# Tyler Millhouse

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| **Areas of Specialization** | Philosophy of Science, Philosophy of Cognitive Science |
| **Areas of Competence** | AI Ethics, Philosophy of Mind, Moral Psychology |

## Education

PhD, Philosophy, University of Arizona (2021)
  Dissertation: *Really Real Patterns*
  Committee: Shaun Nichols (co-chair), Terry Horgan (co-chair), Jonathan Weinberg
  Abstract: In the philosophy of science, there has been a great deal of effort devoted to understanding high-level phenomena as *patterns* in lower-level phenomena. In computer science, there has been a great deal of effort devoted to recognizing patterns and to representing those patterns using formal models. This dissertation engages with the philosophical literature on patterns from a perspective informed by relevant work in computer science. My aim is *not* to correct philosophers' errors or misconceptions by appeal to results in computer science. Rather, my aim is to bolster the philosophical literature by introducing helpful conceptual tools drawn from fields like machine learning, computational modeling, pattern recognition, and algorithmic information theory. As I argue, these conceptual tools allow us to place pattern-based accounts of non-fundamental ontology (esp. Dennett, 1991) on a firmer theoretical foundation. More concretely, I propose a novel, rigorous, and scientifically-informed criterion for the reality of patterns in the physical world. I also propose a more general approach to understanding non-fundamental ontology using ideas from machine learning, such as *features* and *feature selection*. This approach to non-fundamental ontology, I argue, will allow us to better understand scientific modeling, inter-level relations, scientific reduction, and other important issues in the philosophy of science.

MA, Philosophy, Tufts University (2014)
BA, Philosophy, Ashland University (2011)

## Employment

Postdoctoral Fellow, Santa Fe Institute (2021-Present)
  Project: "Foundations of Intelligence in Natural and Artificial Systems"
  Supervisors: Melanie Mitchell (PI), Melanie Moses (Co-PI)

## Publications

Millhouse, T. (2021). "Really Real Patterns." *Australasian Journal of Philosophy*.
  https://bit.ly/3fa9o0B.

Millhouse, T., Moses, M., & Mitchell, M. (2021). "Frontiers in Evolutionary Computation: A Workshop Report." https://arxiv.org/abs/2110.10320.

Millhouse, T., Moses, M., & Mitchell, M. (2021). "Foundations of Intelligence in Natural and Artificial Systems: A Workshop Report." https://arxiv.org/abs/2105.02198.

Millhouse, T. (2021). "Compressibility and the Reality of Patterns." *Philosophy of Science*. 88(1). 2243. https://bit.ly/3595hLP.

Millhouse, T. (2019). "A Simplicity Criterion for Physical Computation." *The British Journal for the Philosophy of Science.* 70(1), 153-178. https://doi.org/10.1093/bjps/axx046.

Millhouse, T., Ayars, A., & Nichols, S. (2019). "Learnability and Moral Nativism: Exploring Wilde Rules," in J. Suikkanen and A. Kauppinen (eds.), *Methodology and Moral Philosophy.* New York, NY: Routledge, 73-90.

Millhouse, T. (2018). "Virtual Machines and Real Implementations." *Minds and Machines.* 28(3), 465-489. https://doi.org/10.1007/s11023-018-9472-7.

Millhouse, T., Bush, L.S. & Moss, D. (2016). "The Containment Problem and the Evolutionary Debunking of Morality," in T.K. Shackelford and R.D. Hansen (eds.), *The Evolution of Morality.* Cham, Switzerland: Springer, 115-135.

## Presentations

"Misconceiving the Mental: Model Instantiation and Computational Functionalism," California Polytechnic State University, April, 2, 2021.

"Patterns and Parsimony," Santa Fe Institute, January, 14, 2021. https://youtu.be/rOjO5P2B-Hc.

"How Kernel Support Vector Machines Represent Actual and Possible Data" (with David Kinney), Modeling the Possible Workshop, October 1, 2020.

"Really Real Patterns," APA Central Division Meeting, Chicago, February 26-29, 2020.

"Compressibility and the Reality of Patterns," Society for the Metaphysics of Science, University of Toronto, November 7-9, 2019.

"The Care and Feeding of Boltzmann Minds," Center for the Study of Language and Information Workshop, Stanford University, June 3, 2017.

"Operationalizing Metaethics: The Disagreement Paradigm in Empirical Moral Psychology" (with L.S. Bush), Society for Philosophy & Psychology, University of Texas, Austin, June 4, 2016.

"Possible Metaethics and Alternative Moral Domains" (with L.S. Bush), Boston Area Moral Cognition Research Group, Boston University, March 25, 2014.

