Jose **Bernal Moyano**

Early Career Researcher in Medical Image Analysis

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Education

The University of Edinburgh & University of Glasgow — *UK*

PhD in Precision Medicine (GPA taught modules: 81.0/100.0) — *2018 - 2021 (expected)*

- Thesis: "Signal processing of dynamic and structural MRI for studying small vessel disease"
- Advisors: Dr. Maria d.C. Valdés-Hernández, Dr. Javier Escudero, Prof. Rhian M. Touyz and Prof. Joanna M. Wardlaw

Heriot-Watt University, Universitat de Girona & Université de Bourgogne — *UK, Spain & France*

MSc in Computer Vision and Robotics (GPA: 84.5/100.0) — *2015 - 2017*

- Thesis: "A quantitative comparison of deep CNN for brain tissue segmentation on MRI"
- Advisors: Prof. Xavier Lladó and Dr. Arnau Oliver

Universidad del Valle — *Colombia*

BSc in Computer Engineering (GPA: 4.53/5.00) — *2009 - 2014*

- Final BSc project: "Evaluating robustness of template matching algorithms"
- Advisors: Dr. Maria Trujillo and Dr. Ivan M. Cabezas

Honours, scholarships & grants

Honours

- *Ad honorem* lecturer - Universidad del Valle — *2020 - 2021*
- IEEE Transactions on Medical Imaging distinguished reviewer — *2021*
- "Excellent *Cum laude*" doctoral thesis - Universitat de Girona — *2020*
- Graduation with distinction - Heriot-Watt University — *2017*
- Graduation with mention "*très bien*" - Université de Bourgogne — *2017*
- Best master thesis - the Master in Vision and Robotics committee — *2017*
- Best Computer Engineering graduate - Universidad del Valle — *2014*
- "Meritorious" final career project - Universidad del Valle — *2014*

Scholarships

- MRC PhD studentship - The University of Edinburgh, University of Glasgow and Medical Research Council — *2018 - 2022*
- PhD FI-DGR2017 studentship - Generalitat de Catalunya — *2017 - 2018*
- "Master in Vision and Robotics" scholarship - EMMC consortium — *2015 - 2017*
- "Study trip for groups of foreign students to Germany" scholarship - DAAD — *2013*
- "Top engineering students" scholarship - Universidad del Valle — *2009 - 2013*

Grants

- Funding to support attendance to the DPUK datathon (£300) - ARUK, University of Exeter, and DPUK — *2019*
- Funding to support attendance to the VIBOT days (£500) - Master in Vision and Robotics committee — *2019*

Research experience

Active research projects

Development of a Colombian brain atlas — *Colombia*

Principal investigator — *2021*

- Aim: Create a Colombian brain atlas using magnetic resonance images to establish potential anatomical, structural and volumetric differences between the average Colombian brain and other atlases in the literature
- Participating institutions: Universidad del Valle & Hospital Universitario del Valle Evaristo García

Glioma segmentation as part of the Federated Tumor Segmentation initiative — *Worldwide*

Co-investigator — *2021*

- Aim: Train a deep learning based segmentation model in a federated fashion to enable quantification and study of gliomas in radiographic scans while allowing secure multi-institutional collaborations worldwide (fets.ai)
- Participating Colombian institutions: Universidad del Valle & Clínica Imbanaco QuirónSalud
- Colombian team coordinators: Dr. Maria Trujillo, Dr. Alejandro Herrera & Dr. William Escobar

In silico biomarkers for epilepsy surgery *Colombia*

Co-investigator *2021*

- Aim: Develop technological tools to support epilepsy surgery
- Participating institutions: Universidad del Valle & Clínica Imbanaco QuirónSalud

Selected publications

I have co-authored 18 peer-review journals papers, 6 book chapters, and 10 conference abstracts (incl. ESOC, OHBM, and ESMRMB); participated in 8 MICCAI Grand Challenges; and presented at national and international conferences. Citations: 1088; h-index: 11; i10-index: 12 (Google Scholar, 28/08/2021).

