

# EVRIPIDIS GKANIAS

## PhD student in Bio-inspired Robotics & Autonomous Systems

@ ev.gkaniias@ed.ac.uk

evgkaniias

uk.linkedin.com/in/evgkaniias

University of Edinburgh, UK

## WORK EXPERIENCE

### Research Associate in Computational Modelling

University of Edinburgh & University of Sheffield

Mar 2017 – Aug 2018

United Kingdom

Advisors: Prof. Barbara Webb & Dr Michael Mangan

Investigate the celestial properties in context of animal navigation

Design a novel anatomically-constrained celestial compass

### Research Assistant in Bio-robotics

University of Edinburgh

Sep 2016 – Feb 2017

United Kingdom

Advisor: Prof. Barbara Webb

Study the learning mechanism of *Drosophila* larva

Build a robot that tries to find the gustatory source following the gradients of the associated odour

### Research Assistant in Machine Learning

Centre for Research and Technology - Hellas (CERTH)

June 2014 – Aug 2015

Greece

Advisor: Dr Petros Daras

Real-time evaluation of athletes' technique from gestures captured using multiple Microsoft Kinects and WIMUs or the Vicon system

Integrate into a video game using C# and Unity3D

## PUBLICATIONS

Gkaniias, E., McCurdy, L. Y., Nitabach, M. N. & Webb, B. An incentive circuit for memory dynamics in the mushroom body of *Drosophila melanogaster*. *bioRxiv* (2022) – accepted by eLife

Schwarz, S., Clement, L., Gkaniias, E. & Wystrach, A. How do backward-walking ants (*Cataglyphis velox*) cope with navigational uncertainty? *Anim Behav* 164, 133–142 (2020)

Gkaniias, E., Risse, B., Mangan, M. & Webb, B. From skylight input to behavioural output: a computational model of the insect polarised light compass. *PLoS Comput Biol* 15, e1007123 (2019)

Stouraitis, T., Gkaniias, E., Hemmi, J. M. & Webb, B. Predator Evasion by a Robocrab. in 6th International Conference on Biomimetic and Biohybrid Systems (eds. Mangan, M. et al.) vol. 10384 428–439 (Springer, 2017)

## EDUCATION

### PhD in Bio-inspired Robotics & Autonomous Systems

University of Edinburgh

Sep 2018 - present

United Kingdom

Insect neuroethology of reinf. learning

Supervisor: Prof. Barbara Webb

Robotics and Autonomous Systems CDT

### MSc in Artificial Intelligence

University of Edinburgh

Aug 2016

United Kingdom

with Distinction

Data-driven adaptation of the evasion behaviour in fiddler crabs

Supervisor: Prof. Barbara Webb

EU/UK Masters Scholarship

### BSc in Computer Science

Aristotle University of Thessaloniki

Jul 2013

Greece

First-class Honours

Deep learning algorithms for multi-label data

Supervisor: Prof. Grigorios Tsoumakas

## FUNDING & AWARDS

### Percy Sladen Memorial Fund Grant

The Linnean Society of London

Jun 2019

Seville, Spain

Fieldwork experiments on desert ants

Test for vector-sequence memories during path integration

### Robotics and Autonomous Systems - Centre for Doctoral Training Grant

Engineering and Physical Sciences Research Council (EPSRC)

Sep 2018

Edinburgh, UK

Awarded to the top 10 applicants

### UK/EU Master's Scholarship

University of Edinburgh

Sep 2015

Edinburgh, UK

Awarded to the top 100 UoE entries

## ORAL PRESENTATIONS

- 🗣️ *How flies acquire, forget and assimilate memories: a computational perspective.* At the Mushroom body meeting. Jun 2021. Online
- 🗣️ *From skylight input to behavioural output: a computational model of the insect polarised light compass.* At the International Navigation Conference. Oct 2019. Edinburgh International Conference Centre, United Kingdom
- 🗣️ *Predator evasion by a Robocrab.* The living Machines. July 2017. Stanford University, CA, USA

## POSTER PRESENTATIONS

- 📄 *An anatomically accurate circuit for short- and long-term motivational learning in fruit flies.* At the Cosyne Conference. March 2022. Lisbon, Portugal
- 📄 *The incentive circuit of the fruit fly brain: a computational perspective.* At the Bernstein Conference. September 2021. Online
- 📄 *Robustness of a model of the insects' celestial compass in realistic conditions.* At the International Conference on Invertebrate Vision. August 2019. Bäckaskog Slott, Sweden
- 📄 *Imitating the Drosophila larval learning behaviour on a robot.* At the Maggot Meeting. October 2018. University of Edinburgh, United Kingdom

## UNIVERSITY THESES

### Insect Neuroethology of Reinforcement Learning

#### Thesis — Doctor of Philosophy

📅 Sep 2018 - Aug 2022 (expected) 📍 University of Edinburgh

We are looking for the underlying mechanism that allows reinforcement learning in insects. Based on recent findings on how dopamine affects the synaptic weights in the fruit fly brain, we develop a novel plasticity rule that allows for the observed memory dynamics, e.g., primitive, flexible or long-lasting memories, depending on the circuitry. We identify an anatomically accurate self-motivated circuit in the fruit fly brain, that can explain a big volume of neural and behavioural data in olfactory conditioning. We now test the found plasticity rule for different benchmarks in reinforcement learning, with the ambition to apply it for autonomous navigation in natural environments.

### Robocrab: data-driven adaptation of the evasion behaviour in fiddler crabs

#### Dissertation — Master of Science

📅 Jun 2016 - Aug 2016 📍 University of Edinburgh

We create a semi-supervised structure of neural network, inspired by the physiology of neurons in fiddler crabs, and train it to adapt the evasion behaviour of fiddler crabs on potential predators, solving a complicated visuomotor problem (developed in Python using the Theano/Tensorflow-based 'keras' library)

### Deep learning algorithms for multi-label data

#### Honours Thesis — Bachelor of Science

📅 Oct 2012 - Jul 2013 📍 Aristotle University of Thessaloniki

We extended a Java library implementing Restricted Boltzmann Machines and Deep Belief Networks and we used it to examine how they perform in a variety of multi-label data-sets.

## RESEARCH INTERESTS

- 🧠 Biologically plausible mechanisms of **learning** and **memory** that allow interpretive **behaviour** in artificial agent
- 🧠 **Computational intelligence** that allows artificial agents to **navigate** in the challenging real-world
- 👁️ Processing **perception** in order to **maximise information** and create hierarchical representations

## STRENGTHS

Research  
Computational Modelling  
Computer Vision  
Information Theory



Probabilistic Machine Learning  
Reinforcement Learning Robotics  
NumPy PyTorch OpenCV Keras  
Theano TensorFlow  
C# C/C++ R Java

## TEACHING POSTS

### Tutor & Demonstrator

#### University of Edinburgh

📅 Sep 2018 - present 📍 United Kingdom

📚 Introductory Applied Machine Learning

🧠 Reinforcement Learning

🔧 Systems Design Project

## ACTIVITIES

### Hacker

#### Junction Hackathon

📅 Nov 2016 📍 Helsinki, Finland

🏆 Winners: "Artificial Intelligence Driven Bots" challenge (Microsoft & Skype)

### Coastal Sailing Diploma

#### Nautical Club of Thessaloniki

📅 Apr 2015 📍 Thessaloniki, Greece

🏆 2nd best performance in school

### Linear and freehand drawing

#### Ergastiri

📅 Jun 2008 📍 Thessaloniki, Greece

🏆 4th best performance in school