

# MAITHILEE KUNDA

## ASSISTANT PROFESSOR OF COMPUTER SCIENCE

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## EDUCATION

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**Georgia Tech**, Atlanta, GA, USA. Ph.D. in Computer Science, 2013.

**MIT**, Cambridge, MA, USA. B.S. in Mathematics with Computer Science, 2006.

## PROFESSIONAL POSITIONS

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**Assistant Professor of Computer Science.** Department of Computer Science, Vanderbilt University, 2021 – present.

**Assistant Professor of Computer Science and Computer Engineering.** Department of Electrical Engineering and Computer Science, Vanderbilt University, 2016 – 2021.

**Research Scientist.** School of Interactive Computing, Georgia Tech, 2013 – 2015.

**Research Assistant.** School of Interactive Computing, Georgia Tech, 2006 – 2013.

**Consultant and Research Scientist.** Aerotonomy, Inc. (part-time), 2004 – 2011.

**Research Fellow.** Environmental Sciences Division, Oak Ridge National Lab, 2004 – 2006.

**Research Assistant.** Computer Science and Artificial Intelligence Laboratory, MIT, 2004 – 2006.

## AWARDS AND HONORS

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**Research featured on CBS 60 Minutes with Anderson Cooper.** Technology demo featured as part of segment on, “Recruiting for talent on the autism spectrum.” October 4, 2020.

**Patrick Henry Winston Award for Best Student Paper on Cognitive Systems**, led by PhD student Yuan Yang, Eighth Annual Conference on Advances in Cognitive Systems, 2020.

**Conference Keynote.** Int. Conf. Computational Modeling (ICCM), Montreal, Canada, 2019.

**Finalist for NSF 2026 Idea Machine**, on team led by Keivan Stassun, Vanderbilt. *Harnessing the Human Diversity of Mind* selected in top 33 finalists in national competition, 2019.

**Vanderbilt Provost Research Studio Award.** Vanderbilt University, Office of the Provost, 2017.

**Notable Alumna Award.** Girls Preparatory School, Chattanooga, TN, 2017.

**MIT Tech Review 35 Innovators Under 35.** MIT Technology Review, 2016. Recognized in the category of “visionary” for research at the intersection of AI, visual thinking, and autism.

**IJCAI Outstanding Reviewer Award.** International Joint Conference on Artificial Intelligence (IJCAI), 2016. Awarded to ~10% of program committee members.

**Rising Stars in EECS.** MIT/Berkeley EECS Departments, 2014. Awarded annually to “approximately 40 outstanding EECS graduate and postdoctoral women.”

**GVU Foley Scholar.** GVU Center, Georgia Tech, 2010. “Foley Scholar awards are determined from a pool of applicants on a merit basis for overall brilliance and potential impact.”

**Google Anita Borg Memorial Scholar.** Google, 2010. "Scholarships will be awarded based on the strength of each candidate's academic background and demonstrated leadership."

**Graduate Research Fellowship Program (GRFP).** National Science Foundation, 2009 – 2011.

**Research Excellence Commendation.** School of Interactive Computing, Georgia Tech, 2008.

**National Defense Science & Engineering Graduate (NDSEG) Fellowship.** DoD, 2006 – 2009.

**Higher Education Research Experience (HERE) Fellowship.** Oak Ridge National Lab, 2006.

**Undergraduate Research Opportunity Program (UROP) Scholarship.** MIT, 2005.

**Global Change Education Program (GCEP) Fellowship.** Department of Energy, 2004 – 2006.

**Research Experience for Undergraduates (REU) Program.** National Science Foundation, 2003.

## TEACHING

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**Instructor,** Computer Science, Vanderbilt University.

- *Advanced Artificial Intelligence*, grad (Spr2020, Spr2021).
- *Artificial Intelligence*, undergrad/grad (Fa2019, Fa2020, Fa2021).
- *Machine Learning / Projects in AI*, undergrad/grad (Spr2017, Spr2018, Spr2019).
- *Computation and Cognition*, grad (Spr2016, Fa2017).
- *Imagery-based Artificial Intelligence*, grad (Fa2016, Fa2018).

**Instructor,** School of Interactive Computing, Georgia Tech.

- *Intro CogSci for CS*, grad (Sum2013, Sum2015), undergrad (Sum2013, Sum2015, Fa2013).
- *Computing and Society*, undergrad (Spr2015).

**Co-Instructor,** School of Interactive Computing, Georgia Tech.

- *Computational Creativity/Knowledge-Based Modeling & Design*, undergrad/grad (Spr2013).

**Guest lectures**

- *Child-Computer Interaction.* University of Washington. February 11, 2021.
- *Artificial Intelligence.* Franklin & Marshall College. September 21, 2020.
- *Neurodiversity-Inspired Science & Engineering.* Vanderbilt. Sep 9, Sep 23, 2020. Mar. 10, 2021.
- *The Visual System.* Vanderbilt. April 10, 2017. April 19, 2019.
- *Georgia Leadership and Education in Neurodevelopmental & Related Disabilities (GA LEND).* Georgia State University, in partnership with Georgia Tech, Emory, Morehouse School of Medicine, and the CDC. May 21, 2012. May 9, 2013.

## PUBLICATIONS

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### JOURNAL PAPERS

- [J.1] Rashedi, R., Bonnet, K., Schulte, R., Schlundt, D., Swanson, A., Kinsman, A., Bardett, N., Warren, Z., Juarez, P., Biswas, G., & Kunda, M. (2021). Opportunities and challenges in developing technology-based social skills interventions for adolescents with autism spectrum disorder: A qualitative analysis of parent perspectives. *Journal of Autism and Developmental Disorders*.
- [J.2] Kunda, M. (2020). AI, visual imagery, and a case study on the challenges posed by human intelligence tests. *Proc. National Academy of Sciences*, 117 (47), 29390-29397.