## Work in Progress

"When Levels Intervene" (Under Review)
"How Kernel Support Vector Machines Represent Actual and Possible Data" (with David Kinney)
"Expertise and the Flow of Social Information" (with Joe Bak-Coleman)
"AI Needs a Science of Intelligence" (with Melanie Mitchell & Melanie Moses)
"Patterns and Parsimony"
"The Problem of Platonic Codes
"What's Wrong with Mechanistic Computation?"
"Miracles, Skepticism, and Realist Priors"
"AI Safety and the Strong Orthogonality Thesis"

## Research

Research Assistant, Christopher Hamilton, University of Arizona (Summer 2017 - Fall 2017)

I developed deep neural networks for classifying images from the Mars Reconnaissance Orbiter. The primary aim of the project was to map the extent of volcanic rootless cones, which indicate the presence of water in the ancient past.

Research Assistant, Shaun Nichols, University of Arizona (Fall 2016)

> I collaborated with Shaun Nichols to design and conduct studies on moral psychology and moral rule learning. In particular, we investigated whether (and how easily) individuals can learn uncommon or unusual kinds of rules.

Research Assistant, Liane Young, Boston College (Summer 2013 - Fall 2013)

> I worked as a research assistant in Liane Young's Morality Lab at Boston College. I conducted studies designed by Larisa Heiphetz on the development of metaethical views in young children.

## Teaching

### Instructor

The Ethics of Data Science and AI, University of Arizona (Fall 2020)
Consciousness and Cognition, University of Arizona (Summer 2020)
Contemporary Moral Problems, University of Arizona (Spring 2020)
The Moral Mind, University of Arizona (Summer 2019)
Minds, Brains, and Computers, University of Arizona (Spring 2019)
Minds, Brains, and Computers, University of Arizona (Fall 2018)
The Moral Mind, University of Arizona (Summer 2018)
The Moral Mind, University of Arizona (Spring 2018)
Minds, Brains, and Computers, University of Arizona (Fall 2017)
Minds, Brains, and Computers, University of Arizona (Summer 2017)
Practical Thinking, Ashland University (Spring 2017)
The Moral Mind, University of Arizona (Summer 2016)
Minds, Brains, and Computers, University of Arizona (Summer 2015)

### Teaching Assistant

Philosophical Perspectives on the Individual, University of Arizona (Terry Horgan, Spring 2017)
Practical Thinking, University of Arizona (Jonathan Weinberg, Spring 2016)
Mind, Matter, and God, University of Arizona (Terry Horgan, Fall 2015)
Justice and Virtue, University of Arizona (Michael Gill, Spring 2015)
Logic, Tufts University (Susan Russinoff, Fall 2013)
Philosophy of Language, Tufts University (Dilip Ninan, Spring 2013)

## Graduate Coursework

### Philosophy of Mind & Cognitive Science

Philosophy of Mind, University of Arizona (Terry Horgan, Fall 2016)
Knowledge and Cognition, University of Arizona (Juan Comensaña, Fall 2015)
Philosophy of Mind, University of Arizona (Jonathan Weinberg, Spring 2015)
Philosophy and Cognitive Science, University of Arizona (Shaun Nichols, Fall 2014)
Intuitions (Independent Study), Tufts University (Daniel Dennett, Fall 2013)
Chomsky, Tufts University (Jody Azzouni, Spring 2013)
Semantics, Tufts University (Ray Jackendoff, Spring 2013)
Foundations of Cognitive Science, Tufts University (Daniel Dennett, Fall 2012)

### Computer & Data Science

Advanced Data Visualization, University of Arizona (Joshua Levine, Fall 2020)
Bayesian Modeling and Inference, University of Arizona (Clayton Morrison, Spring 2016)
Introduction to Machine Learning, University of Arizona (Clayton Morrison, Fall 2015)

Computational Cognitive Neuroscience, University of Arizona (Robert Wilson, Fall 2015)
Artificial Intelligence, University of Arizona (Clayton Morrison, Spring 2015)
Statistics Fundamentals, University of Arizona (Lee Sechrest, Fall 2014)

**Philosophy of Science**

Philosophy of Physical Science, University of Arizona (Richard Healey & Jenann Ismael, Fall 2016)
Philosophy of Science, Tufts University (George Smith, Spring 2014)
Nature and Norms, Tufts University (Mario De Caro, Fall 2012)

**Moral Psychology & Value Theory**

Moral Philosophy, University of Arizona (Julia Annas, Spring 2015)
Social Norms, University of Arizona (Gerald Gaus, Fall 2014)
Cultural Evolution, Tufts University (Daniel Dennett, Spring 2014)
Evolution of Minds and Morals, Tufts University (Patrick Forber, Spring 2014)

## References

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Daniel Dennett
University Professor
Tufts University
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Terrence Horgan
Professor of Philosophy
University of Arizona
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Jenann Ismael
Professor of Philosophy
Columbia University
ji2266@columbia.edu

Jonathan Weinberg
Associate Professor of Philosophy
University of Arizona
jmweinberg@email.arizona.edu

**Note:** Recommendation letters can also be solicited from Shauna Garland at shauna-garland@email.arizona.edu.