

Dongkyu Choi

Department of Social and Cognitive Computing
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Education:

- Ph.D. (2010) Aeronautics and Astronautics, Stanford University, Stanford, CA, USA
with minor in Computer Science
Dissertation: *Coordinated Execution and Goal Management
in a Reactive Cognitive Architecture*
Committee: Pat Langley, Stephen M. Rock, Nils Nilsson, Sanjay Lall
- M.S. (2003) Aeronautics and Astronautics, Stanford University, Stanford, CA, USA
- B.S. (2001) Mechanical and Aerospace Eng., Seoul National University, Seoul, Korea

Professional Experience:

- 2019 – Senior Principal Scientist; Cognitive AI Group Manager
Institute of High Performance Computing (IHPC)
Agency for Science, Technology and Research (A*STAR), Singapore
- 2015 – 2021 Co-founder
Powered Boomerang, LLC, Overland Park, KS, USA
- 2018 – 2019 Researcher
Center for Design Research, University of Kansas, Lawrence, KS, USA
- 2012 – 2019 Assistant Professor
Dept. of Aerospace Engineering, University of Kansas, Lawrence, KS, USA
- 2016, 2017 Summer Faculty Fellow
US Naval Research Laboratory, Washington, DC, USA
- 2009 – 2011 Visiting Research Specialist / Postdoctoral Research Associate
Dept. of Psychology, University of Illinois at Chicago, Chicago, IL, USA
- 2003 – 2009 Research Assistant
Computational Learning Laboratory, CSLI, Stanford University, CA, USA
- 2003 – 2009 Research Assistant
Institute for the Study of Learning and Expertise, Palo Alto, CA, USA
- 1997 – 2000 Computer Systems Engineer / Bilingual Translator
Korean Augmentation to the United States Army, Korea

Research Interests and Project Experience:

Focus of Research:	cognitive architectures, autonomy, symbolic artificial intelligence, cognitive systems, cognitive robotics, human-robot collaboration, unmanned aerial systems
2024 –	Survey of Foundation Models for Robotics National Robotics Programme [PI; SG\$396,604]
2023 –	AiKEiA: AI Knowledge Engineering for Intelligence Analysis Defence Science Organization National Laboratories [Co-I; SG\$999,780]
2022 –	The HAPPY Study – Harnessing Human Potential and Improving Health Span in Women and their Children Study Prenatal / Early Childhood Grant, A*STAR [Co-I; SG\$3,141,824]
2022 –	Improving Student Engagement in Virtual Learning Environments AI3 HTCO Seed Fund, A*STAR [Co-I; SG\$499,224]
2019 –	Human-Robot Collaborative AI for Advanced Manufacturing and Engineering AME Programme, A*STAR [Co-lead; SG\$21,634,800]
2022 – 2023	Cognitive Architecture for Self-motivated Agents AI3 HTCO Seed Fund, A*STAR [PI; SG\$250,000]
2021 – 2023	Self-supervised Learning and Transfer of Robotic Manipulation Knowledge for Smart Manufacturing Robotics HTCO Seed Fund, A*STAR [Co-I; SG\$485,700]
2020 – 2023	K-EMERGE: Knowledge Extraction, Modelling, and Explainable Reasoning for General Expertise AME Programme, A*STAR [Co-lead; SG\$5,997,000]
2017 – 2018	Architectures for Elaborate Goal Reasoning US Naval Research Laboratory [PI; US\$70,000]
2012 – 2015	Autonomous Discovery of Object Properties: Robots That Create Simple Machines Office of Naval Research [Co-PI; US\$225,000]
2012 – 2012	Robotics Challenge: Cognitive Robot for General Missions Defense Advanced Research Projects Agency [PI; US\$371,503]
2009 – 2011	Adaptation by Learning from Error in ICARUS Office of Naval Research [researcher; US\$427,187]
2008 – 2010	Learning Task Knowledge for Cognitive Robots Korea Institute of Science and Technology [PI; KRW100,000,000]
2005 – 2009	Transfer Learning in Integrated Cognitive Systems Defense Advanced Research Projects Agency [researcher; US\$12,242,291]
2003 – 2005	New Research Directions in Integrated Cognitive Architectures National Science Foundation [researcher; US\$99,271]

