Ander **Biguri**

SENIOR RESEARCH ASSOCIATE

TOMOGRAPHIC RECONSTRUCTION AND ITS APPLICATIONS (CT, CBCT, PET), MACHINE LEARNING METHODS, IMAGE ANALYSIS

Cambridge Image Analysis, Department of Applied Mathematics and Theoretical Physics, University of Cambridge

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Research Experience

Senior Research Associate　　　　　　　　　　　　　　　　　　　*Cambridge, UK*

UNIVERSITY OF CAMBRIDGE　　　　　　　　　　　　　　　　　　　*Mar 2022 - Present*

- Member of the Cambridge Image Analysis (CIA) group lead by Prof. Carola-Bibiane Schönlieb at the Department of Applied Mathematics and Theoretical Physics (DAMTP).
- Translational research on extremely low-dose CT reconstruction with machine learning enhanced methods for image guided cancer screening and treatment.
- Funded by the Accelerate Programme for Scientific Discovery
- Member of the oversight committee of the **MPhil of Data intensive Science** at Department of Physics
- Co-Design, prepared, co-lecture and evaluate Image Analysis and Medical Imaging courses at MPhil DiS
- Exploring model-based data-driven methods, e.g. LPD, ACR, LGD and other physics model driven neural networks.
- Development of the **LION toolbox** (*github.com/CambridgeCIA/LION*), a Pytorch-based tool for ML-based CT reconstruction.
- Supervised eight Masters Theses and co-supervision of PhD students.
- Organized minisymposia in BAMC 2023, ICIAM 2023, SIAM IS 2024, ICASSP 2024 and others.

Research Fellow　　　　　　　　　　　　　　　　　　　　　　　*London, UK*

UNIVERSITY COLLEGE LONDON　　　　　　　　　　　　　　　　　*Feb 2020 - Jan 2022*

- Member of the Institute of Nuclear Medicine (INM) based at University College London Hospitals (UCLH) lead by Prof. Kris Thielemans
- Research on Dynamic Whole Body (DWB) PET imaging with a focus on motion detection and correction.
- Active contributor to open source-software such as SIRF, STIR.
- Deep Image Prior for PET denoising.
- Supervised 2 Masters Theses.
- Research funded by General Electric Healthcare.

Freelance　　　　　　　　　　　　　　　　　　　　　　　　　　*UK*

ANDER BIGURI CONSULTING　　　　　　　　　　　　　　　　　　*Dec 2019 - Present*

- Expertise Tomographic Reconstruction Algorithms and Inverse Problems.
- Delivered highly optimized and customized cone-beam CT reconstruction algorithms.

Research Fellow　　　　　　　　　　　　　　　　　　　　　*Southampton, UK*

UNIVERSITY OF SOUTHAMPTON　　　　　　　　　　　　　　　　*Jan 2018 - Dec 2019*

- Member of the Institute of Sound and Vibration Research (ISVR) and the μ-Vis lab *(southampton.ac.uk/muvis)*, with Prof. Thomas Blumensath.
- Research on a tetrahedron-based tomographic imaging system for laminography (limited-angle CT).
- Proposed and designed novel numerical optimization methods.
- Algorithm design and GPU implementation of multi-GPU machines for extremely high-resolution CT.
- Collaborated in research projects (EMPIR AdvanCT, CCPi) with institutions such as the Diamond Light Source, Rolls Royce or the National Physics Laboratory.
- Conducted sensitive industrial research with Rolls Royce among others.
- Trained on operating custom, highly flexible CT scanners.
- Supervised a research student.

PhD in X-ray Tomography Reconstruction Algorithms and Motion Compensation　　*Bath, UK*

UNIVERSITY OF BATH　&　CERN　　　　　　　　　　　　　　　　*Apr 2014 - Nov 2017*

- Research undertaken under the CERN Knowledge Transfer program with Prof. Manucherh Soleimani in order to study motion on proton therapy treatment.
- Studed iterative reconstruction algorithms for CT reconstruction.
- Developmed the **TIGRE toolbox** (*github.com/CERN/TIGRE*), a software for GPU accelerated iterative reconstruction for CT, now one of the standard libraries for industry and research with over 260 citations.
- Studied GPU acceleration methods for tomography and transferred knowledge into developing state-of-the-art CUDA code.
- Studied motion compensation techniques for CT
- Translated a general method for motion compensation for CT, taking ideas from the Phase Space tomography at CERN.
- Promoted my research by publishing codes, articles, etc. open-access, attending conferences, and giving talks.

Grants

Novel Methods for Ultra-low Dose CBCT in Angiography

Austrian Government FFG
FO999914792.

