

BARDIENUS PIETER DUISTERHOF

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PUBLICATIONS

- 2021 ‘**Sniffy Bug: A Fully Autonomous Swarm of Gas-Seeking Nano Quadcopters in Cluttered Environments**’, **Bardienus P. Duisterhof**, Shushuai Li, Javier Burgus, Vijay Janapa Reddi, Guido C.H.E. de Croon – *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021) (to appear)* - **Video**
- 2021 ‘**Tiny Robot Learning (tinyRL) for Source Seeking on a Nano Quadcopter**’, **Bardienus P. Duisterhof**, Srivatsan Krishnan, Jonathan J. Cruz, Colby R. Banbury, William Fu, Aleksandra Faust, Guido C. H. E. de Croon, Vijay Janapa Reddi – *IEEE International Conference on Robotics and Automation (ICRA 2021) (to appear)* - **Video**
- 2019 ‘**Real-Time Machine Learning on Tiny Autonomous Machines**’, **Bardienus P. Duisterhof**, Srivatsan Krishnan, Jonathan J. Cruz, Colby R. Banbury, William Fu, Aleksandra Faust, Guido C. H. E. de Croon, Vijay Janapa Reddi – *Proceedings of the 2nd SysML Conference - On-device Intelligence Workshop*, Palo Alto, CA, USA, 2019.
- 2019 ‘**The Role of Compute in Autonomous Aerial Vehicles**’, Behzad Boroujerdian, Hasan Genc, Srivatsan Krishnan, **Bardienus Pieter Duisterhof**, Brian Plancher, Kayvan Mansoorshahi, Marcelino Almeida, Wenzhi Cui, Aleksandra Faust, Vijay Janapa Reddi – *Under Review at Transactions on Computer Systems (TOCS)*
- 2019 ‘**A Tailless Flapping Wing MAV Performing Monocular Visual Servoing Tasks**’, D.A. Olejnik, **B.P. Duisterhof**, M. Karásek, K.Y.W. Scheper, T. van Dijk and G.C.H.E. de Croon – *11th International Micro Air Vehicle (IMAV) Competition and Conference, Unmanned Systems Journal 2020* - **Video**
- 2018 ‘**Autonomous landing algorithm using a sun position predicting model for extended use of solar powered UAVs**’, **B.P. Duisterhof** & G.C.H.E. de Croon – *10th International Micro Air Vehicle (IMAV) Competition and Conference*

AWARDS

- IMAV Conference 2019: **Best paper award nominee**, top 6 papers.
- **IMAV 2018 Autonomous Drone Race**: 3rd prize and innovation award in indoor competition with DelFly Nimble. Visual servoing on a 30-gram flapping wing MAV.

SELECTED MEDIA COVERAGE

- **Forbes**: ‘Watch This Autonomous Microdrone Swarm Sniff Out A Gas Leak’
- **Robohub**: ‘Sniffy Bug: A Fully Autonomous Swarm of Gas-Seeking Nano Quadcopters in Cluttered Environments’
- **Bitcraze Blog**: ‘Sniffy Bug: A Fully Autonomous Swarm of Gas-Seeking Nano Quadcopters in Cluttered Environments’
- **Bitcraze Blog**: ‘Learning to Seek: autonomous source seeking using deep reinforcement learning onboard a Crazyflie’

TEACHING

- AE2235: Aerospace Systems & Control Theory. Supported undergraduate students in help sessions and developed Python learning tools for an enhanced remote learning experience.

EXPERIENCE

Carnegie Mellon University, Pittsburgh, PA

Aug 2021 - Present

PhD candidate in the Robotics Institute.

Prime Vision, Delft, the Netherlands

Feb 2021 - Jul 2021

Robotics Engineer

- **Motion planning team:** automation of postal sorting processes using a swarm of 25+ robots avoiding each other and obstacles. My job was to develop C++ code to run onboard the robots for robust and efficient motion planning.

Delft University of Technology, Delft, the Netherlands

Jul 2016 - Jan 2021

Undergraduate/Graduate Student

- **M.Sc. thesis** on evolutionary robotics for collaborative gas seeking with a swarm of nano quadcopters. Designed the full stack: hardware, software, simulator, algorithm.
Graded: 9.5/10.0, PI: Guido de Croon.
- Participated in the **2018 IMAV autonomous drone race** in Melbourne, Australia. Developed efficient visual servoing algorithms for autonomous flight in presence of extreme resource constraints.
- Organized an undergraduate research symposium, including a poster session and invited speakers.
- Organized a study tour to Tokyo for a group of 20 students.

Harvard Edge Computing, Cambridge, MA

May - Dec 2019

Visiting Research Fellow

- Developed a **fully autonomous source-seeking nano quadcopter using RL**. Studied various machine learning techniques for deployment under stringent resource constraints.
- Implemented a DQN **Deep Reinforcement Learning policy** onboard a CrazyFlie, demonstrating robust light seeking and obstacle avoidance through hardware-software co-design.

European Space Agency (ESA), Delft, the Netherlands

Mar - Jul 2018

Design Synthesis Exercise

- Designed an experimental orbital re-entry vehicle for the European Space Agency. Vehicle design included, but was not limited to, thermal design, orbital trajectory design and control system design.
- Responsible for the control system. Designed a controller for re-entry at constant Mach number ($M=10$) and extended range through a boost-glide trajectory.

EDUCATION

Delft University of Technology, Delft, the Netherlands

Sept 2018 - Dec 2020

M.Sc. Control and Simulation, Aerospace Engineering - GPA 8.8/10.0 Cum Laude (i.e., with distinction)

- Coursework in computer vision, control theory, flight dynamics, human-machine interaction and autonomous systems.

Georgia Institute of Technology, Atlanta, GA

Aug - Dec 2017

Exchange Student, Computer Science and Mechanical Engineering - GPA 4.0/4.0

- Exchange semester at Georgia Tech, coursework in algorithm design, robotics, computer vision, mobile and ubiquitous computing.

Delft University of Technology, Delft, the Netherlands

Sept 2016 – Jul 2018

TU Delft Honors Student

Selected for the TU Delft Honors Program based on grades and motivation:

- Courses: took additional courses in design thinking, meeting and conference skills.
- Research: undergraduate researcher in the MAVLab (Guido de Croon) from sophomore year.

Delft University of Technology, Delft, Netherlands

Sept 2015 – Jul 2018

B.Sc. Aerospace Engineering - GPA 8.4/10, Cum Laude (i.e., with distinction)

- Top-ranked program in Aerospace Engineering, featuring a wide range of courses in aerospace engineering, computer science and mechanical engineering.
- Courses in aircraft design, control design, computational modelling and flight dynamics.

SKILLS

Languages Python, C, C++, MatLab, Java

Frameworks Tensorflow, TFLite, Keras, Stable Baselines, Paparazzi AutoPilot, ROS, OpenCV, Simulink

EXTRA-CURRICULAR

Athletics

Competitive swimmer in national and international competitions.

Sailing Instructor

Certified sailing instructor, teaching children and adults practical and theoretical sailing skills.

Volunteering

Personally raised €3,116.35 for children with muscle diseases, by swimming across a channel in the ocean.