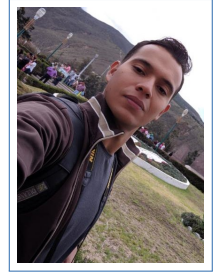# Rubén D Fonnegra, Ph.D(c)

Curriculum Vitae

Medellín, Colombia
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✉ *rubenfonnegrat1015@gmail.com*
🖥 *rubenfonnegra.github.io*

PERSONAL INFO

Date of birth	24th June, 1993
Place of birth	Medellín, Colombia
Citizenship	Colombian
Scholar	https://scholar.google.com/citations?user=g2Y2WBMAAAAJ&hl=es&oi=ao

PERSONAL PROFILE

An enthusiastic, adaptive, fast-learning and very disciplined person. Electronical Engineer, Master in Automatización y Control Industrial and current PhD. student in Engineer with a broad and acute interest in the development of computational systems for the aid of cancer diagnosis. I particularly enjoy collaborating with scientists from different disciplines to develop new skills and abilities to solve new challenges.

EDUCATION

2010 – 2015 **B.S. Electronical Engineer**, *Electronic and Telecommunications department*, Facultad de ingenierías, Instituto Tecnológico Metropolitano.
Medellín, Colombia
Thesis: Anti-collision system for navigation inside an UAV using fuzzy controllers and range sensors
Advisor(s): M.Sc. Germán David Góez Sánchez

2016 – 2019 **M.Sc. Automation and Industrial Control**, *Postgrade department*, Faculty of Engineer, Instituto Tecnológico Metropolitano.
Medellín, Colombia
Thesis: Automatic Emotion Recognition from Multimodal Information Fusion Using Deep Learning Approaches
Advisor(s): Gloria Mercedes Díaz Cabrera, Ph.D. ; Juan Carlos Caicedo Rueda, Ph.D.

2020 – Corrently **Ph.D(c) Engineer**, *Postgrade department*, Faculty of Engineer, Instituto Tecnológico Metropolitano.
Medellín, Colombia
Thesis: Currently
Advisor(s): Gloria Mercedes Díaz Cabrera, Ph.D. ; Juan Carlos Caicedo Rueda, Ph.D.

LANGUAGES

Spanish	Reading: Native	Speaking: Native	Listening: Native
French	Reading: Intermediate	Speaking: Intermediate	Listening: Intermediate
English	Reading: Good	Speaking: Good	Listening: Good

IELTS: B2

Research interest

- Machine Learning and Pattern Recognition
- Theories in Artificial Intelligence
- Computer Vision and Image Processing

Research Activities and Affiliations

Feb – Mar 2015 2016	**IEEE student branch - Medellín, Colombia**. Institution: Instituto Tecnológico Metropolitano Role: Member	

IEEE student branch - Medellín, Colombia.
Institution: Instituto Tecnológico Metropolitano
Role: Member

Feb – Mar
2015 2016

PLC seedbed research group - Researcher student.
Institution: Instituto Tecnológico Metropolitano
Role: Leader student

Aug – Dec
2013 2017

Artificial Intelligence seedbed research group - Researcher student.
Institution: Instituto Tecnológico Metropolitano
Role: Member

Feb – Dec
2016 2017

Research group in Automática, Electrónica y Ciencias Computacionales
Institution: Instituto Tecnológico Metropolitano
Role: Student member

Jan – Dec
2014 2018

Research group and Ambiental Innovation - GIIAM
Institution: Institución Universitaria Pascual Bravo
Role: Associate Researcher

Jan – Current
2019 -

Working Experience

Instituto Tecnológico Metropolitano. Colombia. Academic laboratory worker
Programmable Logic Controllers (PLC) Laboratory worker. Charge activities included preventive, predictive and corrective maintenance performing in industrial drivers, planning academic schedules, maintenance reports, students monitoring and permanent counseling to students and teachers concerning to programming devices (PLC, microcontrollers and FPGAs), controllers design, custom software and other programmed activities from facultad de ingenierías of Instituto Tecnológico Metropolitano.

Jan – Jun
2014 2018

Instituto Tecnológico Metropolitano. Colombia. Professor
Professor in courses of microcontrollers programming, from Mechatronics and Electronic Engineering programs; which are focused in operation and develompment of electronic solutions using digital and analog peripheral devices, users interfaces design, embedded systems design and communication interaces in Microchip and Freescale devices.

Feb – Jun
2016 2018

Instituto Tecnológico Metropolitano. Colombia. External professor
External professor of the in Fundamentals and Applications of Deep Learning, whose main objective is to provide complete training in the fundamentals and use of Deep Learning and Artificial Intelligence tools to propose commercial solutions or in industrial environments using algorithms, libraries and strategies commonly used in this discipline (Python and Tensorflow).

