

CONTACT INFORMATION	University of Lincoln Lincoln Institute for Agri-Food Technology Room 2003, Riseholme Hall Riseholme Park, Lincoln LN2 2LG, UK	✉: tchoi@lincoln.ac.uk 🌐: taeyeongchoi.com 🐦: ssuty
INTERESTS	Novel learning algorithms for robotic/biological agent systems under realistic constraints – deep neural networks, anomaly detection, data/controller synthesis, Bayesian learning, active planning, information-theoretic decision making, decentralised systems, 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 Institute for Agri-food Technology (LIAT) • Lincoln Agri-Robotics (LAR) • Lincoln Centre for Autonomous Systems (L-CAS) 	
EDUCATION	Arizona State University (ASU) , Tempe, AZ, USA MS & 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
	<ul style="list-style-type: none"> • Advisor: Dr. Jaeyoung Choi 	
PUBLICATIONS & PREPRINTS	<p>[1] Choi T., O. Would, A. Salazar-Gomez, and G. Cielniak. Self-supervised Representation Learning for Reliable Robotic Monitoring of Fruit Anomalies. arXiv:2109.10135.</p> <p>[2] Choi T. and G. Cielniak. Adaptive Selection of Informative Path Planning Strategies via Reinforcement Learning. In: <i>Proceedings of the 10th European Conference on Mobile Robots (ECMR 2021)</i>, Aug 31–Sep 3, 2021. Bonn, Germany (Virtual).</p> <p>[3] Choi T., Benjamin Pyenson, Juergen Liebig, and T. P. Pavlic. Beyond Tracking: Using Deep Learning to Discover Novel Interactions in Biological Swarms. Presented at <i>the 4th International Symposium on Swarm Behavior and Bio-Inspired Robotics 2021 (SWARM 2021)</i>, Jun 1–4, 2021. Kyoto, Japan (Virtual). arXiv:2108.09394 – <i>Best Paper Award</i></p> <p>[4] Choi T., Benjamin Pyenson, Juergen Liebig, and T. P. Pavlic. Identification of Abnormal States in Videos of Ants Undergoing Social Phase Change. In: <i>Proceedings of the 35th AAAI Conference on Artificial Intelligence (AAAI 2021)</i>, Feb 2–9, 2021. Virtual conference.</p> <p>[5] Choi T. and T. P. Pavlic. Automatic Discovery of Motion Patterns that Improve Learning Rate in Communication-Limited Multi-Robot Systems. In: <i>Proceedings of the IEEE 2020 International Conference on Multisensor Fusion and Integration (MFI 2020)</i>, Sep 14–16, 2020. Karlsruhe, Germany (Virtual). doi:10.1109/MFI49285.2020.9235218</p> <p>[6] 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</p>	

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). doi:10.1109/ACSOS49614.2020.00036

- [7] **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). doi:10.1109/ICRA40945.2020.9196728
- [8] **Choi, T.**, T. P. Pavlic, and A. 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
- [9] **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
- [10] **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
- [11] **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
- [12] **Choi, T.** Local Behavior Learning for Social Temperature Prediction without Individual Ant Tracking. In: Oral Session at *Collective Information Processing*, Mar 2020, Berlin, Germany.
- [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 enabling a group of people to wake up each other. In: Poster Session at *Seoul Accord ITeM SHOW*, Dec 2012, Seoul, South Korea.

WORKSHOP &
POSTER
PRESENTATION

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
 - Solving combinatorial optimization problems to find the best locations of green infrastructure (wetlands) to minimize potential risks in operating gray infrastructure (reservoirs) 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 detect the occurrences of social behaviors among *Harpegnathos* ants from large video data sets.
 - Automated to discover individual behaviors that highly correlate with the temporal changes of stability in ant colonies.

SSU, Seoul, South Korea

- **Machine Learning for Video Game Design** **Oct 2014 – Aug 2015**
 - Supervisor: Dr. Hyeon-Suk Na
 - Showed the feasibility of a model-free reinforcement learning framework to predict actions of human players at the stage of video game development.
 - Proposed a better team strategy using A* algorithm to maximize the difficulty of a video game Pac-man.
- **Development of a Cognitive Planning and Learning Model for Mobile Platforms** **Dec 2012 – Sep 2014**
 - Supervisor: Dr. Young-Tack Park
 - Contributed to implementing software modules of an android client application to refine collected raw GPS data and communicate with remote servers.
 - Demonstrated ontology-based temporal reasoning approaches with the queries of SPAQL.

**WORK
EXPERIENCE****Atlassian, Mountain View, CA***Data Scientist Intern***May 2018 – Aug 2018**

- **Jira Duplicate Ticket Detection**
 - Built a deep learning pipeline for NLP, which can classify semantically similar tickets from customers so that the writing customer can be notified with relevant tickets already answered before.
 - Collected >124K ticket examples to train, fine-tune, and validate a LSTM based model called BiMPM.
 - Demonstrated 1) better performance than baseline models previously implemented by traditional feature extraction, 2) generalizability with data from different ticket sources, and 3) feasibility in similarity-based ranking scenarios.

