

# Taylor Olson

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## Research Interests

Exploring philosophical moral theories, deontic logics, and machine learning techniques in hopes to instill AI systems with social and moral competence.

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## Education

### Northwestern University, Evanston, IL

PhD Computer Science, Anticipated end of 2024

Thesis Title: *A Formal Theory of Norms*

Advisor: Professor Ken Forbus

Honors: IBM PhD Fellowship, 2023-24; Northwestern Cognitive Science Fellowship, 2018-19

Cognitive Science Certificate, 2023

### University of Northern Iowa, Cedar Falls, IA

B.S., Computer Science, 2018

B.A., Mathematics, 2018

Minor in Philosophy

### Kirkwood Community College, Cedar Rapids, IA

Mechanical Engineering Transfer Program, 2014

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## Research Experience

**Thesis Research**, Computer Science, Northwestern University, Evanston, IL, 2018-Present

Advisor: Professor Ken Forbus

Project: *A Formal Theory of Norms*

- Investigating the theoretical possibility of creating an artificial moral agent
- Developing predicate calculus knowledge representation and reasoning schemes for norms
- Developing machine learning models of norm learning and grounding them in reasoning
- Exploring defeasible logics for resolving normative conflicts

**Research Assistant (with Prof. Ken Forbus)**, Computer Science, Qualitative Reasoning Group, Northwestern University, Evanston, IL, 2018-Present

Project: *Social Reasoning for AI Systems*

- Implementing normative reasoning into a cognitive architecture to govern its behavior
- Extending semantic parsing to handle norm learning via natural language

**Undergraduate Research Intern**, School of Engineering and Applied Sciences, Harvard University, Cambridge, MA, Summer 2017

Advisors: Professor Dustin Tingley, Dr. Margot Levine

Project: *Clustering and Recommending Course Offerings from Syllabi*

- Built and tested an academic course recommender model using a dataset of natural language syllabi
- Developed a pipeline and interface for rapid development of ensemble machine learning models including LSA, LDA, K-nearest neighbors, and Doc2Vec/Word2Vec

**Research Assistant**, Computer Science, University of Northern Iowa, Cedar Falls, IA, 2016-17

Advisor: Professor Aleksandar Poleksić

Project: *Prediction of Adverse Drug Reactions via Unified Medical Language System (UMLS)*

- Automated the translation of compound IDs to their standard IDs
- Analyzed coverage of compound IDs and their adverse reactions for prediction

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**Publications**

- Olson, T., & Forbus, K. D. (Forthcoming 2024). Normative Testimony and Belief Functions: A Formal Theory of Norm Learning. In *Proceedings of the 33<sup>rd</sup> International Joint Conference on Artificial Intelligence*. Jeju, South Korea.
- Olson, T., Salas-Damian R., & Forbus, K.D. (2024). A Defeasible Deontic Calculus for Resolving Norm Conflicts. Proceedings of the 11th Annual Conference on Advances in Cognitive Systems 2021. Palermo, Sicily, Italy.
- Olson, T. (2024). Towards Unifying the Descriptive and Prescriptive for Machine Ethics. In P. Wu , M. Salpukas, H. Wu, S. Ellsworth (Eds.), *Trolley Crash: Approaching Key Metrics for Ethical AI Practitioners, Researchers, and Policy Makers*, (Chapter 5). Cambridge: Academic Press.
- Olson, T., & Forbus, K. D. (2023). Mitigating Adversarial Norm Training with Moral Axioms. In *Proceedings of the AAI Conference on Artificial Intelligence* (Vol. 37, No. 10, pp. 11882-11889).
- Olson, T. (2022). Towards Unifying the Descriptive and Prescriptive for Machine Ethics. In *Proceedings of the AAI 2022 Spring Symposium on "Approaches to Ethical Computing Metrics for Measuring AI's Proficiency and Competency for Ethical Reasoning"*.
- Olson, T. & Forbus, K. (2021). Learning Norms via Natural Language Teachings. In *Proceedings of the 9th Annual Conference on Advances in Cognitive Systems 2021*.