Jul – Current
2018 -

Au – Current 2018 -	**Institución Universitaria Pascual Bravo. Colombia. Associate professor** Associate professor of Robotics courses associated with the Mechatronic systems technology program, which focuses on the design and simulation of manipulators and robots in various environments from the mechanical, electronic and control point of view according to the specifications of a designated task. The data structure course of the software development technology program is also oriented, which is based on the use and correct implementation of structures (such as arrays, arrays, stacks, queues, trees) in programming language for web development (C) taking into account the correct management of computational resources (memory, access times, among others). Finally, it also guides the pattern recognition course in the same program, in which it focuses on the use of preprocessing algorithms and image characterization for solving real-life problems. He is currently developing research projects in the areas of affective computing (emotion recognition) and navigation systems with exoskeletons; both using advanced computational learning algorithms.

PARTICIPATION IN RESEARCH PROJECTS

Emotion Recognition from physiological signals using computational intelligence

This project aims to use different computational strategies for emotional identification, taking into account valence or intention (positive / negative) and emotional intensity (high / low). Additionally, differences between the nature of human and human-robot interactions will also be considered for emotional manifestation. This is because this interaction significantly conditions the production of its manifestation at the time of its elicitation. All this will be done through the analysis of galvanic skin response signals (GSR) and their characteristics, since these devices represent a non-invasive interaction alternative that provides relevant information from both aspects (valence and intensity). In this sense, various computational strategies will be evaluated for the development of systems that allow to identify an emotional event from its intensity and its valence separately, from a database that includes GSR signals. Additionally, the results will be contrasted in such a way that the differences between human interaction and human-robot interaction are considered. This project will contribute to the improvement of computational interfaces that involve improvement strategies in terms of interaction, taking into account the emotional recognition of users.

Human-machine interface control for interaction in automated environments within industrial plants from a fast-coupled digital exoskeleton for adding data to industry 4.0 protocols

The use of exoskeletons within production chains and production processes allows users to reduce biological energy consumption, avoid occupational diseases or direct communication with environments within the work area. For this reason, interest in the development of systems involving these devices has increased in the last decade. This project aims to develop a digital exoskeleton of the upper limbs (arm and forearm) and its control for use within an automated process that allows direct interaction with the process. This, achieving security for the user and inclusion of this in the automated system from its industrial platforms and algorithms for free software in an embedded system based on a cortex M3 processor. For this, the control, the acquisition of biomechanical signals and the use of exoskeleton data will be validated within a process based on electropneumatics controlled by a programmable logic device (PLC) and a control module for industrial processes.

PUBLICATIONS

SELECTED INTERNATIONAL CONFERENCES

Signal Processing	*Anti-collision system for navigation inside an UAV using fuzzy controllers and range sensors*, Dario Fonnegra Tarazona, Ruben; Lopera, Felipe Rios; Sanchez, German-David Goez. Submitted and accepted for oral presentation and publication in XIX Simposio Internacional de Tratamiento de Señales, Imágenes y Visión Artificial-STSIVA 2014. Colombia. 2014.

Artificial Intelligence	*Automatic Face Recognition in Thermal Images using Deep Convolutional Neural Networks*, Fonnegra, Ruben D.; Cardona-Escobar, Andres Felipe; Perez-Zapata, Andres Felipe; Diaz, Gloria M. . Submitted and accepted for oral presentation and publication in XVII Conferencia Latinoamericana de Control Automático CLCA 2016. Colombia. 2016.
Artificial Intelligence	*Performance comparison of deep learning frameworks in image classification problems using convolutional and recurrent networks*, Fonnegra, R. D.; Blair, B.; Diaz, G. M. . Submitted and accepted for oral presentation and publication in IEEE Colombian Conference on Communications and Computing (COLCOM) 2017.