Teaching Interests and Experience:

Topics of Interest:	autonomy, cognitive/agent architectures cognitive robotics, unmanned systems
Introduction to Robotics:	Spring 2014 – 2018
Computing for Engineers:	11 semesters during 2012 – 2018
Rule-based Control Systems:	Fall 2013 & 2017
Aircraft Dynamics:	Fall 2014 – 2016

Journal Publications:

- Ménager, D. H., Choi, D., & Robins, S. K. (2022). Modeling human memory phenomena in a hybrid event memory system. *Cognitive Systems Research*, 75, 25 – 35.
- Ménager, D. H., Choi, D., & Robins, S. K. (2022). A hybrid theory of event memory. *Minds and Machines*, 32, 365 – 394.
- Choi, D. & Langley, P. (2018). Evolution of the ICARUS cognitive architecture. *Cognitive Systems Research*, 48, 25 – 38.
- Xu, W., Choi, D., & Wang, G. (2018). Direct visual-inertial odometry with semi-dense mapping. *Computers & Electrical Engineering*, 67, 761 – 775.
- Kim, E. & Choi, D. (2016). A UWB positioning network enabling unmanned aircraft systems auto land. *Aerospace Science and Technology*, 58, 418 – 426.
- Kim, E. & Choi, D. (2016). Planning of UWB indoor positioning network using binary integer linear programming. *International Journal of Ultra Wideband Communications and Systems*, 3, 166 – 176.
- Kim, E. & Choi, D. (2015). A 3D ad hoc localization system using aerial sensor nodes. *Journal of IEEE – Sensors*, 15, 3716 – 3723.
- Choi, D. (2011). Reactive goal management in a cognitive architecture. *Cognitive Systems Research*, 12, 293 – 308.
- Langley, P., Choi, D., & Rogers, S. (2009). Acquisition of hierarchical reactive skills in a unified cognitive architecture. *Cognitive Systems Research*, 10, 316 – 332.
- Könik, T., O’Rorke, P., Shapiro, D., Choi, D., Nejati, N., & Langley, P. (2009). Skill transfer through goal-driven representation mapping. *Cognitive Systems Research*, 10, 270 – 285.
- Langley, P. & Choi, D. (2006). Learning recursive control programs from problem solving. *Journal of Machine Learning Research*, 7, 493 – 518.

Recent Conference / Symposium Papers:

Chen, R., Qin, C., Jiang, W., & Choi, D. (in press). Is a large language model a good annotator for event extraction? In *Proceedings of the Thirty-Eighth Annual Conference on Artificial Intelligence*. AAAI Press.

Choi, D. (2023). On using generative models in a cognitive architecture for embodied agents. In *Proceedings of the AAAI 2023 Fall Symposium on Integrating Cognitive Architectures and Generative Models*. Arlington, VA: AAAI Press.

Chen, C., Yan, S., Yuan, M., Tay, C. P., Choi, D., & Le, Q. D. (2023). A minimal collision strategy of synergy between pushing and grasping for large clusters of objects. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*.

Ménager, D. H. & Choi, D. (2023). Hybrid event memory as a case base for state estimation in cognitive agents. In *Proceedings of the 31st International Conference on Case-Based Reasoning*.

Choi, D., Shi, W., Liang, Y. S., Yeo, K. H., & Kim, J. (2021). Controlling industrial robots with high-level verbal commands. In *Proceedings of the Thirteenth International Conference on Social Robotics*.

Liang, Y. S., Zhang, C., Choi, D., & Kwok, K. (2021). Improving object permanence using action annotations and reasoning. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*.