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**Invited Talks**

- Mitigating Adversarial Norm Training with Moral Axioms*, Second International Workshop on Computational Machine Ethics, 20th International Conference on Principles of Knowledge Representation and Reasoning (KR2023), 2023. (Virtual).
- Mitigating Adversarial Norm Training with Moral Axioms*, AAI-23, 2023.
- Towards Unifying the Prescriptive and Descriptive for Machine Ethics*, AAI-22 Spring Symposium on "Approaches to Ethical Computing Metrics for Measuring AI's Proficiency and Competency for Ethical Reasoning", Spring 2022.
- Learning Norms via Natural Language Teachings*, The Ninth Advances in Cognitive Systems (ACS) Conference, 2021.
- Artificial Intelligence in Curriculum Design*, National Conference for McNair Scholars and Undergraduate Research, University of Maryland, March 2018
- Artificial Intelligence and Recommender Systems*, McNair Seminar Series, University of Northern Iowa, September 2017.
- Recommendation System Developer*, Joint Research Experience for Undergraduates Summer Symposium, Harvard University, August 2017.

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**Honors & Awards**

- IBM PhD Fellowship, Northwestern University, 2023-2024
- Cognitive Science Travel Grant, Northwestern University, 2023
- Cognitive Science Fellowship, Northwestern University, 2018-2019
- 4th Place, Midwest Instruction and Computing Symposium Programming Contest, 2017
- 1st Place at site, ACM Programming Contest, 2016
- Ronald E. McNair Postbaccalaureate Achievement Program, 2016
- Student of the Month, Kirkwood Community College, 2014
- NSF Engineering Scholarship, Kirkwood Community College, 2012-2014
- Engineering project featured in local newspaper, 2012
- All-Region Basketball, Kirkwood Community College, 2012-2014

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**Teaching**

Guest lecturer, *Deontic Logic*, Knowledge Representation and Reasoning (KRR), Northwestern University, Winter 2024

TA, Introduction to Cognitive Modeling, Northwestern University, Fall 2020 – 2023

Guest lecturer, *Knowledge Representation*, Introduction to Cognitive Modeling, Northwestern University, Fall 2023

Guest lecturer, *Intelligent Tutoring Systems*, Introduction to Cognitive Modeling, Northwestern University, Fall 2022

Guest lecturer, *Deontic Logic*, Knowledge Representation and Reasoning (KRR), Northwestern University, Winter 2022

Guest lecturer, *Intelligent Tutoring Systems*, Introduction to Cognitive Modeling, Northwestern University, Fall 2021

Guest lecturer, *Philosophy and KRR - Deontic Logic*, Knowledge Representation and Reasoning (KRR), Northwestern University, Winter 2021

Guest lecturer, *Statistical Modeling - Introduction to Neural Networks*, Introduction to Cognitive Modeling, Northwestern University, Fall 2020

TA, AI and Experimental Narrative, Northwestern University, Spring 2020

Guest lecturer, *Philosophy and KRR*, Knowledge Representation and Reasoning (KRR), Northwestern University, Winter 2020

Guest lecturer, *Philosophy and KRR*, Knowledge Representation and Reasoning (KRR), Northwestern University, Winter 2019

URM Stem Tutor, University of Northern Iowa, 2016-2018

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**Service & Outreach**

Mentor, Machine Ethics Undergraduate Independent Student, Northwestern University, 2022

Grad Cohort for URMD, CRA-WP, Austin, TX, 2020

STEM Mentor, Morning Mentors, Nichols Middle School, Evanston, IL, 2019-2020

Reading Mentor, America Reads, Lincoln Elementary School, Cedar Falls, IA, 2016-2018

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**Software****Norms Reasoner**

<https://github.com/TeeOhh/Norms-Reasoner>

An application and web interface for running our model of Moral Intuition and Construction on the Moral Conventional Transgression (MCT) Task experiment.

**tRECS**

<https://github.com/TeeOhh/tRECS>

Python NLP package and graphical interface capable of cleaning text data, building various statistical and vector space models, and creating recommender systems. With Janie Neal, Christiana Prater-Lee, and Eshita Nandini.

**UMLS-Similarity-Viewer**

Python package for graphical user interface to UMLS-Similarity, a similarity querying package built on top of the UMLS database of medicines, chemical compounds, and adverse drug reactions.