1. **Bernal, J.**, *et al.* (2021). Deep Learning for Medical Imaging. In: Bacciu, D. and Lisboa, P. J. G. and Vellido, A. (eds) *Deep Learning in Biology and Medicine*, 1-44. World Scientific Publishing Europe. [Shared first authorship]
2. **Bernal, J.**, *et al.* (2021). A four-dimensional computational model of dynamic contrast-enhanced magnetic resonance imaging measurement of subtle blood-brain barrier leakage. *NeuroImage*, 230, 117786.
3. **Bernal, J.**, *et al.* (2021). Generating longitudinal atrophy evaluation datasets on brain magnetic resonance images using convolutional neural networks and segmentation priors. *Neuroinformatics*, 19, 477–492.
4. Carvajal-Camelo, E., **Bernal, J.**, *et al.* (2021). Evaluating the Effect of Intensity Standardisation on Longitudinal Whole Brain Atrophy Quantification in Brain Magnetic Resonance Imaging. *Applied Sciences*, 11(4), 1773.
5. **Bernal, J.**, *et al.* (2020). Examining the relationship between semiquantitative methods analysing concentration-time and enhancement-time curves from DCE-MRI and cerebrovascular dysfunction in small vessel disease. *Journal of Imaging*, 6(6), 43.
6. **Bernal, J.**, *et al.* (2020). Analysis of dynamic descriptors of dynamic contrast-enhanced brain magnetic resonance images for studying small vessel disease. *Magnetic Resonance Imaging*, 66, 240-247.
7. Clèrigues, A., Valverde, S., **Bernal, J.**, *et al.* (2020). Acute and sub-acute stroke lesion segmentation from multimodal MRI. *Computer Methods and Programs in Biomedicine*, 194, 105521.
8. **Bernal, J.**, *et al.* (2019). Quantitative analysis of patch-based fully convolutional neural networks for tissue segmentation on brain magnetic resonance imaging. *IEEE Access*, 7, 89986-90002.
9. **Bernal, J.**, *et al.* (2019). Deep convolutional neural networks for brain image analysis in magnetic resonance imaging: a review. *Artificial Intelligence in Medicine*, 95, 64-81. [A top cited paper in AIM - 2019-2020]
10. Kushibar, K., Valverde, S., González-Villà, S., **Bernal, J.**, *et al.* (2019). Supervised domain adaptation for automatic sub-cortical brain structure segmentation with minimal user interaction. *Scientific Reports*, 9(6742), 1-15.
11. Clèrigues, A., Valverde, S., **Bernal, J.**, *et al.* (2019). Acute ischemic stroke lesion core segmentation in CT perfusion images using fully convolutional neural networks. *Computers in Biology and Medicine*, 115, 103487.
12. Kushibar, K., Valverde, S., González-Villà, S., **Bernal, J.**, *et al.* (2018). Automated sub-cortical brain structure segmentation combining spatial and deep convolutional features. *Medical Image Analysis*, 48, 177-186.
13. Mazo, C., **Bernal, J.**, *et al.* (2018). Transfer learning for classification of cardiovascular tissues in histological images. *Computer Methods and Programs in Biomedicine*, 165, 69-76. [Shared first authorship]
14. Chaves, D., Fernández-Robles, L. **Bernal, J.**, *et al.* (2018). Automatic characterisation of chars from the combustion of pulverised coals using machine vision. *Powder Technology*, 338, 110-118.

Source code

I am convinced that open source is an excellent way not only to disseminate my work but also to ensure other researchers can build upon it. Consequently, I have released the source code of my most recent projects via GitHub (`https://github.com/joseabernal`).

1. **Bernal, J.**, *et al.* (2020). A four-dimensional computational model of dynamic contrast-enhanced magnetic resonance imaging measurement of subtle blood-brain barrier leakage: source code. The University of Edinburgh. https://doi.org/10.7488/ds/2966.

Peer-review activities

I have reviewed numerous works for multiple journals (incl. Artificial intelligence in medicine; IEEE Access; NeuroImage: Clinical; Scientific reports; IEEE Transactions on Biomedical Engineering; and IEEE Transactions on Medical Imaging).

Teaching and supervision experience

Teaching

- Introduction to image processing as *ad honorem* lecturer (UG - Spring). Reference: Dr. Maria Trujillo. *2021*
- Image processing as teaching assistant (PG - Autumn). Reference: Dr. Javier Escudero. *2019 - 2020*
- Medical image segmentation and applications as teaching assistant (PG - Autumn). Reference: Dr. Xavier Lladó. *2017*

Conducted seminars

- Medical image segmentation for clinical applications - Universidad del Valle (ten hours) *2021*
- Medical image segmentation using deep learning - Universitat de Girona (eight hours) *2020*
- Metaheuristics for vehicle routing problems - Universidad Tecnológica de Pereira (two hours) *2020*

Supervision

- William Xu - The University of Edinburgh - Hons project: “Improving perivascular space quantification in brain MRI” *2021*
- Emily Carvajal - Universidad del Valle - BSc project: “Standardising intensities in MRI for brain volumetry” (Laureate) *2020 - 2021*
- Valeria Rivera - Universidad del Valle - BSc project: “The Colombian stereotactic brain MRI atlas” *2020 - 2021*
- Mateo Gregory - Universidad del Valle - BSc project: “Locating and rendering postneurosurgery samples” *2020 - 2021*
- Cristian Ballesteros - Universidad del Valle - MSc project: “Automatic detection of focal cortical dysplasias in MRI” *2020 - 2021*

Skills

- OS: Windows, Linux
- Programming languages: Matlab, Python, R
- Containers: Docker
- Markup: LaTeX
- Languages: Spanish (mothertongue), English

References

- Dr. Maria d.C. Valdés-Hernández, Row Fogo Lecturer in Medical Image Analysis. Affiliation: Centre for Clinical Brain Sciences, The University of Edinburgh, Edinburgh, UK. Email: m.valdes-hernan@ed.ac.uk
- Dr. Javier Escudero, Senior Lecturer in Biomedical Signal Processing. Affiliation: School of Engineering, The University of Edinburgh, Edinburgh, UK. Email: javier.escudero@ed.ac.uk
- Prof. Xavier Lladó, Full Professor. Affiliation: Computer Vision and Robotics Institute, Universitat de Girona, Girona, Spain. Email: xavier.llado@udg.edu
- Dr. Maria Trujillo, Associate Professor. Affiliation: Multimedia and Computer Vision Research Group, Universidad del Valle, Cali, Colombia. Email: maria.trujillo@correounivalle.edu.co