Guillermo Valle Pérez

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Education (Things I've learned)

University of Oxford

Oxford, UK

Systems Biology DTC - ML DPhil *Oct. 2016 - Feb 2021*

- Worked on **deep learning theory (mainly generalization)** in the physics department
- Guillermo Valle-Pérez, Ard A. Louis, and Chico Q. Camargo. "Deep learning generalizes because the parameter-function map is biased towards simple functions.", published at **ICLR 2019**. Interactive poster `guillefix.me/nnbias/`
- Chris Mingard, Joar Skalse, Guillermo Valle-Pérez, David Martínez-Rubio, Vladimir Mikulik, Ard A. Louis. "Neural networks are a priori biased towards Boolean functions with low entropy", preprint `arxiv.org/abs/1909.11522`
- Chris Mingard, Guillermo Valle-Pérez, Joar Skalse, Ard A. Louis. "Is SGD a Bayesian sampler? Well, almost", `https://arxiv.org/abs/2006.15191`
- Guillermo Valle-Pérez, Ard A. Louis. "Generalization bounds for deep learning", `https://arxiv.org/abs/2012.04115`

University of Oxford

Oxford, UK

MMathPhys in Mathematical and Theoretical Physics *Oct. 2012 - Jun. 2016*

- Outcome: Distinction (1st year), First class honours (Parts A & B), **Distinction** (Part C)
- Awarded Magdalen College Demyship for academic excellence, for three consecutive years.

Skills

- Science and others: Python, Numpy, PyTorch, TensorFlow, Keras, Pandas, C++, C, MATLAB, LaTeX, Bash, MPI, SLURM, Google cloud
- Web development: JavaScript, HTML, CSS, React, Meteor, Redux, Node.js
- VR development: Unity/C#, NeosVR. Currently learning: computer graphics

Experience (Things I've done)

Entrepeneur First

Polaris fellow *Jan. 2023 - PRESENT*

- Admitted in the Polaris fellowship `https://www.polaris-fellowship.com/`, a community of highly ambitious individuals, co-learning how to advance our careers to have a positive impact on the world.

Quantumbar.AI

Freelance software engineer *Aug. 2022 - Oct. 2022*

- Developed the animation system for a GPT-3 drive NPC in the social VR platform NeosVR (`https://quantumbar.ai/`)

FLOWERS - Inria

Postdoc *Jan. 2021 - Nov. 2022*

- Working on **multimodal models of human behaviour**, as well as curiosity, exploration, and embodiment of generative models, using VR. Also applied the model to text-guided robotics tasks, and compared it with other models like Trajectory Transformer.
- Valle-Pérez et al. "Transflower: probabilistic autoregressive dance generation with multimodal attention", `metagen.ai/transflower`

MetaGen.AI - Building an Imagenet-scale dataset of human behaviour

Project lead *Nov. 2020 - PRESENT*

- Taking the lessons learned from the VRAI project, I am leading a project to **collect multimodal data about human behaviour**, at scale, leveraging Social VR platforms. As I argue in `metagen.ai/ai` this would have many applications, and is likely to be a necessary step towards human-level and human-like AI.

VRAI - AI in social VR environments

Project lead *Nov. 2019 - Nov. 2020*

- An exploratory student-led research project where we explored the use of **social VR environments for training RL agents**. This involved many fun technical challenges, from infrastructure development to environment design, mixed with fun research challenges, like developing algorithms for continual learning, curiosity, imitation. `oxai.org/socialvr-ai`. The main product has been a plugin integrating NeosVR with Unity ML-Agents `github.com/oxai/vrai/` used for experiments with imitation learning.

DeepSaber

Project co-lead *2019*

- Co-lead the development of a deep learning approach to generate levels for the Beat Saber VR game. `github.com/oxai/deepsaber`. We utilized Google Cloud extensively to train the final working model, and it was crucial for finishing it within our imposed deadline.

Immersive Technologies Summer School

Project lead *Jun. 2018*

- Three-day project-based immersive course on immersive technologies. Using Unity, our team developed an app to experience phenomena from the theory of special relativity in VR.

University of Oxford

Systems biology DTC short research projects *Jul. 2016*

- Studied the properties of the parameter–function mapping for deep neural networks. Found a form of **simplicity bias**, expected from algorithmic information theory, which when combined with PAC-Bayes theory may explain their good generalization ability
- Explored multi-task deep reinforcement learning models that weren't based on task-specific rewards, but instead learned general skills like "navigating", using autoencoder-like architectures between action sequences and state transitions. Also explored alternative algorithms for navigating graphs based on their spectral decomposition, inspired by grid cell representations in the hippocampus.

University of Oxford Theoretical physics department

Research internship *Jul. 2016*

- Researched some properties of abstract genotype-phenotype maps regarding algorithmic complexity, using finite-state transducers as a model. The research involved simulation and theoretical analysis involving mostly **algorithmic information theory** and dynamical systems.

Oxford Artificial Intelligence Society

Labs Technology Officer & Co-founder *Aug. 2014 - Jan. 2020*

- Led a series of pytorch workshops. `github.com/MaksymPetyak/oxaipytorch`
- Led and worked on research projects. See DeepSaber, VRAI
- Creating and maintaining the website. `oxai.org`

DECancer.AI

Developed prototype and advising *Jan. 2019 - Jan. 2020*

- Developed a deep learning prototype for cancer detection from blood sample data, as part of a team which won the All Innovate startup idea competition
- I later helped develop a more advance model based on graph neural networks. I am now working as a technical adviser to assist with the further development of that model.

AugMath

Developing interactive computer algebra system *July. 2015 - PRESENT*

- Developing an interactive computer algebra system that allows the direct manipulation of mathematical expressions, and animates the result
- Github: `github.com/guillefix/augmath`

Other interests

- Music. Listening, and playing piano and guitar. I compose music in collaboration with a friend (`soundcloud.com/guillermo-valle-7`)
- Anime, videogames, socializing, dancing, clubbing, having fun, both in VR and IRL
- Virtual and augmented reality. Social VR (Neos, VRChat, etc) are the most powerfully playful media I've yet tried. I want more scientist to use it as a collaborative medium!
- Deeply understanding things (math, physics, science); exploring the unknown
- Philosophy, psychology, neuroscience, neurotechnology. How to understand the mind
- Finding simple representations of complex ideas, storytelling. Drawing, designing, making things