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Guy Davidson

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Machine learning researcher applying insights from the cognitive sciences to machine learning research. I aim to explore promising components of human cognition absent in AI, especially in deep and reinforcement learning solutions, and attempt to integrate cognitive ideas with current methods. By combining theoretical insights from the cognitive sciences and experimental work, I hope to better understand the the cognitive faculties that enable human learners to generalize flexibly and rapidly and utilize prior knowledge to facilitate new learning, and operationalize these mechanisms in artificial neural network models. I am excited to bring **eight years of software development experience** to ensure my work is robustly engineered and straightforward to reproduce.

EDUCATION

NYU CENTER FOR DATA SCIENCE — New York, NY
PhD student — 2019–Present

- Advised by Professor Brenden Lake, investigating cognitively-driven representations for deep reinforcement learning.

MACHINE LEARNING SUMMER SCHOOL — London, England
Hosted by University College London and Imperial College London — 07/2019

MINERVA SCHOOLS — San Francisco, CA
BSc in Computational Sciences — 2015–2019

- Graduated summa cum laude with a concentration in Machine Learning. GPA: 3.98/4.0
- Coursework including Bayesian Statistics, Machine Learning, Cognitive Neuroscience, Quantum Mechanics
- **Capstone project**: investigating the scaling behavior of different meta-learning algorithms: how quickly new tasks are learned as a function or previous training, using a novel benchmark paradigm inspired by visual question answering. Collaborating with **Professor Mike Mozer** at CU Boulder.

PUBLICATIONS AND PRESENTATIONS

PUBLICATIONS

Davidson, G., Mozer, M. C. (2020). Sequential mastery of multiple visual tasks: Networks naturally learn to learn and forget to forget. *The IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*. `https://arxiv.org/abs/1905.10837`.

PREPRINTS

Davidson, G., Lake, B. M. (2020). Investigating Simple Object Representations in Model-Free Deep Reinforcement Learning. `https://arxiv.org/abs/2002.06703`.

PEER REVIEWED CONFERENCE PROCEEDINGS

Davidson, G., Radulescu, A., & Niv, Y. (2019). Contrasting the effects of prospective attention and retrospective decay in representation learning. *The 4th Multidisciplinary Conference on Reinforcement Learning and Decision Making*.

Bennett, D., **Davidson, G.**, & Niv, Y. (2019). Momentum and mood in policy-gradient reinforcement learning. *The 4th Multidisciplinary Conference on Reinforcement Learning and Decision Making*.

UNREVIEWED CONFERENCE PRESENTATIONS

Davidson, G., Radulescu, A., & Niv, Y. (2018). Passive forgetting or selective attention? Comparing two models of learning in multidimensional environments. *Cognitive Computational Neuroscience Meeting* (Late-Breaking Research).

TEACHING

DS-UA 112: INTRODUCTION TO DATA SCIENCE — NYU
Section leader — 09/2019-12/2019
Served as a section leader for new undergraduate course introducing students to NYU's newly approved Data Science major.

RESEARCH & PROFESSIONAL EXPERIENCE

PRINCETON NEUROSCIENCE INSTITUTE — Princeton, NJ
Research Intern — 05/2018–08/2018

Joined the **Niv Lab**, headed by **Professor Yael Niv**, to investigate human reinforcement learning (RL) in multidimensional environments:

- Modeled data from previous experiments, making discoveries regarding the dissociable roles of attention and decay in human RL, and the efficacy of eye-tracking and fMRI-based attention measures.
- Implemented a reinforcement learning experiment in a customizable web platform, enabling data collection using Amazon Mechanical Turk and building a framework used by several current lab members to develop new experiments.
- Developed a simulation environment for bandit problems to motivate work framing mood as a momentum variable.

AIDOC MEDICAL Tel Aviv, Israel
Research Engineer 05/2017–11/2017

- Implemented research-supporting tools in Azure cloud environment to facilitate and expedite deep learning experimentation, reducing idea-to-experiment turnaround 10x from 1-2 hours to 5-10 minutes.
- Explored distributed model training frameworks, performed experiments and analyses leading to opt for tool development.

AMAZON PRIME AIR Seattle, WA
Software Development Engineer Intern 05/2016–08/2016

- Implemented binary image loading solution for proprietary hardware and software platform using C and assembly.
- Contributed to serialization library used in multiple projects across the Prime Air development group.

MINERVA PROJECT San Francisco, CA
Software Development Engineer Intern 01/2016–05/2016

- Designed and delivered overhaul of invoicing system, transitioning from a fixed to a line-itemized implementation, to allow for improved flexibility, history tracking, and increased robustness, in a Python/Django/MySQL web-stack.

SIMILARWEB Tel Aviv, Israel
Software Engineer 06/2015–09/2015

- Integrated products with external partners, debugged and solved multiple production issues, in Node.JS, iOS, and Python.

ISRAEL DEFENSE FORCES INTELLIGENCE BRANCH Israel
Team leader, training instructor, software engineer 08/2008–10/2014

- Team leader: grew team of four software developers to ten, responsible for developing tools to enhance analysis capabilities and solve production issues. Reduced turnaround time more than 2x, contributed to Israel Defense Prize-winning project.
- Instructor: managed two other instructors, training ten pupils in software engineering and computer networking.
- Software engineer: built in-house data ingestion pipelines and analysis tools. Developed primarily in Python and Java and cultivated debugging and fault analysis expertise.

SKILLS

PROGRAMMING LANGUAGES

- Python (PyTorch, TensorFlow, Keras, Numpy, Sklearn)
- Javascript • Matlab • Java
- Shell • C • C++ • R • HTML/CSS

INTERESTS

- Native in **English** and **Hebrew**
- Proficient in **Spanish**
- Avid Ultimate Frisbee player (Played on Israeli national team)