

Wilka Torrico De Carvalho, *Aspiring Cognitive Scientist and AI Researcher*

CONTACT INFORMATION	<i>Website:</i> cogscikid.com <i>Github:</i> github.com/wcarvalho <i>E-mail:</i> wcarvalh@umich.edu <i>Google Scholar</i>
RESEARCH INTERESTS	My long-term goal is to develop theories for human learning and generalization. In particular, I'm interested in how we discover and exploit richly structured representations to enable sophisticated behavior and rapid adaptation. Towards this end, I am currently working on weak inductive biases for object-centric deep reinforcement learning.
EDUCATION	University of Michigan–Ann Arbor , Ann Arbor, Michigan USA Sep 2018 - Present <i>School of Engineering</i> , Ph.D. in Computer Science Advisors: Honglak Lee , Satinder Singh , Richard Lewis University of Southern California , Los Angeles, California USA Aug 2015 - May 2017 <i>Viterbi School of Engineering</i> , M.S. in Computer Science Advisor: Yan Liu Stony Brook University , Stony Brook, New York USA Aug 2011 - May 2015 <i>College of Arts and Sciences</i> , B.S. in Physics Advisor: Axel Drees Brooklyn Technical High School , Brooklyn, New York USA May 2007 - May 2011 Diploma in Applied Physics
HONORS & AWARDS	1/200 chosen internationally for Heidelberg Laureate Forum 2018 GEM National Fellowship sponsored by IBM, Adobe 2017, 2018 University of Michigan Rackham Merit Fellowship 2017 ICLR, Neurips BAI Travel Award 2017, 2019 NSF Graduate Research Fellowship (Neuroscience) 2015 Provost Award for Academic Excellence (20/5000 graduates chosen) 2015 Researcher of the Month (1 monthly at Stony Brook University) 2014 HHMI Minority Undergraduate Research Fellowship 2014 ΣΠΣ Physics Honor Society (sponsored by Alfred Goldhaber) 2013 NSF Louis Stokes Alliance for Minority Participation Scholar 2011 Deans List 2011-2015
IN PREPARATION	Wilka Carvalho , Andrew Lampinen, Kyriacos Nikiforou, Felix Hill, Murray Shanahan. “ <i>Feature-Attending Recurrent Modules for Generalizing Object-Centric Behavior.</i> ” 2021
CONFERENCE PUBLICATIONS	Chris Hoang, Sungryull Sohn, Jongwook Choi, Wilka Carvalho , Honglak Lee. “ <i>Successor Feature Landmarks for Long-Horizon Goal-Conditioned Reinforcement Learning.</i> ” In NeurIPS, 2021 Wilka Carvalho , Anthony Liang, Kimin Lee, Sungryull Sohn, Honglak Lee, Richard L. Lewis, Satinder Singh. “ <i>Reinforcement Learning for Sparse-Reward Object-Interaction Tasks in First-person Simulated 3D Environments.</i> ” In IJCAI, 2021 Sanjay Purushotham*, Wilka Carvalho *, Tanachat Nilanon, Yan Liu. “ <i>Variational Recurrent Adversarial Domain Adaptation.</i> ” In ICLR, 2017 Wilka Carvalho . “ <i>Modeling a Detection of internally reflected Cherenkov light (DIRC) Particle Detector for High-Multiplicity Collisions.</i> ” In SURC, 2015

WORKSHOP
PUBLICATIONS

Lajanugen Logeswaran, **Wilka Carvalho**, Honglak Lee. “*Learning Compositional Tasks from Language Instructions.*” In NeurIPS Deep RL Workshop, 2021

Wilka Carvalho, Murray Shanahan. “*Learning to Represent State with Perceptual Schemata.*” In ICML {Unsupervised RL, Real Life RL} Workshops, 2021

Wilka Carvalho, Anthony Liang, Kimin Lee, Sungryull Sohn, Honglak Lee, Richard L. Lewis, Satinder Singh. “*Reinforcement Learning for Sparse-Reward Object-Interaction Tasks in First-person Simulated 3D Environments.*” In {ICML Object-Oriented Learning, NeurIPS DeepRL} Workshops, 2020

