

# Declan Oller

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## Quick Overview

- Research Scientist at Sony AI, applying Reinforcement Learning to AAA video games
- 8+ years applying Machine Learning, Reinforcement Learning, and optimization techniques in research and production environments
- PhD in physics, MS in physics, BA in Math and Physics
- 10 peer reviewed publications (5 first author), 1 patent

## EDUCATION

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2011 – 2017

### Doctor of Philosophy, Physics, Brown University, Providence, RI

- Doctoral advisor: Professor Jimmy Xu
- Dissertation: "Anodic Alumina as a Scalable Platform for Structural Coloration and Optical Rectification"

2011 – 2013

### Master of Science, Physics, Brown University, Providence, RI

- Classes: Classical Mechanics, Quantum Mechanics I & II, Electrodynamics, Statistical Mechanics, Laboratory Experiments and Techniques, Solid State Physics I & II, Semiconductor Heterostructures, VLSI Design

2007 – 2011

### Bachelor of Arts, Mathematics and Physics, Clark University, Worcester, MA

- Thesis advisor: Professor Charles Agosta
- Thesis: "Experiments with Thermophoresis Using Direct Simulation Monte Carlo Simulations"

## SKILLS

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### Methods and Techniques

- Reinforcement learning, deep learning, Bayesian modeling, generative models, optimization, evolutionary algorithms, data science (modeling / analysis / visualization), mathematical modeling, functional programming, computer simulation

### Languages and Libraries

- Python (TensorFlow, PyTorch, JAX, SciPy, Pandas, scikit-learn, OpenCV, PyMC3), GNU/Linux, C++, Haskell, Mathematica, OR-Tools, Gurobi, MATLAB, JavaScript

## WORK EXPERIENCE

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2020 – Present

### AI Research Scientist

Sony AI

- Developed reinforcement learning systems for AAA games, contributing to superhuman performance in Gran Turismo (published in Nature)
- Research and development of novel reinforcement learning algorithms.
- Guidance and mentorship of interns on technical research projects.

2018 – Present

### Machine learning and optimization consultant

Technical consulting, Perciplex LLC, Providence, RI

- Optimization and machine learning consulting for exploration of a network concept
- Machine learning applied to large quantities of time series data
- Used C++, Omnet++, and Python for network simulation and optimization

2019 – 2020 **Mathematical modeling consultant**

Boston Medical Center, Boston, MA

- Used Bayesian modeling to estimate required distribution of take-home naloxone kits needed to save a given number of lives and other statistics for a public health study
- Developed a large scale data pipeline architecture, using Pandas, PyMC3, Bayesian modeling, Data science (modeling / analysis / visualization)
- PI: Professor Traci Green

2012 – 2017 **Research Assistant**

Professor Jimmy Xu, Department of Physics, Brown University, Providence, RI

- Experimental, computer simulation, and modeling research on Scalable Structural Coloration, Optical Rectification, Resistive Switching, Confined Electron Systems
- Regularly performed microfabrication, experiment setup, data analysis
- Article, grant, and project review writing and editing
- Trained and directed undergraduate and newer graduate students

2009 – 2011 **Earlier Research Experience**

- Numerical computer simulation of first-passage times for DNA translocation in the nanopore research experiment using C++, with Professor Sean Ling, Department of Physics, Brown University.
- Simulation of rarefied gas for general boundary conditions using Monte Carlo techniques with C++, with Professor Charles Agosta, Physics Department, Clark University.
- Development of MATLAB code for the data acquisition program of an Advanced Frequency Counter for an experiment of the Weak Equivalence Principle, Harvard-Smithsonian Center for Astrophysics.

**SELECTED PUBLICATIONS**

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- Wurman, Peter R., ..., **Declan Oller**, et al., "Outracing champion Gran Turismo drivers with deep reinforcement learning." *Nature*, 602.7896 (2022).
- Irvine, Michael A., **Declan Oller**, Jesse Boggis, Brian Bishop, Daniel Coombs, Eliza Wheeler, Maya Doe-Simkins et al. , "Estimating naloxone need in the USA across fentanyl, heroin, and prescription opioid epidemics: a modelling study." *The Lancet Public Health*, 7.3 (2022).
- **Declan Oller**, Tobias Glasmachers, and Giuseppe Cuccu, "Analyzing Reinforcement Learning Benchmarks with Random Weight Guessing." In Proceedings of the 19th International Conference on Autonomous Agents and MultiAgent Systems. International Foundation for Autonomous Agents and MultiAgent Systems (2020).
- **Declan Oller**, R. M. Osgood III, Jimmy Xu, and Gustavo E. Fernandes, "Optical Rectification in a Reconfigurable Resistive Switching Filament.", *Appl. Phys. Lett.* 115, 043101 (2019).
- **Declan Oller**, De He, Jin Ho Kim, Domenico Pacifici, Jimmy Xu, and Gustavo E. Fernandes. "Colour gamuts arising from absorber–dielectric–metal optical resonators." *Coloration Technology* (2017).
- **Declan Oller**, Gustavo E. Fernandes, Stylianos Siontas, Jimmy Xu, and Domenico Pacifici. "Scalable physical coloration." *Materials Research Bulletin* 83 (2016): 556-562.
- **Declan Oller**, Gustavo E. Fernandes, Jin Ho Kim, and Jimmy Xu. "Investigation of quantum confinement within the tunneling-percolation transition for ultrathin bismuth films." *Physica B: Condensed Matter* 475 (2015): 117-121.

See Google Scholar or my website for a full list of publications.

**ADDITIONAL INFORMATION**

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**Patent** "Wireless mesh data network with increased transmission capacity", US10517092B1, 2019.

**Interests** Cello, BJJ, puzzle and strategy games