Brian K. S. Isaac-Medina, PhD

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Durham, UK

Machine Learning and Computer Vision research scientist with strong programming skills and experience in using AI for security applications. My current research is focused on anomaly detection, object recognition and feature representation.

Professional Experience

Dec 2022 - Present **Postdoctoral Research Associate**   Durham University, Durham, UK
- Lead developer of deep learning-based projects for anomaly detection and object recognition, using modern computer vision frameworks and machine learning libraries.
- Technical lead on developing a real-time anomaly detection system on synchronised infrared and visible cameras, including fast panorama formation from an incoming PTZ camera stream and parallel deep learning-based object and anomaly detectors.
- Design and implementation of a novel object-level anomaly detector based on self-supervised learning of object features applied to parcel X-ray security screening.
- My contribution has resulted in three publications and two more submitted works.
- Academic supervisor of an undergrad student working on real-time spherical mosaicking.

Jan 2021 - Mar 2021 **Research Assistant**   Durham University, Durham, UK
- R&D lead of a project for Unmanned Aerial Vehicle Detection and Re-identification supervised by Dr Hubert Shum. This work resulted in two publications.

Jan 2016 – Mar 2019 **Software developer**   Zenzzer, Yucatan, Mexico
Software developer of an intelligent system for measuring the fuel level of cars. My roles include:
- Amazon Web Services (AWS) developer. Responsible for building cloud services including serverless systems, web APIs and implementing auto-scalable servers communicating through web sockets.
- Android Developer: design and development of the communication protocol of Android devices with a remote sensor reading different car parameters.

Selected Publications

- **Brian K. S. Isaac-Medina**, Chris G. Willcocks and Toby P. Breckon. Exact-NeRF: An Exploration of a Precise Volumetric Parameterization for Neural Radiance Fields. In Proc. Computer Vision and Pattern Recognition (CVPR), IEEE, 2023.

- **Brian K. S. Isaac-Medina**, Chris G. Willcocks and Toby P. Breckon. Multi-view Vision Transformers for Object Detection. In Proc. Int. Conf. on Pattern Recognition (ICPR), IEEE, 2022.

- **Brian K. S. Isaac-Medina,** Matt Poyser, Daniel Organisciak, Chris G. Willcocks, Toby P. Breckon, Hubert P. H. Shum. Unmanned Aerial Vehicle Visual Detection and Tracking Using Deep Neural Networks: A Performance Benchmark. In Proc. Int. Conf. on Computer Vision Workshops (ICCVW), IEEE, 2021.

- Brian K. S. Isaac-Medina, Chris G. Willcocks and Toby P. Breckon. Multi-view Object Detection Using Epipolar Constraints within Cluttered X-ray Security Imagery. In Proc. Int. Conf. Pattern Recognition (ICPR), IEEE, 2020.

Education

2019 - 2024   **PhD Computer Science**   [Department of Computer Science, Durham University](#)
- Thesis title: [On Deep Machine Learning for Multi-view Object Detection and Neural Scene Rendering](#).
- Research Topics: Object Detection, Neural Scene Rendering, Multi-view Geometry.
- Supervised by [Prof Toby P. Breckon](#).

2017 - 2018   **MSc Internet Systems and E-Business**   [Department of Computer Science, Durham University](#)
- Dissertation title: Automated image analysis for blood cell counting and classification, supervised by [Dr Boguslaw Obara](#).
- Graduated with distinction.

2011 - 2016   **BEng, Mechatronics (Hons)**   [Faculty of Engineering, Universidad Autónoma de Yucatán, Mexico](#)
- Thesis title: Implementation of a technique based on electrical measurements for structural health monitoring on multiscale hierarchical composite materials under impact loading, directed by [Dr Francis Avilés Cetina](#).
- Award of the highest GPA in the Engineering (Mechatronics) program, 2011/16.

Technical skills

- Programming languages: <u>Python</u>, Java, Kotlin.
- Deep Learning libraries and frameworks: <u>Pytorch</u>, JAX, <u>MMDetection</u>, Detectron2.
- Data Science and computer vision libraries: <u>OpenCV</u>, scikit, pandas, numpy, matplotlib.
- Scientific Programming: Mathematica, MATLAB.
- Operating systems: Linux (Debian and Red Hat).

Other Responsibilities

- President of the Durham Mexican Society 2020/21 and Treasurer during the 2022/23 academic year.
- Trained in an X-ray machine's operation and data processing for cabin baggage scanning.
- Member of the Academic Council of the Engineering Faculty of the Universidad Autónoma de Yucatán.
- CVPR 2023 House band bass player.

Languages

- English. Professional proficiency.
- Spanish. Native speaker.