Chris Hoang, Sungryull Sohn, Jongwook Choi, **Wilka Carvalho**, Honglak Lee. “*Successor Landmarks for Efficient Exploration and Long-Horizon Navigation.*” In NeurIPS DeepRL Workshop, 2020

Wilka Carvalho, Kimin Lee, Anthony Liang, Ryan Krueger, Richard L. Lewis, Satinder Singh, Honglak Lee. “*Efficiently Learning to Perform Household Task with Object-oriented Exploration.*” In NeurIPS BAI, 2019 (**Oral**)

Bryant Chen*, **Wilka Carvalho***, Benjamin Edwards, Taesung Lee, Ian Molloy, Heiko Ludwig. “*Detecting Backdoor Attacks on Deep Neural Networks by Activation Clustering.*” In AAAI Artificial Intelligence Safety Workshop, 2018 (**Best Paper**)

Sanjay Purushotham*, **Wilka Carvalho***, Yan Liu. “*Variational Adversarial Deep Domain Adaptation for Health Care Time Series Analysis.*” In NeurIPS Machine Learning for Healthcare Workshop, 2016 (**Spotlight**)

TALKS

Intelligent Robot Lab (**Invited**). Brown. (February, 2022)

Computational Cognitive Neuroscience Lab. Harvard. (February, 2022)

Computational Cognitive Neuroscience Lab (**Invited**). University of California—Berkeley. (January, 2022)

Deep Learning Community of Practice (**Invited**). Intel. (January, 2022)

Deep RL Workshop (**Contributed Opinion**). NeurIPS. (December, 2021)

Object Representations for Learning Workshop (**Invited**). NeurIPS. (December, 2020)

Cognitive Tools Lab. University of California—San Diego. (November, 2020)

Cognitive Science Community. University of Michigan. (November, 2020)

Stony Brook Society of Physics. Stony Brook, NY. (April, 2020)

Machine Learning Lunch Seminar. University of Southern California. (April, 2017)

PATENTS

Wilka Carvalho. “*Compositional Generalization in Reinforcement Learning.*” Under Review

Bryant Chen, **Wilka Carvalho**, Heiko Ludwig, Ian Molloy, Jialong Zhang, Benjamin Edwards. “*Detecting poisoning attacks on neural networks by activation clustering.*” 2020

Wilka Carvalho, Bryant Chen, Benjamin Edwards, Taesung Lee, Ian Molloy, Jialong Zhang. “*Using Gradients to Detect Backdoors in Neural Networks.*” 2018

Wilka Carvalho, Yan Liu, Tanachat Nilanon, Sanjay Purushotham. “*Effective Knowledge Transfer Among Patient Populations via Deep Learning.*” 2017

RESEARCH
EXPERIENCE

University of Michigan—Ann Arbor, Ann Arbor, Michigan USA

AI Lab, August 2018 – Present

Advisors: [Honglak Lee](#), [Satinder Singh](#), [Richard Lewis](#)

- Studying how deep reinforcement learning agents can discover representations and temporally-extended behaviors that enable generalization

DeepMind, London, UK

Cognition Team, *March 2021 – July 2021*

Advisor: [Murray Shanahan](#)

- Studying agent-state representations for generalization of deep reinforcement learning agents in 3D environments

Microsoft Research, Redmond, Washington USA

Medical Devices Group, *June 2018 – August 2018*

Advisor: [Sumit Basu](#)

- Developed a machine learning model that can predict clinical measures from physiological signals measured by a wearable device.

IBM Research, San Jose, California USA

AI Platform Research Group, *September 2017 – December 2017*

Advisor: [Heiko Ludwig](#)

- Contributed to novel research algorithm by suggesting subspace projection technique that increased our performance from 15% to 95% accuracy.
- Research led to workshop publication and was presented in global meeting to IBM executives including CEO and selected for funding.

Visa Research, Palo Alto, California USA

Data Analytics Group, *June 2017 – August 2017*

Advisor: [Hao Yang](#)

- Implemented model and baselines for language generation and question answering.

