

Luis Carlos Garcia Peraza Herrera

Assistant Professor (Lecturer) in Computer Vision

<https://www.garciaperazaherrera.com>

✉ luiscarlos.gph@gmail.com |  GitHub |  LinkedIn |  Research Publications & Citations

EDUCATION

PHD ARTIFICIAL INTELLIGENCE & COMPUTER VISION

UNIVERSITY COLLEGE LONDON
2015-2020 | London, UK
Thesis: Deep Learning for Real-time Image Understanding in Endoscopic Vision

MASTER OF RESEARCH IN MEDICAL AND BIOMEDICAL IMAGING

UNIVERSITY COLLEGE LONDON
2014-2015 | London, UK

MASTER OF RESEARCH IN MEDICAL ROBOTICS AND IMAGE GUIDED INTERVENTIONS

IMPERIAL COLLEGE LONDON
2013-2014 | London, United Kingdom

MASTER OF SCIENCE IN COMPUTER SCIENCE

UNIVERSITY OF LA LAGUNA
2010-2012 | Tenerife, Spain

BACHELOR OF SCIENCE IN COMPUTER SCIENCE

UNIVERSITY OF LA LAGUNA
2007-2010 | Tenerife, Spain

SKILLS

DEEP LEARNING

PyTorch

PROGRAMMING

Python • C/C++ • CUDA • Boost • Valgrind • Shell • Git • Docker • Jira • Confluence

SCIENTIFIC SOFTWARE

Sklearn • Numpy • Pandas • Matplotlib • Seaborn • OpenCV • ROS • LaTeX

LANGUAGES

English	Full professional proficiency
Spanish	Native
Italian	Conversational

WORK & RESEARCH EXPERIENCE

ASSISTANT PROFESSOR | KING'S COLLEGE LONDON

May 2023 – Present | London, UK

- Lecturer in Computer Vision.
- Research focused on visual understanding with limited supervision.

RESEARCH FELLOW | KING'S COLLEGE LONDON

Jul 2022 – Apr 2023 | London, UK

- Published an article on hyperspectral image segmentation (**paper**).

RESEARCH ASSOCIATE | KING'S COLLEGE LONDON

Jun 2019 – Jun 2022 | London, UK

- Received the UK EPSRC IAA Award, securing 50K to lead my own research on segmentation of endoscopic images and hire a Research Assistant for the project.
- Participated in animal experiments, leading the data collection for our group's collaborative effort on hyperspectral image segmentation during autonomous robotic surgery for scoliosis.
- Published the first journal article on autonomous robotic endoscope control for manual keyhole surgery (**paper**) (**video**).

RESEARCH SCIENTIST INTERN | SIEMENS HEALTHINEERS

Mar 2018 – Nov 2018 | Princeton, USA

- Co-authored a **US patent** for motion correction and 3D reconstruction of coronary arteries from angiography images.

PHD | UNIVERSITY COLLEGE LONDON

Sep 2015 – Dec 2020 | London, UK

- Published 23 co-authored papers in 12 international conferences and 6 international journals that have been cited >500 times.
- Proposed a number of methods to segment surgical instruments from endoscopic images in real time.
- Developed a method to segment surgical tools without manual segmentation annotations that led to a research contract with an industrial player to embed the proposed method within their commercial prototype. (**paper**) (**press release**)
- Published the first open dataset for detection of Early Squamous Cell Neoplasia (ESCN) in the esophagus. (**dataset**)
- Participated as an active researcher of GIFT-Surg, a collaborative research effort between the UK and Belgium to improve fetal treatments.
- Built research collaborations outside the scope of my PhD project, engaging with clinicians from three different hospitals in two continents.
- Took part in public engagement, patient engagement, and fundraising for the charities supporting the research projects in the lab.
- Mentored MSc students, including the winner of the 2016 UCL Medical Physics department IPEM Prize for the best MSc research project to create a digital ophthalmoscope based on liquid lenses and electrowetting.

TECHNICAL ANALYST | FLEXTRADE

Jun 2013 – Sep 2013 | London, UK

- Responsible for the IT infrastructure for >150 users, including >300 virtual machines and >10 networking devices.
- Main roles: DevOps, system administration, firewall engineering.