- [J.3] Kunda, M. (2018). Visual mental imagery: A view from artificial intelligence. *Cortex*, 105, 155-172.
- [J.4] Brown, E., Park, S., Warford, N., Seiffert, A., Kawamura, K., Lappin, J., and Kunda, M. (2018). An architecture for spatiotemporal template-based search. *Advances in Cognitive Systems*, 6, 101-118.
- [J.5] Kunda, M., Soulières, I., Rozga, A., & Goel, A. K. (2016). Error patterns on the Raven's Standard Progressive Matrices Test. *Intelligence*, 59, 181-198.
- [J.6] Kunda, M., and Ting, J. (2016). Looking around the mind's eye: Attention-based access to visual search templates in working memory. *Advances in Cognitive Systems*, 4, 113-129.
- [J.7] McGreggor, K., Kunda, M., & Goel, A. K. (2014). Fractals and Ravens. *Artificial Intelligence*, 215, 1-23.
- [J.8] Kunda, M., McGreggor, K., & Goel, A. K. (2013). A computational model for solving problems from the Raven's Progressive Matrices intelligence test using iconic visual representations. *Cognitive Systems Research*, 22-23, 47-66.
- [J.9] Kunda, M., & Goel, A. K. (2011). Thinking in Pictures as a cognitive account of autism. *Journal of Autism and Developmental Disorders*, 41 (9), 1157-1177.
- [J.10] Neidhoefer, J., Gibson, C., Kunda, M., and Johnson, E. (2007). Determinism and autonomy in the National Airspace System (NAS). *Journal of Aerospace Computing, Information, and Communication*, 4 (11), 1037-1045.

#### PEER-REVIEWED CONFERENCE AND WORKSHOP PAPERS

- [C.1] Dunn, A., Qiao, A., Johnson, M., & Kunda, M. (2021). "Measuring more to learn more from the block design test: A literature review." *Proceedings of the Annual Meeting of the Cognitive Science Society*. **22% oral acceptance rate.**
- [C.2] Chen Z., Li S., Rashedi R., Zi X., Elrod-Erickson M, Hollis B., Maliakal A., Shen X., Zhao S., & Kunda M. (2020). Creating and characterizing datasets for social visual question answering. *IEEE International Conference on Development and Learning and Epigenetic Robotics (ICDL/EPIROB)*.
- [C.3] Yang, Y., McGreggor, K., and Kunda, M. (2020). Not quite any way you slice it: How different analogical constructions affect Raven's Matrices performance. *Eighth Annual Conference on Advances in Cognitive Systems (ACS)*. **Best Student Paper Award.**
- [C.4] Ainooson, J., Michelson, J., Sanyal, D., Palmer, J. H., and Kunda, M. (2020). Strategies for visuospatial reasoning: Experiments in sufficiency and diversity. *Eighth Annual Conference on Advances in Cognitive Systems (ACS)*.
- [C.5] Hua, T., and Kunda, M. (2020). Modeling Gestalt visual reasoning on Raven's Matrices using generative image inpainting techniques. *Eighth Annual Conference on Advances in Cognitive Systems (ACS)*.
- [C.6] Michelson, J., Sanyal, D., Ainooson, J., and Kunda, M. (2020). A measure of visuospatial reasoning skills: Painting the big picture. *Eighth Annual Conference on Advances in Cognitive Systems (ACS)*.

- [C.7] Cha, S., Ainooson, J., Chong, E., Soulières, I., Rehg, J., and Kunda, M. (2020). Enhancing cognitive assessment through multimodal sensing: A case study using the block design test. *42<sup>nd</sup> Annual Meeting of the Cognitive Science Society*.
- [C.8] Zi, X., Li, S., Rashedi, R., Rushdy, M., Lane, B., Mishra, S., Biswas, G., Swanson, A., Kinsman, A., Bardett, N., Warren, Z., Juarez, P., and Kunda, M. (2020). Science learning and social reasoning in adolescents on the autism spectrum: An educational technology usability study. *42<sup>nd</sup> Annual Meeting of the Cognitive Science Society*.
- [C.9] Rashedi, R., Bonnet, K., Shulte, R., Schlundt, D., Swanson, A., Kinsman, A., Bardett, N., Warren, Z., Juarez, P., Biswas, G., and Kunda, M. (2020) Opportunities and challenges in developing technology-based social skills interventions for youth with autism spectrum disorder: A qualitative analysis of parent perspectives. *Int. Conf. Learning Sciences (ICLS)*.
- [C.10] Kunda, M. (2019). Nonverbal task learning. *Annual Conf. Advances in Cognitive Systems*, Cambridge, MA.
- [C.11] Scheer, B., Renteria, F. C., and Kunda, M. (2019). Technology-based cognitive enrichment for animals in zoos: A case study and lessons learned. *41<sup>st</sup> Annual Meeting of the Cognitive Science Society*, Montreal, Canada.
- [C.12] Kunda, M. (2019). AI and cognitive testing: A new conceptual framework and roadmap. *41<sup>st</sup> Annual Meeting of the Cognitive Science Society*, Montreal, Canada.
- [C.13] Brown, E., Park, S., Warford, N., Seiffert, A., Kawamura, K., Lappin, J., and Kunda, M. (2018). SpatioTemporal Template-based Search: An architecture to model human search for spatiotemporal targets. *Annual Conf. Advances in Cognitive Systems*, Menlo Park, CA.
- [C.14] Wang, X., Wang, X., and Kunda, M. (2018). Ordering of training inputs for a neural network learner. *Annual Conf. Advances in Cognitive Systems*, Menlo Park, CA.
- [C.15] Elliott, F., Stassun, K., and Kunda, M. (2018). IACI: A human-inspired computational architecture to help us understand visual data exploration. *Annual Conf. Advances in Cognitive Systems*, Menlo Park, CA.
- [C.16] Eilbert, J., Peters, Z., Elliott, F., Stassun, K., and Kunda, M. (2018). Shapes in scatterplots: Comparing human visual impressions and computational metrics. *40<sup>th</sup> Annual Meeting of the Cognitive Science Society*, Madison, WI. **31% oral acceptance rate.**
- [C.17] Warford, N., and Kunda, M. (2018). Measuring individual differences in visual and verbal thinking styles. *40<sup>th</sup> Annual Meeting of the Cognitive Science Society*, Madison, WI.
- [C.18] Palmer, J. H., and Kunda, M. (2018). Thinking in PolAR pictures: Using rotation-friendly mental images to solve Leiter-R Form Completion. *AAAI National Conference*. **25% acceptance rate, and selected for oral presentation.**
- [C.19] Wang, X., Elliott, F., Ainooson, J., Palmer, J., and Kunda, M. (2017). An object is worth six thousand pictures: The egocentric, manual, multi-image (EMMI) dataset. In *International Conference on Computer Vision Workshop on Egocentric Perception, Interaction, and Computing (EPIC@ICCV)*, Venice, Italy.

