Felipe Torres Figueroa

Computer Vision - Deep Learning
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EDUCATION

PhD in applied Mathematics *October 2020 - September 2024*
École Centrale Marseille Marseille - France
Supervisors Ronan Sicre, Stephane Ayache, Yannis Avrithis
PhD thesis: *Learning discriminative representations to interpret image recognition models.*
Development of techniques for interpretable image recognition.

Master of Biomedical Engineering *March 2018-March 2020*
Universidad de los Andes Bogotá - Colombia
Supervisor Pablo Arbeláez
Master thesis: *Automatic Bone Age Assessment*
Development of techniques for automated bone age assessment, using computer vision and deep learning.
Additional coursework on computer vision and deep learning in general.

Bachelor in Biomedical Engineering *January 2013 - March 2018*
Universidad de los Andes Bogotá - Colombia
Bachelor thesis: *Design of Medical Devices*
Development of a medical device for measuring breathing cycles on babies during their sleep.
Elective coursework focused on research projects, computer science and image processing.

PROJECTS

CLS-Pooling, Laboratoire d'Informatique et Systèmes *August 2022-June 2023*
Research Scientist
Development of a transformer based approach to provide enhanced interpretability properties to convolutional neural networks.
For this goal, a cross attention branch that spans across the depth of a given model was trained, computing interactions between feature maps at given points and a class token that is used to perform classification with.

- F. Torres, H. Zhang, R. Sicre, S. Ayache, Y. Avrithis. CA-Stream: Attention-based pooling for interpretable image recognition. 3^{rd} Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops. 2024.

Gradient Denoising, Laboratoire d'Informatique et Systèmes *January 2021-September 2023*
Research Scientist
Development of an approach to denoise classification gradients on convolutional neural networks.
For this goal, a modified training protocol was proposed for standard neural networks, where a regularization aims to denoise the model's gradients.

- F. Torres, H. Zhang, R. Sicre, S. Ayache, Y. Avrithis. A Learning Paradigm for Interpretable Gradients. 19^{th} International Conference on Computer Vision Theory and Applications. 2024.

Opti-CAM, Laboratoire d'Informatique et Systémes *July 2021-January 2023*
Research Scientist
Development of a Class Activation Mapping approach for interpretable recognition.

For this goal, the weighted coefficient for computation of these methods is optimized, ensuring that the logit/probability of the groundtruth class is maximized. Conversely, this approach also revisits the metrics for comparing interpretability methods based on these mappings.

- H. Zhang, F. Torres, R. Sicre, Y. Avrithis, S. Ayache. Opti-CAM: Optimizing saliency maps for interpretability. arXiv:2301.07002v1. 2023

Vehicle Counting and Re Identification , Universidad de los Andes *January 2020 - June 2020*
Research Intern
Development of an approach for vehicle counting, tracking and re-identification.
For this goal, an approach for vehicle counting and tracking across different camera views was developed.

- A. Ospina, F. Torres. Countor: Count without bells and whistles. Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) Workshops. 2020.

Wound Measuring , Universidad de los Andes *January 2019-September 2019*
Research Assistant
Development of an ImageJ tool for measuring wound healing rates in micrography data.
For this goal, an ImageJ program was designed, using image morphology to select the largest connected element based on image properties and user input (which identifies a wound in tissue), and measure its shape properties.

- A. Suarez, F. Torres, L. Bocanegra, P. Arbeláez, D. Garcia, J.C. Cruz, C. Muñoz. An image J plugin for the high throughput image analysis of in vitro scratch wound healing assays. PloS one 15 (7), e0232565. 2020.

Bone Age Assessment, Universidad de los Andes *January 2016 - December 2019*
Undergraduate Research Assistant, Undergraduate Research Assistant
Development of a deep learning approach to estimate bone age using hand X-rays.
For this goal, a convolutional neural network was trained, using a siamese encoder that combines local information from specific regions of interest and age information.
This project was ultimately funded by the Administrative Department of Science, Technology and Innovation (COLCIENCIAS) under the grant 841-2017.

- C. I. González, M. C. Escobar, F. Torres, L. Daza, G. Triana, P. Arbeláez. SIMBA: Specific identity markers for bone age assessment. International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI). 2020.
- M. C. Escobar, C. I. González, F. Torres, L. Daza, G. Triana, P. Arbeláez. Hand Pose Estimation for Pediatric Bone Age Assessment. International Conference on Medical Image Computing and Computer-Assisted Intervention (MICCAI). 2019.
- F. Torres, C. I. González, M. C. Escobar, L. Daza, G Triana, P. Arbeláez. An Empirical Study on Global Bone Age Assessment. 15^{th} International Conference on Medical Information Processing and Analysis (SIPAIM). 2019.
- F. Torres, M.A. Bravo, E. Salinas, G Triana, P. Arbeláez. Bone age detection via carpogram analysis using convolutional neural networks. 13^{th} International Conference on Medical Information Processing and Analysis (SIPAIM). 2017. DOI: 10.1117/12.2285949

SKILLS

Programming Languages	**Proficiency**
Python	Advanced

Bash	Intermediate
Matlab	Intermediate
Java	
Basic	

Deep Learning Frameworks	**Proficiency**
Pytorch	Advanced
Caffe	Intermediate
Tensorflow	Basic

Languages	**Proficiency**
Spanish	Native
English	C1
French	B2

AWARDS AND SCHOLARSHIPS

Grant 841-2017 , COLCIENCIAS *September 2017*
Funding under the project 777 -2017 of COLCIENCIAS for a research project on science and technology. Grant from the entity to work in conjunction with the hospital and associated resources to build a bone age assessment tool for a Colombian cohort.

Research Grant , Fundación Santa Fe de Bogotá *July 2016*
Funding to work in conjunction between Fundación Santa Fe de Bogotá and Universidad de los Andes to build a Bone Age Assessment dataset and a preliminary model to perform binary bone age assessment.

Best Project , ELLIS Summer School *September 2023*
Winner of best project award within the Ellis Summer School (Sept 18th-22nd) hosted by Unimore Department of Engineering in Modena, Italy.
Work towards watermarking Large Language Model outputs to detect if a given text is generated by one of such technologies.

ACTIVITIES

QARMA Research Team, Laboratoire d'Informatique et Systèmes *Octubre 2020- ongoing*
I'm an active member on the research group, I give talks related to my area of research and help in supervision of master students during their internships in the laboratory.

Biomedical Computer Vision Group, Universidad de los Andes *January 2016 - March 2020*
During this time I was an active member of the group. I gave talks regarding my research interests of computer vision, in particular about image recognition, segmentation and visual query answering. Conversely, I helped guide projects of undergraduate students within the group.

Athletics Team, Universidad de los Andes *June 2017 - December 2019*
During this time I was a middle distance runner within the university's athletics team. I specialized in races between 800 meters and 5 kilometers.