

CONTACT INFORMATION	Lincoln Agri-Robotics Centre University of Lincoln Room 2003, Riseholme Hall Lincoln LN2 2LG, UK	✉: tchoi@lincoln.ac.uk 🌐: taeyeongchoi.com 🐦: ssuty
INTERESTS	Novel learning algorithms for real applications with limited resources — agricultural AI, robotics, deep neural networks, anomaly detection, data/controller synthesis, Bayesian learning, active planning/navigation, information-theoretic decision-making, decentralised systems, and reinforcement learning	
CURRENT ACADEMIC APPOINTMENTS	University of Lincoln (UoL) , Lincoln, UK Postdoctoral Research Associate	Oct 2020 – Present
	<ul style="list-style-type: none"> • Supervisor: Dr. Grzegorz Cielniak • Affiliations: <ul style="list-style-type: none"> – Lincoln Agri-Robotics (LAR) – Lincoln Institute for Agri-food Technology (LIAT) – Lincoln Centre for Autonomous Systems (L-CAS) 	
EDUCATION	Arizona State University (ASU) , Tempe, AZ, USA M.S. & Ph.D., Computer Science	Dec 2020
	<ul style="list-style-type: none"> • Advisor: Dr. Theodore (Ted) P. Pavlic • Ph.D. Dissertation: "Deep Learning Approaches for Inferring Collective Macrostates from Individual Observations in Natural and Artificial Multi-Agent Systems Under Realistic Constraints". ISBN: 9798557031004 	
	Soongsil University (SSU) , Seoul, South Korea B.S.E., Computer Science and Engineering	Aug 2015
WORK EXPERIENCE	Atlassian , Mountain View, CA <i>Data Scientist Intern</i>	May 2018 – Aug 2018
	<ul style="list-style-type: none"> • Jira Duplicate Ticket Detection <ul style="list-style-type: none"> – Designed a deep learning pipeline for human natural language to classify semantically similar tickets from customers. – Gathered >124K examples to implement, train, fine-tune, and validate specialized LSTM models. – Demonstrated 1) significantly higher accuracy than traditional machine learning models, 2) generalizability to the data from different sources of ticket, and 3) feasibility of similarity-based ranking scenarios. 	
PUBLICATIONS	(Preprints / Under Review) [1] Choi T. and G. Cielniak. Channel Randomisation with Domain Control for Effective Representation Learning of Visual Anomalies in Strawberries. <i>Under review in the AAAI-22 Workshop on AI for Agriculture and Food Systems (AIAFS)</i> . [2] Choi T. , O. Would, A. Salazar-Gomez, and G. Cielniak. Self-supervised Representation Learning for Reliable Robotic Monitoring of Fruit Anomalies. <i>Under review in the 2022 IEEE International Conference on Robotics and Automation (ICRA 2022)</i> . arXiv:2109.10135. [3] Choi T. , Benjamin Pyenson, Juergen Liebig, and T. P. Pavlic. Beyond Tracking: Using Deep Learning to Discover Novel Interactions in Biological Swarms. <i>Under review in the Journal of Artificial Life and Robotics</i> — Extension of the <i>Best Paper Award</i> winner at the <i>4th International Symposium on Swarm Behavior and Bio-Inspired Robotics 2021 (SWARM 2021)</i> , Jun 1–4, 2021. Kyoto, Japan. Virtual event. arXiv:2108.09394.	

(Published)