OPEN SOURCE PROJECTS

- **vitcifar10**, a Python package containing a Vision Transformer (ViT) codebase for training and testing on CIFAR-10.
- **otda**, a Python package for domain adaptation based on optimal transport.
- **fda**, a Python package for Fourier-based domain adaptation.
- **synapi**, a Python package for managing datasets in Synapse.
- **latentplot**, a Python package to plot the latent space of a set of images with different dimensionality reduction methods.
- **smm** a sklearn-friendly Python package to estimate the parameters of a t-Student mixture distribution from data using Expectation-Maximization. This package is used by many researchers and organizations worldwide, including the U.S. Geological Survey (USGS).
- **videosum**, a Python package for video summarisation.
- **endoseg**, a Python package to segment the visible area in endoscopic images.
- **endotip** is a Python package to extract surgical instrument tooltips from video frames that have been already segmented.
- **keypoint-annotation-tool**, Python Dash application for annotating keypoints in images.
- **easyipc**, a faster-than-ZeroMQ and easy-to-use Python library for inter-process communications.
- **dockerx** Python package to launch Docker containers with X11 support in remote systems accessible via SSH.
- **libgrabcut**, a C++ library with Python bindings that implements GrabCut with CUDA-based Gaussian Mixture Models for real-time segmentation with scribbles.
- **ndarray-opencv-converter**, header-only C++ library to make available to Python those functions and methods written in C++ whose input/output is an OpenCv matrix.
- **rtspwebviewer**, web server that displays an RTSP video stream.

SELECTED PUBLICATIONS

- **Robotic Endoscope Control via Autonomous Instrument Tracking**. Frontiers of Robotics and AI, 2022. ([paper](#)) ([video](#)).
Proposed and built the first autonomous instrument tracking system that allows for solo laparoscopic surgery without additional sensors to track the instruments besides the necessary endoscope camera. In the proposed robotic system, the endoscope camera is autonomously controlled by a robotic arm while the surgeon operates.
Performed a user-study of the proposed system with 8 participants (including two surgeons) and showed that it yielded a predictable behaviour that could be quickly understood and learned by the participants to perform clinical-grade surgical tasks in a reasonable time.
- **Image Compositing for Segmentation of Surgical Tools without Manual Annotations**. IEEE TMI, 2021. ([paper](#))
Devised a method to segment surgical instruments in endoscopic images and achieved an accuracy comparable to state-of-the-art without using any manual segmentation annotations.
- **Intrapapillary Capillary Loop Classification in Magnification Endoscopy: Open Dataset and Baseline Methodology**. IJ-CARS, 2020. ([paper](#))
Curated and shared the first open dataset for classification of Intrapapillary Capillary Loop (IPCL) patterns on endoscopic video frames of patients with Early Squamous Cell Neoplasia (ESCN) in the esophagus.
Revisited Class Activation Maps and proposed a novel convolutional model that solves the image classification task at the same time that explains what features of the input domain drive the decision-making process of the network, even for small objects in the image such as vessels, where traditional class activation maps do not work.
- **ToolNet: Holistically-Nested Real-Time Segmentation of Robotic Surgical Tools**. IROS, 2017. ([paper](#))
Proposed and validated the first convolutional model to perform surgical tool segmentation in real-time, showing that deep supervision helps to improve the tool segmentation accuracy when the size of the network is reduced, as it is the case for those models aimed to work in real-time.
- **Real-time Segmentation of Non-rigid Surgical Tools Based on Deep Learning and Tracking**. CARS Workshop, MICCAI, 2016. ([paper](#))
Best Paper Award.
Achieved a new state of the art for real-time surgical tool segmentation exploiting the ability of deep neural networks to produce accurate segmentations of highly deformable parts along with the high speed of optical flow.

AWARDS

- 2021 UK EPSRC Impact Acceleration Account Award (£50K)
- 2017 Best MPhil to PhD Upgrade, CDT in Medical Imaging 2014 cohort
- 2016 Best Paper Award, CARS Workshop, MICCAI 2016
- 2016 Co-advisor of the student that won the departmental IPEM Prize
- 2014 Council of Tenerife MRes+PhD Scholarship (€29K)
- 2014 UK EPSRC PhD Studentship (£90K)
- 2013 Council of Tenerife Scholarship (€4K)
- 2012 Canary Islands Student Excellence Scholarship (€3K)