**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
 - Responsible for grading exams and office hours (2 hours/week) to tutor students for assignments.
- **CSE 310: Data Structures and Algorithms:** **Aug 2017 – Dec 2017**
 - Instructor: Dr. Andréa Richa
 - Responsible for teaching recitation session (4 hours/week), grading exams, and providing C++ programming guides for assignments.
- **CSE 205: Object-Oriented Programming & Data** **Jan 2016 – Mar 2016**
 - Instructor: Dr. Xuerong Feng
 - Responsible for grading exams and Java programming tutoring (4 hours/week).
- **CSE 100: Prin. of Programming with C ++** **Jan 2016 – Mar 2016**
 - Instructor: Dr. Phillip Miller
 - Responsible for supervision of C++ programming laboratory (5 hours/week) and programming tutoring hours (4 hours/week).
- **CSE 424: Capstone Project II** **Aug 2015 – Dec 2015**
 - Instructor: Dr. Debra Calliss
 - Responsible for supervising each project group's achievement toward their short-term and long-term goals as well as grading IT ethics essays.

MENTORING	<p>UoL, Lincoln, UK</p> <ul style="list-style-type: none"> • Owen Would (MSc in Robotics & Autonomous Systems) Mar 2021 – Sep 2021 <ul style="list-style-type: none"> – For this Masters dissertation, implemented deep network-based visual anomaly detectors of strawberry images at various growth stages and mainly validated GAN-based approaches on challenging conditions such as partial visibility with occlusions. <p>ASU, Tempe, AZ, USA</p> <ul style="list-style-type: none"> • Sehyeok Kang (MS in Computer Engineering) Mar 2019 – May 2020 <ul style="list-style-type: none"> – For his Masters thesis, implemented physical mobile robots <i>Thymio</i> to solve Remote Teammate Localization problems under realistic constraints and also analysed the relationship between the prediction accuracy and the amount of available observations. • Ricardo Weir (BS in Computer Science) Mar 2018 – Dec 2018 <ul style="list-style-type: none"> – Built a deep learning pipeline, from data annotations to model validations, to track individual <i>Harpegnathos</i> ants using YOLO algorithm.
PROFESSIONAL SERVICE	<p>TAROS 2021</p> <ul style="list-style-type: none"> • <i>Session Chair: "Oral Session 3"</i> Sep 2021 <p>ASU Graduate and Professional Student Association</p> <ul style="list-style-type: none"> • <i>Research Grants Reviewer</i> Aug 2017 – May 2018 • <i>Travel Grants Reviewer</i> Aug 2016 – Jul 2017 <p>IEEE CASE 2017</p> <ul style="list-style-type: none"> • <i>Session Co-chair: "Big Data for Automation II"</i> Aug 2017
GRANTS & AWARDS	<p>SWARM 2021</p> <ul style="list-style-type: none"> • Best Paper Award Jun 2021 <p>ASU Graduate College</p> <ul style="list-style-type: none"> • Completion Fellowship (\$8,550 plus tuition for 1 credit hour) Aug 2020 <p>ASU Ira A. Fulton Schools of Engineering</p> <ul style="list-style-type: none"> • Engineering Graduate Fellowship (\$700) May 2020 <p>ASU School of Computing, Informatics, and Decision Systems Engineering</p> <ul style="list-style-type: none"> • Doctoral Fellowship (\$4,000) Mar 2020 <p>ASU Social Insect Research Group</p> <ul style="list-style-type: none"> • Student Research Grants (\$1,550) Nov 2018 <ul style="list-style-type: none"> – Project: Deep features for generalizable insect behavior learning. <p>Software Development Competition at SSU College of Information Technology</p> <ul style="list-style-type: none"> • Bronze Prize (Photos & Demo) Oct 2012 <ul style="list-style-type: none"> – Social Alarm: Smart Anroid Alarm Application

HARDWARE AND
SOFTWARE SKILLS

Data Science & Machine Learning:

- Tensorflow/PyTorch to implement various GPU-accelerated deep neural network algorithms, such as ANN, CNN, and RNN, for a huge amount of (possibly, temporal) data.
- Tensorboard: Visualization tool for machine learning models trained by Tensorflow/Pytorch.
- WEKA to easily try diverse preprocessing methods or (un)supervised machine learning algorithms.
- Open CV to (pre-)process video or image data.
- Gephi to visualize graph data.

Robotics:

- Thymio: A two-wheeled mobile robotic platform with a diameter of about 12cm, which can be easily programmed through a python interface.
- Robotarium: Mobile multi-robot system simulator, designed by *GRITSLab* in *Georgia Institute of Technology*, enabling to remotely access the physical robotic resources.

Programming Languages:

- Python, Java, C, C++, UNIX shell scripting, GNU make, MySQL, and others.

Operating Systems:

- Microsoft Windows family, Apple OS X, Linux, and other UNIX variants.

Others:

- Unity 3D, MATLAB, L^AT_EX, GitHub, Android application development, TCP/IP networking.

SERVICE

ASU International Students Club

Student President

Aug 2016 – Dec 2017

Korea Food for the Hungry International (KFHI)

Math Tutor for Middle School Students

Apr 2014 – Aug 2014

Campus Crusade for Christ at Seoul South District

Student President

Mar 2011 – Aug 2012

Republic of Korea Army

Military Service

Feb 2009 – Dec 2010