Huang, Z., Zhu, H., Sun, Y., Choi, D., Tan, C., & Lim, J.-H. (2021). A diagnostic study of visual question answering with analogical reasoning. In *Proceedings of the IEEE International Conference on Image Processing*.

Liang, Y. S., Choi, D., & Kwok, K. (2021). Maintaining a reliable world model using action-aware perceptual anchoring. In *Proceedings of the IEEE International Conference on Robotics and Automation*.

Jaiswal, S., Choi, D., & Fernando, B. (2020). What do CNNs gain by imitating the visual development of primate infants? In *Proceedings of the 31st British Machine Vision Conference*.

Jaiswal, S., Choi, D., & Fernando, B. (2020). How does simulating aspects of primate infant visual development inform training of CNNs? In *Proceedings of the 42nd Annual Meeting of the Cognitive Science Society*.

Ménager, D. H., Choi, D., & Robins, S. K. (2019). A hybrid theory of event memory. In *Proceedings of the Seventh Annual Conference on Advances in Cognitive Systems*. Cambridge, MA.

Choi, D., Langley, P., & To, S. T. (2018). Creating and using tools in a hybrid cognitive architecture. In *Proceedings of the AAAI 2018 Spring Symposium on Integrating Representation, Reasoning, Learning, and Execution for Goal Directed Autonomy*. Stanford, CA: AAAI Press.

Ménager, D. H., Choi, D., Roberts, M., & Aha, D. W. (2018). Learning planning operators from episodic traces. In *Proceedings of the AAAI 2018 Spring Symposium on Integrating Representation, Reasoning, Learning, and Execution for Goal Directed Autonomy*. Stanford, CA: AAAI Press.

- Langley, P., Meadows, B., Sridharan, M., & Choi, D. (2017). Explainable agency for intelligent autonomous systems. In *Proceedings of the Twenty-Ninth Annual Conference on Innovative Applications of Artificial Intelligence* (pp. 4762 – 4763). San Francisco: AAAI Press.
- Ménager, D. H., Choi, D., Floyd, M. W., Task, C., & Aha, D. W. (2017). Dynamic goal recognition using windowed action sequences. In *Proceedings of the AAAI-2017 Workshop on Plan, Activity, and Intent Recognition*.
- Choi, D. (2017). ICARUS' implications for the standard model of mind. In *Proceedings of the AAAI 2017 Fall Symposium on A Standard Model of the Mind*. Arlington, VA: AAAI Press.
- Xu, W., & Choi, D. (2016). Direct visual-inertial odometry and mapping for unmanned vehicle. *Lecture Notes in Computer Science: Proceedings of 12th International Symposium on Visual Computing*, Springer-Verlag.
- Roberts, M., Hiatt, L. M., Coman, A., Choi, D., Johnson, B., & Aha, D. W. (2016). ActorSim: A toolkit for studying cross-disciplinary challenges in autonomous systems. In *Proceedings of the AAAI 2016 Fall Symposium on Cross-Disciplinary Challenges in Autonomous Systems*, Arlington, VA.
- Ménager, D. H., & Choi, D. (2016). A robust implementation of episodic memory in a cognitive architecture. In *Proceedings of the 38th Annual Meeting of the Cognitive Science Society*, Philadelphia, PA.
- Langley, P., Barley, M., Meadows, B., Choi, D., & Katz, E. P. (2016). Goals, utilities, and mental simulation in continuous planning. In *Proceedings of the Fourth Annual Conference on Advances in Cognitive Systems*, Evanston, IL.
- Kim, J., & Choi, D. (2016). Design and control of a novel tiltrotor platform. In *Proceedings of AIAA Infotech @ Aerospace, AIAA Science and Technology Forum and Exposition*, San Diego, CA.
- To, S. T., Langley, P., & Choi, D. (2015). A unified framework for knowledge-lean and knowledge-rich planning. In *Proceedings of the Third Annual Conference on Advances in Cognitive Systems*, Atlanta, GA.
- Choi, D., Kim, K., Kim, D., & You, B.-J. (2011). Problem solving and learning for a humanoid robot. In *Proceedings of the IEEE International Conference on Robotics and Biomimetics*, Phuket, Thailand: IEEE Press.
- Kim, K., Choi, D., Lee, J.-Y., Park, J.-M., & You, B.-J. (2011). Controlling a humanoid robot in home environment with a cognitive architecture. In *Proceedings of the IEEE International Conference on Robotics and Biomimetics*, Phuket, Thailand: IEEE Press.
- Choi, D., & Ohlsson, S. (2011). Interoperating learning mechanisms in a cognitive architecture. In *Proceedings of the AAAI 2011 Fall Symposium on Advances in Cognitive Systems*, Arlington, VA: AAAI Press.
- Choi, D., & Ohlsson, S. (2011). Effects of multiple learning mechanisms in a cognitive architecture. In *Proceedings of the 33rd Annual Meeting of the Cognitive Science Society* (pp. 3003 – 3008). Boston, MA: Cognitive Science Society, Inc.
- Kim, K., Lee, J.-Y., Choi, D., Park, J.-M., & You, B.-J. (2010). Autonomous task execution of a humanoid robot using a cognitive model. In *Proceedings of the IEEE International Conference on Robotics and Biomimetics*, Tianjin, China: IEEE Press.