- [C.20] Ainooson, J., and Kunda, M. (2017). A computational model for reasoning about the Paper Folding task using visual mental images. *39th Annual Meeting of the Cognitive Science Society*, London, UK.
- [C.21] Elliott, F. M., Stassun, K., and Kunda, M. (2017). Visual data exploration: How expert astronomers use flipbook-style visual approaches to understand new data. *39th Annual Meeting of the Cognitive Science Society*, London, UK.
- [C.22] Kunda, M., El-Banani, M., and Rehg, J. (2016). A computational exploration of problem-solving strategies and gaze behaviors on the Block Design task. *38th Annual Meeting of the Cognitive Science Society*, Philadelphia, PA, 235-240.
- [C.23] Kunda, M. (2015). Computational mental imagery, and visual mechanisms for maintaining a goal-subgoal hierarchy. *3rd Annual Conference on Advances in Cognitive Systems*, Atlanta, GA.
- [C.24] Kunda, M., and Ting, J. (2015). Looking around the mind's eye: How internal deployments of attention can affect visual search performance. *3rd Annual Conference on Advances in Cognitive Systems*, Atlanta, GA.
- [C.25] Goel, A. K., Kunda, M., Joyner, D. A., & Vattam, S. (2013). Learning about representational modality: Design and programming projects for knowledge-based AI. *Fourth AAI Symposium on Educational Advances in Artificial Intelligence*, Bellevue, WA.
- [C.26] Kunda, M., Soulières, I., Rozga, A., & Goel, A. (2013). Methods for classifying errors on the Raven's Standard Progressive Matrices test. *35th Annual Conference of the Cognitive Science Society*, Berlin, Germany, 2796-2801.
- [C.27] Kunda, M., McGregor, K., & Goel, A. K. (2012). Reasoning on the Raven's Advanced Progressive Matrices test with iconic visual representations. *34th Annual Conference of the Cognitive Science Society*, Sapporo, Japan, 1828-1833.
- [C.28] Kunda, M., McGregor, K., & Goel, A. K. (2011). Two visual strategies for solving the Raven's Progressive Matrices intelligence test. *AAAI National Conference*, San Francisco, CA. **25% acceptance rate, and selected for oral presentation.**
- [C.29] McGregor, K., Kunda, M., and Goel, A. K. (2011). Fractal analogies: Preliminary results from the Raven's test of intelligence. *2nd International Conference on Computational Creativity*, Mexico City, Mexico.
- [C.30] Kunda, M., McGregor, K., & Goel, A. K. (2010). Taking a look (literally!) at the Raven's intelligence test: Two visual solution strategies. *32nd Annual Conference of the Cognitive Science Society*, Portland, OR, 1691-1696.
- [C.31] McGregor, K., Kunda, M., and Goel, A. K. (2010). A fractal approach towards visual analogy. *1st International Conference on Computational Creativity*, Lisbon, Portugal.
- [C.32] McGregor, K., Kunda, M., and Goel, A. K. (2010). A fractal analogy approach to Raven's test of intelligence. *AAAI Workshop on Visual Representations and Reasoning*, Atlanta, GA.
- [C.33] Kunda, M., McGregor, K., and Goel, A. K. (2009). Addressing the Raven's Progressive Matrices test of general intelligence. *AAAI Fall Symposium on Multi Representational Architectures for Human Level Intelligence*, Arlington, VA.

- [C.34] Kunda, M., and Goel, A. K. (2008). How Thinking in Pictures can explain many characteristic behaviors of autism. *7th IEEE International Conference on Development and Learning*, Monterey, CA, 304-309.
- [C.35] Kunda, M., and Goel, A. K. (2008). What can pictorial representations reveal about the cognitive characteristics of autism? *International Conference on the Theory and Application of Diagrams*, Herrsching, Germany. *LNCS*, 5223, 103-117. **27% long-paper acceptance rate.**
- [C.36] Kunda, M., and Goel, A. K. (2008). Thinking in Pictures: A fresh look at cognition in autism. *30th Annual Conference of the Cognitive Science Society*, Washington, DC, 321-326. **32% oral acceptance rate.**
- [C.37] Neidhoefer, J., Gibson, C., Kunda, M., and Johnson, E. (2007). Determinism in autonomy for applications in the National Airspace System (NAS). *AIAA: Infotech@Aerospace*, Rohnert Park, CA.
- [C.38] Marquez, J., Cummings, M., Roy, N., Kunda, M., and Newman, D. (2005). Collaborative human-computer decision support for planetary surface traversal. *AIAA: Infotech@Aerospace*, Arlington, VA.