Selected research articles

Signal Processing	*Sistema anti colisiones para navegación en interiores de un Quacopter usando un controlador difuso y sensores de rango*, Fonnegra Tarazona, Ruben Dario; Lopera, Felipe Rios; Sanchez, German-David Goez. En: Revista de Investigaciones Universidad del Quindío. 2016.
Computer vision	*MSpecFace: A Dataset for Facial Recognition in the Visible, Ultra Violet and Infrared Spectra.*, Fonnegra R.D., Molina A., Pérez-Zapata A.F., Díaz G.M. Botto-Tobar M., Esparza-Cruz N., León-Acurio J., Crespo-Torres N., Beltrán-Mora M. (eds) Technology Trends. Communications in Computer and Information Science, vol 798. Springer, Cham
Artificial Intelligence	*Speech Emotion Recognition Based on a Recurrent Neural Network Classification Model*, Fonnegra R.D., Díaz G.M. In: In: Cheok A., Inami M., Romão T. (eds) Advances in Computer Entertainment Technology. Lecture Notes in Computer Science, vol 10714. Springer, Cham
Artificial Intelligence	*Deep Learning based Video Spatio-Temporal Modeling for Emotion Recognition*, Fonnegra R.D., Díaz G.M. In: Masaaki Kurosu (ed) Human-Computer Interaction: Theories, Methods and Human Issues (Part I). Lecture Notes in Computer Science, vol 10901. Springer, Cham.
Artificial Intelligence	*Speech Emotion Recognition Integrating Paralinguistic Features and Auto-encoders in a Deep Learning Model*, Fonnegra R.D., Díaz G.M. In: Masaaki Kurosu (ed) Human-Computer Interaction: Theories, Methods and Human Issues (Part I). Lecture Notes in Computer Science, vol 10901. Springer, Cham.
Artificial Intelligence	*Orientation estimating in a non-modeled aerial vehicle using inertial sensor fusion and machine learning techniques*, Fonnegra R.D., Góez G.D., Tobón A.F. In: Revista Iberoamericana de Automática e Informática industrial, [S.l.], v. 16, n. 4, p. 415-422, sep. 2019. ISSN 1697-7920.
Artificial Intelligence	*Emotion Recognition from Time-Frequency Analysis in EEG Signals Using a Deep Learning Strategy.*, Fonnegra R.D., Campáz-Usuga P., Osorno-Castillo K., Díaz G.M. In Narvaez-Espinoza, F. (eds). Communications in Computer and Information Science, Springer, Cham, Dic 2019.
Artificial Intelligence	*Generalized adversarial networks for stress field recovering processes from photoelasticity images.*, de León, J. C. B., Fonnegra, R. D., & Restrepo-Martínez, A. (2020, August). In Applications of Digital Image Processing XLIII (Vol. 11510, p. 115100S). International Society for Optics and Photonics.

Participation in academic events

Signal processing	**XIX Simposio Internacional de Tratamiento de Señales, Imágenes y Visión Artificial-STSIVA 2014** Place: Armenia, Colombia Fecha: 17 al 19 de septiembre de 2014 Organizer: Universidad Uniquindío Role: Speaker
Robotics	**Parque I para todos** Place: Medellín, Colombia Date: 19 de mayo de 2015 Organizer: Instituto Tecnológico Metropolitano Role: Associate in organizer comittee

Artificial intelligence	**XVII Conferencia Latinoamericana de Control Automático CLCA 2016** Place: Medellín, Colombia Date: 13 al 15 de octubre de 2016 Organizer: Universidad EAFIT Role: Speaker
Artificial intelligence	**IEEE Colombian Conference on Communications and Computing (COLCOM) 2017** Place: Cartagena de Indias, Colombia Date: 16 al 18 de Agosto de 2017 Organizer: IEEE Computer Society Role: Speaker
Academic	**Cumbre Colombo-Francesa de Investigación, Innovación y Educación Superior COL-IFRI 2019.** Place: Medellín, Colombia Date: 12 al 14 de Junio de 2019 Organizer: Colifrí, Agregado de cooperación universitaria y científica de la embajada de Francia en Colombia y universidad EAFIT. Role: Speaker

Personal and academic achievements

Winner of the fully funded national scholarship program for doctoral studies under "becas excelencia doctoral del Bicentenario". May, 2020
Institution: Minciencias, Colombia.

Summa cum Laude for master's thesis work titled "Automatic Emotion Recognition From Multimodal Information Fusion Using Deep Learning Approaches". April, 2019
Institution: Instituto Tecnológico Metropolitano (ITM), Medellín, Colombia.

Winner of the fully funded interrnational internship program on agreement 161 signed between the Instituto Tecnológico Metropolitano (ITM) and Sapiencia, April, 2017.
Objective: To propose an experiment in the laboratory of the Autonomous Systems and Robotics of the Department of Informatics and Systems Engineering (U2IC) of l'École Nationale Supérieure de Techniques Avancées (ENSTA) ParisTech; to perform emotion modeling through human-robot and human-human based interactions
Advisor: Prof. Adriana Tapus, Ph.D.
Institution: Instituto Tecnológico Metropolitano (ITM)

Skills and abilities

Reseach	Previous experience in Machine learning. Pattern recognition. Artificial intelligence. Image processing and analysis. Signals processing algorithms.	**Software**	Advanced skills in programming languages: Python, C++, Bourne-again shell (Bash) and Lenguaje M (Matlab)