraduate]

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

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

July 2024: CodeCrew Summer Camp Invited Speaker, *University of Memphis*

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

2023–2025: Community Web Resources Coordinator for the Association for the Advancement in Affective Computing (AAAC).

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

2023: Special Session Co-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.**