#### SHORT PAPERS, ABSTRACTS, AND POSTERS

- [A.1] Flores, I., Fallon, C., and Kunda, M. (2021). Visuospatial skills and the workforce. *International Conference on the Theory and Application of Diagrams*.
- [A.2] Cummings, P., Fauchet, P., Goldfarb, M., Jones, M., Kunda, M., Perlin, J., Sarkar, N., Stassun, K., Warren, Z., & Zelik, K. (2020). Engineering for inclusion: empowering individuals with physical and neurological differences through engineering invention, research, and development. *Engineering*, 7 (2), 141-143.
- [A.3] Hua, T., and Kunda, M. (2020). Modeling Gestalt visual reasoning on Raven's Progressive Matrices using generative image inpainting techniques. *42<sup>nd</sup> Annual Meeting of the Cognitive Science Society*.
- [A.4] Sanyal, D., Michelson, J., Seiffert, A., and Kunda, M. (2020). Part of your world: Trends in the visual complexity of digital media. *Annual Meeting of the Cognitive Science Society*.
- [A.5] Ainooson, J., Michelson, J., Sanyal, D., Palmer, J. H., and Kunda, M. (2020). Modeling visuospatial reasoning across 17 different tests on the Leiter scale of nonverbal intelligence. *42<sup>nd</sup> Annual Meeting of the Cognitive Science Society*.
- [A.6] Rashedi, R. and Kunda, M. (2019). Reasoning together: Promoting mutual understanding in technology design for individuals with autism. *45<sup>th</sup> Annual Conference of the Association for Moral Education*, Seattle, WA.
- [A.7] Rashedi, R. and Kunda, M. (2019). Visual supports and theory of mind reasoning: Autism spectrum disorders. *Institute of Education Sciences Principal Investigators Meeting*, Washington, DC.
- [A.8] Wang, X., Ma, T., Molla, A., Cha, S., Ainooson, J., Wang, X., and Kunda, M. (2018). An object is more than a single image: The Toybox dataset of visual object transformations. *Vision Meets Cognition Workshop at the 2018 Conference on Computer Vision and Pattern Recognition (CVPR)*, Salt Lake City, Utah.

- [A.9] Kunda, M. (2018). Visual thinking and AI. *Autism, Innovation & the Workforce: Envisioning the Future of Human-Technology Partnerships, NSF Convergence Conference*, Nashville, TN.
- [A.10] Kunda, M. (2018). Learning visuospatial reasoning skills from experience. Global Convergence NSF Science of Learning Meeting, Washington, DC.
- [A.11] Kunda, M. (2017). Understanding the role of visual mental imagery in intelligence: The Retinotopic Reasoning (R2) cognitive architecture. *Association for the Advancement of Artificial Intelligence (AAAI) Fall Symposium Series: A Standard Model of the Mind*, Washington, DC.
- [A.12] Brown, E. L., II, Seiffert, A. E., Warford, N., Park, S., & Kunda, M. (2017). Computational cognitive systems to model information salience. *American Indian Science and Engineering Society National Conference (AISES)*, Denver, CO.
- [A.13] Kunda, M. (2016). Visual imagination: A view from artificial intelligence. *Eye's Mind Conference: Visual Imagination, Neuroscience and the Humanities*, Norwich, UK.
- [A.14] Kunda, M. (2014). Computational models of gaze in neuropsychological assessments. *Joint Meeting for NSF Expeditions on Computational Behavioral Science and Socially Assistive Robotics*, Atlanta, GA.
- [A.15] Kunda, M., Soulières, I., Mottron, L., and Goel, A. K. (2011). Comparing patterns of errors on the Raven's Progressive Matrices test: Strategy differences among typically developing individuals, individuals with autism, and computational models. *International Meeting for Autism Research (IMFAR)*, San Diego, CA.
- [A.16] Kunda, M., McGregor, K., and Goel, A. K. (2010). Can the Raven's Progressive Matrices intelligence test be solved by thinking in pictures? *International Meeting for Autism Research (IMFAR)*, Philadelphia, PA.
- [A.17] Kunda, M., and Goel, A. (2009). Evidence for Thinking in Pictures as a cognitive account of autism. *International Meeting for Autism Research (IMFAR)*, Chicago, IL.
- [A.18] Kunda, M., Marland, G., Canella, L., Schlamadinger, B., and Bird, N. (2005). Impact of albedo change on carbon sequestration strategies. *Third USDA Symposium on Greenhouse Gases & Carbon Sequestration in Agriculture and Forestry*, Baltimore, MD.
- [A.19] Kunda, M., Bird, N., Canella, L., Marland, G., and Schlamadinger, B. (2005). Carbon management, earth surface albedo, and biomass fuels. *14th European Biomass Conference and Exhibition: Biomass for Energy, Industry, and Climate Protection*, Paris, France.

## INVITED TALKS AND PANELS – RESEARCH

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- [T.1] AI, Visual Imagery, and the Many Unsolved Challenges of Human Intelligence Tests. *First Graduate Conf. Italian Association for Cognitive Science*. Sept. 13, 2021. **Keynote talk.**
- [T.2] Individual differences in visuospatial reasoning in neurodiverse and neurotypical populations. *Dagstuhl Seminar 21192: Approaches and Applications of Inductive Programming*. May 10, 2021.