University of Southern California, Los Angeles, California USA

Melody Machine Learning Lab, *November 2015 – May 2017*

Advisor: [Yan Liu](#)

Samsung and NSF funded project: “Variational Adversarial Deep Domain Adaptation for Health Care Time Series Analysis”

- Implemented novel neural network that employed variational inference and adversarial training for transfer learning of multivariate time-series.
- Research led to a publication and a patent.
- Communicated research to general public through research feature by the USC Graduate School and to technical audience at ICLR poster presentation.

Stony Brook University, Stony Brook, New York USA

Heavy Ion Research Group, *January 2013 – August 2015*

Advisor: [Axel Drees](#)

DOE funded project: “Modeling a Detection of internally reflected Cherenkov light Particle Detector for High-Multiplicity Collisions”

- Contributed methods from multivariate calculus and linear algebra to particle detection algorithm. Accuracy improved from 60% to 80%.
- Designed and implemented a statistical analysis pipeline in C++ for measuring efficacy of particle detection algorithm.

Stony Brook University, Stony Brook, New York USA

Computational Neuroscience Group, *Fall 2014*

Advisor: [Giancarlo La Camera](#)

NSF LSAMP funded project: “Spectral Analysis of Rodent Neural Data”

- Performed spectral analyses on neural data to determine behavioral correlates of neural activity.

California Institute of Technology, Pasadena, California USA

Emotion and Social Cognition Laboratory, *Summer 2014*

Advisor: [Ralph Adolphs](#)

HHMI funded project: “Modeling the Cognitive Process of Attributing Traits to Others”

- Formulated a trait learning behavioral experiment to study human inference.

University of Minnesota, Minneapolis, Minnesota USA

Neuromodulation Research and Technology Laboratory, *Summer 2013*

Advisor: [Matthew Johnson](#)

NIH funded project: “Modeling Deep Brain Stimulation of Globus Pallidus Internus”

- Implemented python script to build a biologically feasible computational model of neural networks

National Central University, Jhongli City, Taiwan

Turbulent Combustion Laboratory, *Summer 2012*

Advisor: [Shenqyang Shy](#)

TEACHING
EXPERIENCE

Stony Brook University, Stony Brook, NY

Calculus Instructor, *Spring 2015*

Worked with two math professors to develop and teach a supplementary calculus curriculum that promoted minority representation in stem majors.

Stony Brook University, Stony Brook, NY

Educational Opportunity Program Personal Tutor, *Spring 2013 - Fall 2014*

Tutored marginalized students in introductory physics and math courses

SERVICE

Reviewer, NeurIPS Deep RL Workshop, 2020, 2021

Student Volunteer, ICLR, 2017

OUTREACH

HS2 Engineer’s Highschool Panel, Virtual, 2021

Stony Brook Society of Physics, Stony Brook, NY, 2020

Michigan Explore Graduate Studies Workshop, Ann Arbor, MI, 2019

Research and Fellowships Week NSF Panel, Los Angeles, CA, 2016

National Society of Black Engineers Grad Panel, Los Angeles, CA, 2016

Graduate School External Fellowship Boot Camp, Los Angeles, CA, 2016

Mentored marginalized high school youth through the Pullias Center for Higher Education, Los Angeles, CA, 2016

Engineering Graduate Diversity Symposium, Los Angeles, CA, 2015

Black Student Association: What it takes to go to Graduate School, Los Angeles, CA, 2015

Collegiate Science and Technology Entry Program Undergraduate Research Panel, Stony Brook, CA, 2014

SKILLS

Machine Learning Software: Pytorch, TensorFlow, Theano, Keras

Neuroscience Software: Neuron

Languages: Python, C++, C, Java

Systems: Unix, Linux, OSX

PRESS

[Finding Gaps in Your Grad School Apps](#)
[This Week In Machine Learning \(TWIML\) Research Feature](#)
[University of Michigan Research Feature](#)
[Exploring the source of social stereotypes](#)
[Black History Month: Why a career in science?](#)
[Research Feature by the USC Graduate School](#)
[2015 NSF Graduate Research Fellow Wilka Carvalho](#)
[Biomath Learning Center Launches Modified Supplemental Instruction Program](#)
[URECA Research of the Month: Wilka Carvalho](#)
[Student Feature by Stony Brook University](#)

INTERESTS

• [traveling](#) • [chess](#) • [software development](#) • [improvisational dance](#) • [deadpan humor](#)