- [4] **Choi T.** and G. Cielniak. Adaptive Selection of Informative Path Planning Strategies via Reinforcement Learning. In: *Proceedings of the 10th European Conference on Mobile Robots (ECMR 2021)*, Aug 31–Sep 3, 2021. Bonn, Germany. Virtual event. doi:10.1109/ECMR50962.2021.9568796
 - [5] **Choi T.**, Benjamin Pyenson, Juergen Liebig, and T. P. Pavlic. Identification of Abnormal States in Videos of Ants Undergoing Social Phase Change. In: *Proceedings of the 35th AAAI Conference on Artificial Intelligence (AAAI 2021)*, Feb 2–9, 2021. Virtual event.
 - [6] **Choi T.** and T. P. Pavlic. Automatic Discovery of Motion Patterns that Improve Learning Rate in Communication-Limited Multi-Robot Systems. In: *Proceedings of the IEEE 2020 International Conference on Multisensor Fusion and Integration (MFI 2020)*, Sep 14–16, 2020. Karlsruhe, Germany. Virtual event. doi:10.1109/MFI49285.2020.9235218
 - [7] Kang, S., **T. Choi** and T. P. Pavlic. How Far Should I Watch? Quantifying the Effect of Various Observational Capabilities on Long-range Situational Awareness in Multi-robot Teams. In: *Proceedings of the 1st IEEE International Conference on Autonomic Computing and Self-Organizing Systems (ACSOS 2020)*, Aug 17–21, 2020. Washington, DC, USA. Virtual event. doi:10.1109/ACSOS49614.2020.00036
 - [8] **Choi, T.**, S. Kang, and T. P. Pavlic. Learning Local Behavioral Sequences to Better Infer Non-local Properties in Real Multi-robot Systems. In: *Proceedings of the 2020 IEEE International Conference on Robotics and Automation (ICRA 2020)*, May 31–June 4, 2020. Paris, France. Virtual event. doi:10.1109/ICRA40945.2020.9196728
 - [9] **Choi, T.**, T. P. Pavlic, and A. W. Richa. Automated Synthesis of Scalable Algorithms for Inferring Non-Local Properties to Assist in Multi-Robot Teaming. In: *Proceedings of the 2017 IEEE International Conference on Automation Science and Engineering (CASE 2017)*, Aug 20–23, 2017. Xi'an, China. doi:10.1109/COASE.2017.8256320
 - [10] **Choi, T.** and H. Na. Stealthy Behavior Simulations based on Cognitive Data. *The Journal of Korea Society (JKGS)*, 16(2):27–40, Apr 2016. doi:10.7583/JKGS.2016.16.2.27
 - [11] **Choi, T.** and H. Na. Making Levels More Challenging with a Cooperative Strategy of Ghosts in Pac-Man. *The Journal of Korea Society (JKGS)*, 15(5):89–98, Oct 2015. doi:10.7583/JKGS.2015.15.5.89
 - [12] **Choi, T.** and H. Na. Stealthy Behavior Simulations based on Cognitive Data. In: *Proceedings of the 2015 IEEE International Conference on Machine Learning and Cybernetics (ICMLC 2015)*, 16(2):27–40, Jul 12–15 2015. Guangzhou, China. doi:10.1109/ICMLC.2015.7340900
- POSTER PRESENTATIONS
- [13] **Choi, T.**, T. P. Pavlic, and A. W. Richa. Automated Synthesis of Scalable Algorithms for Inferring Non-local Properties to Assist in Multi-Robot Teaming. In: Poster Session at *Southwest Robotics Symposium*, Jan 2018. Tempe, AZ, USA.
 - [14] **Choi, T.**, T. P. Pavlic, and A. W. Richa. Automated Synthesis of Scalable Algorithms for Inferring Non-local Properties to Assist in Multi-Robot Teaming. In: Poster Session at *TEDxASU: Innovators Symposium*, Mar 2017. Tempe, AZ, USA.
 - [15] **Choi, T.**, J. Lee, C. Soh, and J. Lee. Social Alarm: Smart mobile application helping people to get up together. In: Poster Session at *Seoul Accord ITem SHOW*, Dec 2012. Seoul, South Korea.
- INVITED TALKS
- [16] Self-supervised Learning of Visual Anomalies in Strawberries. In: *International Conference on Digital Technologies for Sustainable Crop Production (DIGICROP)*, Mar 2022. Virtual event.

- [17] AI Research in Agriculture and Beyond — Successful Machine Learning under Limited Resources. In: *Hankyong National University, School of Computer Engineering & Applied Mathematics Seminar*, Dec 2021. Anseong, South Korea.
- [18] Identifying Anomalies for Better Decision-Making. In: *University of Lincoln, CMP9766M: Frontiers of Robotics Research Seminar*, May 2021. Lincoln, UK. Virtual event.
- [19] Local Behavior Learning for Social Temperature Prediction without Individual Ant Tracking. In: Oral Session at *Collective Information Processing*, Mar 2020. Berlin, Germany.
- [20] Machine Learning Applications for Video Game Development. In: *Hankyong National University, School of Computer Engineering & Applied Mathematics Seminar*, Jul 2015. Anseong, South Korea.

RESEARCH PROJECTS

ASU, Tempe, AZ

- NSF: "CRISP: Type 2/Collaborative Research: Design and Control of Coordinated Green and Gray Water Infrastructure to Improve Resiliency in Chemical and Agricultural Sectors" **Aug 2018 – Dec 2019**
 - PI: Dr. John Sabo
 - Combinatorial optimization for the placement of green infrastructures (wetlands) along with gray infrastructures (reservoirs) to minimize risks of natural disasters in an area of interest.
- DARPA I20: "BioSwarm: Bio-Inspired Swarming" **Aug 2017 – Jul 2018**
 - Supervisor (co-PI): Dr. Theodore (Ted) P. Pavlic
 - PI: Dr. Stephen C. Pratt
 - Designed deep neural networks to identify informative behaviors of *Harpegnathos* ants for classification of colonial states.

SSU, Seoul, South Korea

- Reinforcement Learning for Video Game Design **Oct 2014 – Aug 2015**
 - Supervisor: Dr. Hyeon-Suk Na
 - Designed a model-free reinforcement learning framework to predict the actions of human players at the stage of video game development.
 - Proposed team strategies of enemies using A* algorithm to highly increase the level in the games of Pac-Man.
- Development of a Cognitive Planning and Learning Model for Mobile Platforms **Dec 2012 – Sep 2014**
 - Supervisor: Dr. Young-Tack Park
 - Contributed to refining noisy GPS data from Android phones and creating modules on Android OS for reliable communication with a remote server computer.
 - Implemented ontology-based temporal reasoning models integrated with SPAQL.