- [T.3] Why Intelligence Tests Are (Still!) a Very Hard Problem for AI. *NYU Concepts and Categories seminar series*. Friday April 16, 2021.
- [T.4] Why Intelligence Tests Are Still a Very Hard Problem for AI. *Interdisciplinary College (IK): Neuroscience, Neuroinformatics, Cognitive Science, AI, and More*. March 13, 2021.
- [T.5] Autism, AI, and visuospatial thinking: Understanding cognitive strengths through computational modeling and behavior analytics. *Workshop on Artificial and Human Intelligence at the European Conference on Artificial Intelligence (ECAI)*. September 8, 2020.
- [T.6] Autism-inspired AI for visuospatial and social reasoning. *Summer AI Talk Series, Indiana University*. June 23, 2020.
- [T.7] Autism-inspired AI for visuospatial and social reasoning. *Bridging AI and Cognitive Science, Workshop at the Int. Conf. Learning Representations (ICLR)*. April 26, 2020.
- [T.8] Imagery-based AI. *17th Annual International Conference on Cognitive Modeling*. July 21, 2019, Montreal, Canada. **Keynote talk**.
- [T.9] Imagery-based AI. *National Academy of Sciences Colloquium on "The Brain Produces Mind by Modeling."* May 2, 2019, Irvine, CA.
- [T.10] Image and thought: Computational investigations into imagery-based visuospatial reasoning, learning, and attention. *Navy Center for Applied Research in Artificial Intelligence Symposium Series, Naval Research Laboratory*. April 30, 2019, Washington, DC.
- [T.11] Visual mental imagery: A view from AI. *UT Austin*. Nov. 8, 2018, Austin, TX.
- [T.12] Thinking in Pictures: AI approaches for learning, using, and flexibly re-using visuospatial knowledge. *Cognitive Science Colloquium Series, Indiana University*. Nov. 5, 2018, Bloomington, IN.
- [T.13] Imagery-based AI. *CogSci Speaker Series, Northwestern U.* Jun. 18, 2018, Evanston, IL.
- [T.14] Imagery-based AI. *University of Huddersfield*. May 15, 2018, Huddersfield, UK.
- [T.15] Imagery-based AI. *Workshop: NSF Science of Learning Collaborative Network on Mapping, Measuring, & Modeling Perceptual Expertise*. Feb. 1, 2018, Nashville, TN.
- [T.16] Understanding strategy differences on cognitive tests. *Vanderbilt Surprising Connections in Autism & Innovation, NSF Convergence Conference*. Nov. 17, 2017, Nashville, TN.
- [T.17] Looking and thinking: What wearable cameras can reveal about visual mental imagery. *Workshop on Egocentric Vision: From Science to Real-World Applications*. Jun. 5, 2017, Bloomington, Indiana.
- [T.18] Visualizing how things move: A computational imagery approach to physical reasoning. *Coding workshop, University of Quebec at Montreal*. Apr. 7, 2017, Montreal, Canada.
- [T.19] Visual thinking in autism and in artificial intelligence systems. *NeuroQAM Seminar, University of Quebec at Montreal*. Apr. 6, 2017, Montreal, Canada.
- [T.20] Mental imagery: A view from artificial intelligence. *Cognitive & Cognitive Neuroscience Seminar, Vanderbilt University*. Jan. 18, 2017, Nashville, TN.
- [T.21] Visual thinking: A view from AI. *Biomedical Engineering Seminar, Vanderbilt University*. Nov. 2, 2016, Nashville, TN.



- [T.22] Mental imagery: A view from artificial intelligence. *Psychology and Human Development Seminar, Vanderbilt University*. Oct. 28, 2016, Nashville, TN.
- [T.23] Visual thinking in the data-to-action pipeline. *GVU Brownbag Seminar, Georgia Tech*. Sep. 10, 2015, Atlanta, GA.
- [T.24] Thinking in Pictures: Computational visual cognition. *Sci Foo Camp, Google Headquarters*. Jun. 27, 2015, Mountain View, CA.
- [T.25] Computational mechanisms for visual thinking. *Attention and Working Memory Lab, Georgia Tech*. Apr. 21, 2015, Atlanta, GA.
- [T.26] Visual thinking in the data-to-action pipeline. *EECS Seminar, Vanderbilt University*. Mar. 12, 2015, Nashville, TN.
- [T.27] Visual problem solving in autism, psychometrics, and AI. *Mathematics and Computer Science Seminar, Emory University*. May 2, 2013, Atlanta, GA.
- [T.28] The case of the Raven's Progressive Matrices intelligence test. *GTNeuro Club, Georgia Tech*. Mar. 28, 2013, Atlanta, GA.
- [T.29] Identifying the visual cognitive phenotype in autism. *Atlanta Autism Consortium Research Special Interest Group*. Mar. 14, 2013, Atlanta, GA.
- [T.30] Can the Raven's Progressive Matrices test be solved visually? *Laboratoire de Neurosciences Cognitives des Troubles Envahissants du Developpement, University of Montreal*. Sep. 15, 2010, Montreal, Canada.
- [T.31] Can the Raven's Progressive Matrices test be solved by thinking in pictures? *Yale Early Social Cognition Lab, Yale University*. Sep. 13, 2010, New Haven, CT.
- [T.32] Visual thinking in autism: Design of behavioral experiments using the dual-task paradigm. *Atlanta Autism Consortium*. Sep. 25, 2009, Atlanta, GA.

## INVITED TALKS AND PANELS – EDUCATION/OUTREACH

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- [T.1] Panel on accelerating convergent solutions at the technology/work interface for societal impact. *IEEE Women in Engineering International Leadership Conference*. April 27, 2021.
- [T.2] Research panel. *Autism TN @ Vandy*. April 19, 2021.
- [T.3] Panel on how to prepare the next generation of cognitive systems researchers. *Annual Conference on Advances in Cognitive Systems*. August 12, 2020.
- [T.4] Panel on professional integrity: The value of honor in engineering, business, medicine, and research professions. *Vanderbilt Honor Council*. February 19, 2020.
- [T.5] Panel on AI & Historiography. *Vanderbilt Tech & Society Club*. October 10, 2019.
- [T.6] Discussant for film screening of *Temple Grandin*. Women of VISE (WoV), Vanderbilt Institute for Surgery and Engineering. February 27, 2020.
- [T.7] Panel on how humans experience the world, think, & relate to technology. *Association for the Advancement of Science (AAAS) Program of Dialogue on Science, Ethics, & Religion (DoSER), Campus Event at Vanderbilt University*. March 20, 2019.

