



## **School of Computing, Engineering, and the Built Environment Edinburgh Napier University**

### **PHD STUDENT PROJECT**

#### **Funding and application details**

**Funding status:** Self funded students only

**Application instructions:**

Detailed instructions are available at <https://blogs.napier.ac.uk/scebe-research/available-phd-student-projects/>

*Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.*

#### **Project details**

**Supervisory Team:**

- DIRECTOR OF STUDY: Dr. Luigi La Spada (Email: [L.LaSpada@napier.ac.uk](mailto:L.LaSpada@napier.ac.uk))
- 2<sup>ND</sup> SUPERVISOR: Dr. Brian Davison

**Subject Group:** Cyber-security and system engineering

**Research Areas:** Electronic Engineering, Robotics, Artificial Intelligence, Machine Learning

**Project Title:** Advanced Drone Technology for Precision Operations

**Project description:**

This research proposal is focused on the critical objective of advancing precision in the domain of drone operations.

Currently, literature predominantly focuses on discrete parameters affecting precision. Basso (2019) presents a prototype UAV that achieves high precision positioning using onboard sensors and sensor fusion techniques. Stehr (2015) discusses the use of drones in precision agriculture, highlighting their ability to monitor fields more frequently and capture detailed data for crop management. Gonzalez (2018) focuses on advances in unmanned aerial systems and payload

technologies for precision agriculture. Ajakwe (2022) proposes a deep learning-based approach for proactive identification and neutralization of UAVs in mission critical operations, achieving high performance metrics in terms of detection accuracy and efficiency. Overall, these works demonstrate the potential of advanced drone technology for precise operations in various fields, yet they lack a comprehensive analysis of how these factors interact and collectively impact drone performance. To address this gap, the proposed research will systematically identify and categorize the key parameters affecting drone precision, considering environmental and technical aspects. It will develop a comprehensive testing framework and methodologies for quantifying the influence of these parameters, leveraging real-world experiments and data collection. Additionally, advanced control algorithms (involving Artificial Intelligence/Machine Learning) and sensor fusion techniques will be explored to optimize precision. The expected contributions of this research include a deeper understanding of parameter interactions, actionable insights for precision enhancement across various drone applications, and the facilitation of responsible and effective drone integration into industries where precision is of utmost importance, such as agriculture, infrastructure inspection, and emergency response.

#### **References:**

- [1] Ajakwe, S.O., Ihekoronye, V.U., Kim, D., & Lee, J. (2022). Tractable Minacious Drones Aerial Recognition and Safe-Channel Neutralization Scheme for Mission Critical Operations. 2022 IEEE 27th International Conference on Emerging Technologies and Factory Automation (ETFAs), 1-8.
- [2] Basso, M., Bigazzi, L., & Innocenti, G. (2019). DART Project: A High Precision UAV Prototype Exploiting On-board Visual Sensing.
- [3] Gonzalez, F., Mcfadyen, A., & Puig, E. (2018). Advances in Unmanned Aerial Systems and Payload Technologies for Precision Agriculture.
- [4] Stehr, N.J. (2015). Drones: The Newest Technology for Precision Agriculture. Natural Sciences Education, 44, 89-91.

## **Candidate characteristics**

#### **Education:**

A first-class honours degree, or a distinction at master level, or equivalent achievements in Electrical/Electronic Engineering or Computer Science or Mechanical Engineering or Robotics.

#### **Subject knowledge:**

- Electronics
- Control Systems
- Aerodynamics
- Computer Programming
- Sensor Technology
- Mathematics
- Robotics
- Communication Systems
- Mechanical Engineering

#### **Essential attributes:**

- Strong Analytical Skills,
- Research Aptitude,

- Problem-Solving Skills,
- Technical Proficiency,
- Interdisciplinary Knowledge (see above),
- Communication Skills,
- Teamwork and Collaboration

**Desirable attributes:**

- Publication Record, Leadership Experience, Grant Writing Skills, Industry Experience, Teaching and Mentoring, Cybersecurity Expertise.