TEACHING EXPERIENCE

ASU, Tempe, AZ

Teaching Assistant

- CSE 450/551: Design Analysis of Algorithms/Foundations of Algorithms: **Jan 2018 – May 2018**
 - Instructor: Dr. Andréa Richa
 - Graded exams, and held office hours (2 hours/week) for tutoring students.

- CSE 310: Data Structures and Algorithms: **Aug 2017 – Dec 2017**
 - Instructor: Dr. Andréa Richa
 - Taught recitation sessions (4 hours/week), graded exams, and provided instructions for C++ programming assignments.
- CSE 205: Object-Oriented Programming & Data **Jan 2016 – May 2016**
 - Instructor: Dr. Xuerong Feng
 - Graded exams, and tutored students for Java programming (4 hours/week).
- CSE 100: Prin. of Programming with C ++ **Jan 2016 – May 2016**
 - Instructor: Dr. Phillip Miller
 - Supervised C++ programming laboratories (5 hours/week), and held tutoring hours (4 hours/week).
- CSE 424: Capstone Project II **Aug 2015 – Dec 2015**
 - Instructor: Dr. Debra Calliss
 - Supervised each project group with their short-term and long-term goals, and graded IT ethics essays.

MENTORING

UoL, Lincoln, UK

- Owen Would (MSc in Robotics & Autonomous Systems) **Mar 2021 – Sep 2021**
 - Studied on deep network-based visual anomaly detection of strawberry images, and validated GAN-based approaches on challenging conditions such as occlusion.

ASU, Tempe, AZ, USA

- Sehyeok Kang (MS in Computer Engineering) **Mar 2019 – May 2020**
 - Researched on Remote Teammate Localization on the physical robot platform *Thymio*, and also analysed the correlation between the prediction accuracy and the amount of observation samples.
- Ricardo Weir (BS in Computer Science) **Mar 2018 – Dec 2018**
 - Built a YOLO-based deep learning pipeline from data annotation to model validation to perform automatic tracking of individual *Harpegnathos* ants from video recordings.

GRANTS
& AWARDS**SWARM 2021**

- Best Paper Award Jun 2021

ASU Graduate College

- Completion Fellowship (\$8,550 plus tuition for 1 credit hour) Aug 2020

ASU Ira A. Fulton Schools of Engineering

- Engineering Graduate Fellowship (\$700) May 2020

ASU School of Computing, Informatics, and Decision Systems Engineering

- Doctoral Fellowship (\$4,000) Mar 2020

ASU Social Insect Research Group

- Student Research Grants (\$1,550) Nov 2018
 - Project: Deep features for generalizable insect behavior learning.

	SSU College of Information Technology	
	<ul style="list-style-type: none"> • Bronze Award at Software Development Competition – Social Alarm: Smart Android Alarm Application (Photos & Demo) 	Oct 2012
PROFESSIONAL SERVICE	TAROS 2021	
	<ul style="list-style-type: none"> • <i>Session Chair: "Oral Session 3"</i> 	Sep 2021
	ASU Graduate and Professional Student Association	
	<ul style="list-style-type: none"> • <i>Research Grants Reviewer</i> 	Aug 2017 – May 2018
	<ul style="list-style-type: none"> • <i>Travel Grants Reviewer</i> 	Aug 2016 – Jul 2017
	IEEE CASE 2017	
	<ul style="list-style-type: none"> • <i>Session Co-chair: "Big Data for Automation II"</i> 	Aug 2017
HARDWARE AND SOFTWARE SKILLS	Data Science & Machine Learning:	
	<ul style="list-style-type: none"> • Tensorflow, PyTorch, Tensorboard, Weka, OpenCV, and Gephi. 	
	Robotics:	
	<ul style="list-style-type: none"> • Thymio: A two-wheeled mobile robotic platform with a small diameter of about 12cm. • Robotarium: Mobile multi-robot system simulator, designed by <i>GRITSLab</i> in <i>Georgia Institute of Technology</i>, enabling to remotely access the physical robotic resources. • Webots: An open-sourced robot simulator to visualise operation of various commercialised platforms in 3D with Python scripts. 	
	Programming Languages:	
	<ul style="list-style-type: none"> • Python, Java, C, C++, UNIX shell scripting, GNU make, MySQL, and others. 	
	Operating Systems:	
	<ul style="list-style-type: none"> • Microsoft Windows family, Apple OS X, Linux, and other UNIX variants. 	
	Others:	
	<ul style="list-style-type: none"> • Unity 3D, MATLAB, L^AT_EX, GitHub, Android, and TCP/IP programming. 	
SERVICE	ASU International Students Club	
	<i>Student President</i>	Aug 2016 – Dec 2017
	Korea Food for the Hungry International (KFHI)	
	<i>Math Tutor for Middle School Students</i>	Apr 2014 – Aug 2014
	Campus Crusade for Christ at Seoul South District	
	<i>Student President</i>	Mar 2011 – Aug 2012
	Republic of Korea Army	
	<i>Military Service</i>	Feb 2009 – Dec 2010