- [T.8] Roundtable on the societal implications of AI, with science fiction author Ted Chiang. *Vanderbilt University*. March 18, 2019.
- [T.9] Panel on "The Academic Interview: What Do Search Committees Want?" for STEM. *Vanderbilt Graduate School Career Development*. November 14, 2018.
- [T.10] How AI influences our understanding of human intelligence (and vice versa). *Assoc. for Advancement of Science (AAAS) Program of Dialogue on Science, Ethics, & Religion (DoSER), event at Texas State University*. Nov. 9, 2018, San Marcos, TX. **Keynote talk.**
- [T.11] Panel on autism and innovation. *Vanderbilt Inclusability Lunch and Learn Series, Disability Awareness Month*. Oct. 23, 2018, Nashville, TN.
- [T.12] Plenary Session and Panel on Edtech: The Buzz, the Promise, the Evidence, and the Future. *Institute of Education Sciences PI Meeting*. Jan. 9, 2019, Washington, DC.
- [T.13] Of minds and machines: What artificial intelligence tells us about ourselves. *American Association for the Advancement of Science (AAAS) Program of Dialogue on Science, Ethics, & Religion (DoSER) annual holiday lecture*. Dec. 4, 2017. Washington, DC. **Keynote talk.**
- [T.14] Panel on autism, AI, and robotics: From intervention to inspiration. *American Association for the Advancement of Science (AAAS) Program of Dialogue on Science, Ethics, and Religion (DoSER), at Annual Conf. Religion News Association (RNA)*. Sep. 7, 2017, Nashville, TN.
- [T.15] Visual thinking in autism and in AI systems. *Symposium on Surprising Connections: Math, Physics, Computer Science, and Autism*. Feb. 7, 2017, Nashville, TN.
- [T.16] Visual thinking: A view from artificial intelligence. *Neuro-diverse: A Symposium on Autism, Neuroscience, and Perceptual Thinking*. May 23, 2016, Nashville, TN.
- [T.17] An Illustrated Conversation: Visual Thinking in Autism, Art, and Creativity. *Neuro-Humanities Entanglement Conference and Neuro-Salon*. Apr. 12, 2012, Atlanta, GA.

## RESEARCH STUDENTS

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### Postdoctoral Fellows

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| 1. Effat Farhana, 2021-present.            | 3. Israel Flores, 2020-2021.    |
| 2. Caoimhe Harrington-Stack, 2021-present. | 4. Roxanne Rashedi, 2018-2020.  |
|  | 5. Fernanda Elliott, 2016-2020. |

### Ph.D. Students

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|-----------------------------------|----------------------------------|
| 1. Deepayan Sanyal, 2018-present. | 4. James Ainooson, 2016-present. |
| 2. Ryan Yang, 2018-present.       | 5. Tengyu Ma, 2018-2020.         |
| 3. Joel Michelson, 2017-present.  |                                  |

### M.S. Students

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|-----------------------------|------------------------------|
| 1. Shiyao Li, 2019-2020.    | 3. Xiaotian Wang, 2017-2018. |
| 2. Zhanwen Chen, 2018-2020. |                              |

### Part-Time Graduate or Post-Baccalaureate Students

- |                               |                           |
|-------------------------------|---------------------------|
| 1. Raymond Yates, 2021.       | 4. Victor Lin, 2020-2021. |
| 2. Yiyuan Yang, 2020-present. | 5. Simeng Zhao, 2020.     |
| 3. Kenneth Li, 2020-2021.     | 6. Chris Ketchum, 2019.   |

### Selected Undergraduate Students

1. Yejin Jeong, 2021-present.
2. Dylan Kistler, 2021-present.
3. Aviv Roskes, 2021-present.
4. Sarah Myers, 2021-present.
5. Rana Khan, 2021-present.
6. Teddy Solomon, 2021.
7. Chris Petrella, 2021.
8. Xinyu Shen, 2020-present.
9. Alice Qiao, 2020-2021.
10. Maya Johnson, 2020-2021.
11. Avery Dunn, 2020-2021.
12. Angela Maliakal, 2020.
13. Morgan Elrod-Erickson, 2019-present.
14. Carson Fallon, 2019-present.
15. Bryan Hollis, 2019-2021.
16. Tianyu Hua, 2019-2020.
17. Sean Cha, 2018 – 2019.
18. Xiaoman Zi, 2018-2020.
19. Edwin Santiago, 2018.
20. Aneesha Dasari, 2017 – 2018.
21. Joe Eilbert, 2017 – 2018.
22. Ben Scheer, 2016 – 2019.
23. Noel Warford, 2016 – 2018.
24. Josh Palmer, 2016 – 2018.
25. Soobeen Park, 2017, 2020.
26. Ellis Brown, 2017.
27. Max DeGroot, 2017.
28. Zameese Peters, 2017.
29. Mike Lee, 2015.
30. Clay Washington, 2015.
31. Mohamed El Banani 2014 – 2015.
32. Yongkoo Kang 2014 – 2015.
33. Mika Munch, 2014 –2015.
34. Emeke Nkadi 2014 – 2015.
35. Richard Stauffer, 2014 – 2015.
36. Syfuddin Rashid, 2014.
37. Julia Ting, 2014.

### High School Students

1. Tessa Haws, 2020-2021.
2. Binula Illukpitiya, 2017.
3. Brandt Plomaritis, 2016.

## CURRENT FUNDING

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### [F.1] **AI Institute: The Institute for an AI-Engaged Future of Learning**

*Source:* National Science Foundation

*Location:* NC State (lead), Vanderbilt, UNC Chapel Hill, Indiana U., Digital Promise

*Total Award:* \$4,149,999 (Vanderbilt), \$20M total. *Duration:* 07/2021 – 06/2026

*PI:* James Lester (NC State), *Co-PIs:* Gautam Biswas (Vanderbilt) and several others. Kunda is senior personnel.