Co-I €264,501

2024-2027

Developing novel data-driven and variational algorithms for CBCT Angiography of the brain. Collaboration of University of Cambridge, Danube Private University, Medical University of Vienna and MedPhoton GmbH (Brainlabs).

Teaching experience

Guest Lecturer

World

VARIOUS

2014-2024

- Guest lecturer in various universities and summer schools around the world. Examples include RELIANCE CT acquisition and processing school (2024), SQUIDS Seminars University of Manchester (2023), Inverse problems University of Bath (2016) among many others.
- Main topics: CT reconstruction using variational regularization, CT reconstruction using machine learning, application of mathematical methods into real examples.

Lecturer

Cambridge, UK

UNIVERSITY OF CAMBRIDGE

Jan 2024 - July 2024

- Designed, prepared, lectured and assessed courses in the new Data intensive Science (DiS) MPhil
- **Medical Imaging.** Physics of CT and PET scanners (forward model). Reconstruction using pseudoinverse, variational regularization and machine learning. Coursework, exam design and evaluation.
- **Image Analysis** Mathematically deep image processing course. "Classical image processing" including image representations, transforms on images (e.g. morphological, geometric) and applications (e.g. segmentation, deconvolution, denoising etc). Coursework, exam design and evaluation.
- Proposal, supervision and evaluation of 5 DiS MPhil theses and 2 from other courses.

Lecturer

London, UK

UNIVERSITY COLLEGE LONDON

Sep 2020 - Dec 2020

- **Research techniques**, MSc. Nutrition.
Reading papers, grants, how does university do research etc. Name of the exact module unknown, seems its unavailable now, perhaps a pademic-only module.

Teaching Assistant

Bath, UK

UNIVERSITY OF BATH

Sept 2014 - Apr 2017

- **Fundamentals of Visual Computing**, 2nd year Computer Science. (2014, 2015, 2016)
OpenGL, C++, geometric transformations, PCA, image processing techniques.
- **Computer Applications**, 1st year Architecture and Civil Engineering. (2014, 2015)
Python, numpy, matplotlib.
- **Robotics Lab**, 1st year Integrated Electronic and Mechanical Engineering. (2014, 2015)
Arduino, basic control theory (PIDs).
- **Computational Intelligence**, 4th year Electronic and Electrical Engineering. (2016)
Genetic algorithms, neural networks.

Education

MSc in Automation and Electrical Engineering

Mondragon, Spain

MONDRAGON UNIBERTSITATEA

Sept 2010 - Jul 2013

- Developed an state of the art Digital Image Correlation for stereo camera vision system to help material characterization.
- Erasmus semester in Aalborg Universitet, Denmark

BSc in Electronic and Electrical Engineering

Mondragon, Spain

MONDRAGON UNIBERTSITATEA

Sept 2007 - Jul 2010

Relevant Research Skills

- Extended knowledge of tomographic reconstruction methods and inverse problems, particularly in CT but also PET, SPECT and, EIT.
- Specialized in translational research from Engineering/Maths to Medicine, particularly cancer imaging.
- Wide knowledge of numerical methods and their implementation.
- Wide Knowledge of Deep learning methods, particularly for tomography and medical imaging
- Wide knowledge of image-based medical processes and needs.
- Knowledge of motion challenges and solutions in the medical field.
- Deep understanding of GPU computing technologies.
- Excellent programming skills (proficient in C++, C, Python, MATLAB and CUDA).
- Understanding of the principles of a variety of fields, such as image processing, computer vision mathematical optimization, radiation therapy in oncology
- Good outreach skills having presented in many conferences, symposiums and seminars.
- Reviewer for high impact journals such as Physics in Medicine & Biology (IOP), Biological Physics Express (IOP), SoftwareX (Elsevier), International Journal of Radiation Oncology (Elsevier), Computational Imaging (IEEE), among others.
- Good control of research tools such as git, Linux, LaTeX, MS Office.

Honors & Awards

2019	**Outstanding Reviewer**, IOP journals Physics in Medicine & Biology	*International*
2016	**Prize for winning poster**, Motion correction in X-ray tomography using a priori known deformation vector fields and iterative reconstruction method	*Utrecht, Netherlands*
2014	**Prize for winning poster**, Dual modality EIT-CBCT for lung radiation therapy	*CERN, Switzerland*
2013	**Talentia program**, Qualified as one of the best students of the region	*Euskadi, Spain*
2012	**2nd Prize**, MATLAB Student Challenge	*International*
2011	**2nd Prize**, Best Papers IEEE Spot Conference	*Aalborg, Denmark*