Choi, D., & Ohlsson, S. (2010). Learning from failures for cognitive flexibility. In *Proceedings of the 32nd Annual Meeting of the Cognitive Science Society*, Portland, OR: Cognitive Science Society, Inc.

Choi, D. (2010). Nomination and prioritization of goals in a cognitive architecture. In *Proceedings of the 10th International Conference on Cognitive Modeling*, Philadelphia, PA: Drexel University.

Choi, D. (2010). Reactive goal management in a cognitive architecture. In *Proceedings of the AAAI-2010 Workshop on Goal-Directed Autonomy*, Atlanta, GA: AAAI Press.

Choi, D., & Ohlsson, S. (2010). Cognitive flexibility through learning from constraint violations. In *Proceedings of the Nineteenth Annual Conference on Behavior Representation in Modeling Simulation*, Charleston, SC.

Choi, D., Kang, Y., Lim, H., & You, B.-J. (2009). Knowledge-based control of a humanoid robot. In *Proceedings of the IEEE/RSJ International Conference on Intelligent Robots and Systems*, St. Louis, MO: IEEE Press.

Choi, D. (2009). Concurrent execution in a cognitive architecture. In *Proceedings of the 31st Annual Meeting of the Cognitive Science Society*, Amsterdam, Netherlands: Cognitive Science Society, Inc.

Ali, K., Leung, K., Könik, T., Choi, D., & Shapiro, D. (2009). Knowledge-directed theory revision. In *Proceedings of the Seventeenth International Conference on Inductive Logic Programming*, Leuven, Belgium: Springer-Verlag.

* For papers published before 2009, see my [Google Scholar page](#).

Professional Service:

Program Co-chair: ACS 2018

Organizing Committee Member: CogSci 2010 – 2014

Senior Program Committee Member: AAAI 2018

Program Committee Member: AAAI 2012 & 2017; ACS 2013

Grant Proposal Reviewer: Icelandic Research Fund (2020)

Journal Reviewer: SORO (2023); JAIR (2021); IEEE RA-L (2020);

Experimental and Theoretical AI (2019);

Artificial Intelligence (2013); Machines (2013);

Computational Intelligence (2011); Cognitive Systems Research (2011); AGI (2011)

Conference Reviewer: IROS 2013/2020, ICAR 2013, Humanoids 2012, CogSci 2012,

ICRA 2011, CogSci 2011, BRiMS 2010, and others

Session Chair: IROS 2009

Certifications and Languages:

Microsoft Certified Professional (MCP) (1997 –)

Microsoft Certified Systems Engineer (MCSE) (1997 – 2001)

Korean (native), English (fluent), Japanese (limited)