### [F.2] **NSF2026: EAGER: Collaborative Research: Enhancing Employment for Neurodiverse Individuals through Next-Gen, AI-Enabled Assessments of Visuospatial Cognition**

*Source:* National Science Foundation

*Location:* Vanderbilt University (lead), Vanderbilt University Medical Center (partner)

*Total Award:* \$251,998 (VU), \$60,000 (VUMC). *Duration:* 10/01/2020 – 09/30/2022

*PI:* Maithilee Kunda. *Co-PI:* Gautam Biswas, Keivan Stassun, Frank Tong, Timothy Vogus, Zachary Warren (VUMC). *Senior Personnel:* Jesse Spencer-Smith.

### [F.3] **B1: Inclusion AI for Neurodiverse Employment**

*Source:* National Science Foundation

*Location:* Vanderbilt (lead), Yale University, Georgia Tech

*Total Award:* \$5,000,000. *Duration:* 09/2020-08/2022

PI: Nilanjan Sarkar. Kunda is senior personnel.

[F.4] **Neurodiversity Inspired Science and Engineering (NISE)**

*Source:* National Science Foundation

*Location:* Vanderbilt University

*Total Award:* \$2,999,985. *Duration:* 09/01/2019 – 08/31/2024

PI: Mark Wallace, Co-PI: Maithilee Kunda, Frank Tong, Keivan Stassun, Nilanjan Sarkar

[F.5] **Betty's Mind: A Theory of Mind and Social Reasoning Intervention for Adolescents with Autism Spectrum Disorders Based on a Learning by Teaching Approach**

*Source:* Institute for Education Sciences

*Location:* Vanderbilt University (lead), Vanderbilt University Medical Center

*Total Award:* \$1,399,955. *Duration:* July 1, 2018 – June 30, 2022

PI: Maithilee Kunda, Co-PI: Gautam Biswas, Pablo Juarez, Zachary Warren

## PAST FUNDING

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[F.1] **Convergence Accelerator Phase I (RAISE): Empowering Neurodiverse Populations for Employment through Inclusion AI and Innovation Science**

*Source:* National Science Foundation

*Location:* Vanderbilt University (lead), Georgia Institute of Technology, Yale University, Cornell University, Vanderbilt University Medical Center

*Total Award:* \$1,000,000. *Duration:* 09/01/2019 – 05/31/2021

PI: Nilanjan Sarkar, Co-PI: James Rehg (GT), Brian Scassellati (Yale), Susanne Bruyere (Cornell), Zachary Warren (VUMC). Senior Personnel: Keivan Stassun, Amy Weitlauf, Maithilee Kunda, Timothy Vogus, Joshua Wade.

[F.2] **CompCog: Collaborative Research: Learning Visuospatial Reasoning Skills from Experience**

*Source:* National Science Foundation (#1730044)

*Location:* Vanderbilt University (lead), Indiana University

*Total Award:* \$299,691 (\$200,000 Vanderbilt). *Duration:* 08/15/2017 – 08/14/2019.

PI: Maithilee Kunda, Co-PI: Bethany Rittle-Johnson (Vanderbilt), Linda Smith (IU)

[F.3] **Convergence HTF: A Workshop Shaping Research on Human-Technology Partnerships to Enhance STEM Workforce Engagement**

*Source:* National Science Foundation

*Location:* Vanderbilt University

*Total Award:* \$98,346. *Duration:* September 1, 2017 – August 31, 2018

PI: Keivan Stassun, Co-PI: Maithilee Kunda, Zack Warren, Frank Tong, Nilanjan Sarkar

[F.4] **New Explorations in Visual Object Recognition**

*Source:* Vanderbilt University Discovery Grant Program

*Location:* Vanderbilt University

*Total Award:* \$50,000. *Duration:* July 1, 2017 – June 30, 2019

PI: Maithilee Kunda

- [F.5] **Center for the Study of Autism and Innovation**  
*Source:* Vanderbilt University Trans-Institutional Programs  
*Location:* Vanderbilt University  
*Total Award:* \$200,000. *Duration:* July 1, 2017 – June 30, 2019  
 PI: Keivan Stassun, Co-PI: Zachary Warren, Julie Taylor, Sal March, Timothy Vogus, Maithilee Kunda, Frank Tong, Alan Bentley, Philippe Fauchet, Mark Wallace
- [F.6] **Collaborative Research: NSF INCLUDES: South East Alliance for Persons with Disabilities in STEM (SEAPD-STEM)**  
*Source:* National Science Foundation  
*Location:* Auburn (lead), Vanderbilt, Alabama State University, Tuskegee University  
*Total Award:* \$298,424 (\$5,178 Vanderbilt). *Duration:* October 1, 2016 – March 31, 2019  
 PI: Overtoun Jenda (Auburn University), co-PI: Maithilee Kunda, Kelly Holley-Bockelmann (Vanderbilt); Alan Wilson, Asheber Abebe, Caroline Dunn, Daniela Marghitsu (Auburn); Mohammed Qazi, Michael Curry (Tuskegee); Carl Pettis, Cleon Barnett, Michelle Foster (Alabama State)
- [F.7] **Comp Cog: Collaborative Research on the Development of Visual Object Recognition**  
*Source:* National Science Foundation  
*Location:* Indiana University (lead), Georgia Institute of Technology  
*Total Award:* \$718,740 (GT: \$313,582). *Duration:* August 1, 2015 – July 31, 2018  
 PI: Linda Smith (IU), Co-PI: Chen Yu, Jim Rehg, Maithilee Kunda, Fuxin Li

## PROFESSIONAL & OUTREACH ACTIVITIES

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### Scientific Leadership and Professional Service

1. Chair, Member Abstracts Committee, CogSci Organizing Committee, 2019.
2. Co-chair, Working Group on Perceptual/Motor Functions as part of AAAI Common Model of Cognition symposium series, 2018 – present.
3. Invited expert, *Workshop on Human-Machine Teaming*, Air Force Research Laboratory and Wright Brothers Institute, December 17-19, 2018, Dayton, OH.
4. Faculty investigator and founding member, Vanderbilt Frist Center for Autism and Innovation, 2017 – present.
5. Chair, Organizing Committee, Joint Meeting for NSF Expeditions on Computational Behavioral Science and Socially Assistive Robotics, Georgia Tech, 2014.
6. Co-chair, Organizing Committee, AAAI Workshop on Visual Representations and Reasoning, 2010.
7. Proposal review, National Science Foundation, 2015 (ad hoc reviewer), 2016 (panelist), 2020 (panelist), 2021 (panelist).

