

Declan Oller

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in declan-oller

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EDUCATION

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, Physics & Mathematics, Clark University, Worcester, MA

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

WORK EXPERIENCE

2019 – current

Software consulting

Professor Traci Green, Boston Medical Center, Boston, MA

- Contracting for Naloxone Needed to Save study
- Used Bayesian modeling to calculate number of Take Home Naloxone kits needed to save a given number of lives and other statistics
- Worked on a large scale data pipeline architecture
- Python, Pandas, PyMC3, GitHub

2018 – current

Partner and Co-Founder

Technical consulting, Perciplex LLC, Providence, RI

- Optimization and artificial intelligence consulting for exploration of a network concept
- C++, Omnet++, Python, GitHub

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
- Python, Mathematica

2011

Research Assistant

Professor Sean Ling, Department of Physics, Brown University, Providence, RI

- Numerical computer simulation of first passage times for DNA translocation in the nanopore research experiment using C++

2010 – 2011

Research Assistant

Professor Charles Agosta, Physics Department, Clark University, Worcester, MA

- Simulation of rarefied gas for general boundary conditions using Monte Carlo techniques with C++

2009 **Physical Technician**

Harvard-Smithsonian Center for Astrophysics, Cambridge, MA

- Development of Matlab code for the data acquisition program of an Advanced Frequency Counter for an experiment of the Weak Equivalence Principle

SELECTED PROJECTS

Reinforcement Learning robot

- Used Reinforcement Learning to make a physical robot I built successfully learn to play a game with no prior information about it
- Python, PyTorch, SciPy, GitHub, deep Q-learning

NeuroEvolution agents for winning OpenAI gym games

- Made an Evolutionary Algorithm to evolve neural network policies for agents to win OpenAI gym games, using no gradient descent
- Python, OpenAI Gym, GitHub

Genetic Algorithms for solving the brachistochrone problem

- Made a gradient-free Genetic Algorithm to solve the classic "brachistochrone problem" of physics and others
- Python, GitHub

Modular NeuroEvolution agents combined with gradient descent

- Expanded on a previous project, by using NeuroEvolution to determine neural network topology and gradient descent to train the networks, and created a framework for capturing successful neural networks as discrete modules
- Python, PyTorch, GitHub

Solving Skyscrapers and other puzzles using OR-Tools

- Used a constraint satisfaction package to solve the "Skyscrapers" puzzle game and others
- Python, OR-Tools, GitHub

Realtime image recognition and data analysis of neighborhood traffic

- Used Python, OpenCV, Tensorflow, and Pandas with a Raspberry Pi/camera to do real-time image recognition of a camera stream of traffic
- Python, OpenCV, Pandas, TensorFlow, Raspberry Pi

Centipede robot

- Built a centipede robot out of 3D-printed parts I designed, controlled with a hierarchical object-oriented structure
- Python, GitHub, 3D printing

An interactive introduction to Simulated Annealing

- Wrote an interactive tutorial using d3.js, illustrating the basics of Simulated Annealing optimization with two physics-based examples
- d3.js, GitHub, JavaScript

SKILLS

Computer skills

- Python (Pandas, scikit-learn, seaborn, PyTorch, SciPy), GNU/Linux, C++, Mathematica, LabVIEW, OR-Tools, Gurobi, Onshape
- Techniques: Machine learning, optimization algorithms, reinforcement learning, deep learning, evolutionary algorithms, data analysis, visualization, modeling

Experimental skills

SEM, FIB, TEM, AFM, FTIR spectroscopy, photo and electron-beam lithography, thermal and electron beam evaporation, clean room procedure, machining, circuit design

PUBLICATIONS

- Oller, Declan, Jimmy Xu, R. M. Osgood III, and Gustavo E. Fernandes, "Optical Rectification in a Reconfigurable Resistive Switching Filament." *Applied Physics Letters*, accepted, 2019.
- Oller, Declan, 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).
- Oller, Declan, Gustavo E. Fernandes, Stylianos Siontas, Jimmy Xu, and Domenico Pacifici. "Scalable physical coloration." *Materials Research Bulletin* 83 (2016): 556-562.
- Oller, Declan, 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.
- Gustavo E. Fernandes, Jin Ho Kim, Declan Oller, and Jimmy Xu. "Reduced graphene oxide mid-infrared photodetector at 300 K." *Appl. Phys. Lett.* 107, 111111 (2015).
- De He, Zhijun Liu, Gustavo E. Fernandes, Tianyi Shen, Declan Oller, Domenico Pacifici, Jin Ho Kim, and Jimmy Xu. "High-purity red coloration via mode-selective absorption in a layered thin-film cavity." *AIP Advances* 8, 065226 (2018).

ADDITIONAL INFORMATION

Interests Cello, Guitar, Photography, Effects pedal design, Strategy games