### Institutional Service

1. Founder and organizer, GradCS@Vanderbilt seminar series, 2021-2022.
2. Undergraduate academic advisor, Computer Science, Vanderbilt University, 2016 – present.
3. Data Science Next Generation Committee, 2020.
4. EECS seminar series organizer, Department of Electrical Engineering and Computer Science, Vanderbilt University, 2017 – 2019.

5. Task force, trans-institutional M.S. in data science, Vanderbilt University, 2017.
6. Faculty search committee, Department of Electrical Engineering and Computer Science, Vanderbilt University, 2016-17, 2017-18, 2019-20, 2020-21, 2021-22.
7. School Advisory Committee, School of Interactive Computing, Georgia Tech, 2014 – 2015.

### **Broadening participation in CS and STEM**

1. Guest speaker, Vanderbilt Minority Women in STEM student organization. Sept. 21, 2021.
2. Women in Technology/ChIPs STEAM panel for high school girls. January 27, 2021.
3. Hosted ~75 high school girls at Vanderbilt for conversation on college, computer science, and careers in STEM, February 12, 2019.
4. Roundtable luncheon with Women of VISE (WoV), Vanderbilt Institute for Surgery and Engineering, April 4, 2018.
5. Research mentor for high school students, 2016, 2017, 2020.
6. Faculty advisor, Women in Computing ACM-W student chapter, Vanderbilt, 2016 – 2020.
7. Have actively recruited research students from groups underrepresented in CS and STEM. Current and past research students include: 18 women, 4 Black students, 3 Latinx students, and 5 neurodiverse students (autism spectrum, dyslexia, learning disability); as well as numerous interdisciplinary students introduced to CS/AI research (4 psychology, 3 physics, 3 creative writing, 1 education, and 1 neuroscience).

### **Other educational outreach**

1. Reader, College Guild program for incarcerated individuals, 2020-present.
2. Let's Get Ready academic program for low-income high school students. *SAT Verbal Preparation Course* (2003 – 2004). Tutoring in writing and AP calculus (2004).

### **Media and public outreach**

1. "Recruiting for talent on the autism spectrum." *CBS 60 Minutes* with correspondent Anderson Cooper. October 4, 2020. Watched by 10.76 million people (Nielsen ratings). Also put together a detailed informational website for the public about this research: <https://www.vanderbilt.edu/autismandinnovation/our-research-on-the-block-design-test-as-featured-on-cbs-60-minutes-with-anderson-cooper/>
2. Presented demo of Film Detective, an educational technology game to help adolescents on the autism spectrum learn to decode social scenarios, at the 7th Annual ED Games Expo at the Kennedy Center in Washington, D.C., January 9, 2020. See press release: <https://engineering.vanderbilt.edu/news/2020/film-detective-helps-kids-with-autism-interpret-actors-actions/>
3. Finalist for NSF 2026 Idea Machine, team led by Keivan Stassun, Vanderbilt. *Harnessing the Human Diversity of Mind* selected in top 33 finalists nationally, 2019. See video here: <https://nsf2026imgallery.skild.com/entries/harnessing-the-human-diversity-of-mind>
4. "Using AI to understand autism." *Top Of Mind With Julie Rose* podcast, Nov. 1, 2017.
5. "Visual thinking, autism and artificial intelligence." *Assistive Technology Update* podcast with Wade Wingler, Oct. 6, 2017.
6. "AI that thinks in pictures." *Women in Tech Show* podcast with Edaena Salinas, Nov. 8, 2016.
7. Chair, Organizing Committee, *Neuro-diverse: A Symposium on Autism, Neuroscience, and Perceptual Thinking*, event for the public, October 2016.

**Senior Program Committee / Meta-Reviewer**

1. AAAI: National Conf. Association for Advancement of Artificial Intelligence, 2018, 2019.
2. CogSci: Annual Meeting of the Cognitive Science Society, 2019, 2020.

**Program Committee / Conference Reviewer**

1. AAAI: National Conf. Association for Advancement of Artificial Intelligence, 2016 –2017.
2. ACS: Advances in Cognitive Systems, 2015 – 2020.
3. C&C: ACM Conference on Creativity and Cognition
4. CogSci: Annual Conference of the Cognitive Science Society
5. CVPR: Computer Vision and Pattern Recognition, 2021.
6. DIAGRAMS: International Conference on Theory and Application of Diagrams, 2016.
7. ICC: International Conference on Computational Creativity
8. ICML: International Conference on Machine Learning, 2019.
9. IJCAI: International Joint Conference on Artificial Intelligence, 2015 – 2016.

**Journal Reviewer**

1. Cognitive Science
2. Cortex
3. Journal of Autism and Developmental Disorders
4. Psychological Review
5. Research in Developmental Disabilities
6. ASME Journal of Mechanical Design

**Professional Memberships**

1. AAAI: Association for the Advancement of Artificial Intelligence
2. ACM: Association for Computing Machinery
3. CVF: Computer Vision Foundation
4. CogSci: Cognitive Science Society
5. INSAR: International Society for Autism Research