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Frank Julca Aguilar

Education

2012–2016 **Ph.D. in Computer Science - Computer Vision**, University of Nantes, France, and University of São Paulo, Brazil (joint Ph.D. program).
Advised by Nina S. T. Hirata, Christian Viard-Gaudin and Harold Mouchère.

2010–2012 **M.S. in Computer Science - Computer Vision**, Institute of Mathematics and Statistics of University of São Paulo, Brazil.
Advised by Nina S. T. Hirata.

2005–2009 **B.S. in Computer Science**, National University of Trujillo, Peru.

Research Experience

07/2016–Now **Postdoctoral Researcher**, University of São Paulo, Brazil.
Develop new methods for image operator learning using convolutional neural networks [1, 2]. Investigate region-based convolutional neural networks for object and visual relationship detection [3].

06/2012–04/2016 **Research Fellow**, University of São Paulo, Brazil.
Developed novel context-aware features for recognition of symbols (101 classes) and spatial relations (e.g. *superscript* and *subscript*) in mathematical expressions [4]. Integrated Shape Context descriptors with neural networks [5, 6].

10/2013–11/2014 **Research Fellow**, University of Nantes, France.
Investigated machine learning and graph parsing methods for recognition of graphics (e.g. diagrams and mathematical expressions). Developed a general technique that can be applied to a variety of graphics (most techniques are specifically developed for a single graphic type) with state-of-the-art accuracy [7, 8, 9].

06/2011–12/2012 **Research Fellow**, University of São Paulo, Brazil.
Developed a system that manages the construction and automatic ground-truth annotation of handwritten mathematical expression datasets [10]. Implemented and evaluated a new graph matching-based technique (used by the system) to automatize ground-truth annotation [11, 12].

Software

- DeepTRIOS (Python-Tensorflow) – image operator learning with CNNs: `https://github.com/fjulca-aguilar/trios/tree/cnn/trios/contrib/cnn`
- Image content-based retrieval using Chromaticity Moments (Java): `https://github.com/fjulca-aguilar/chromaticity-moments`

- ExpressMatch dataset: part of the dataset is included in the CROHME dataset **here**. The complete dataset can be downloaded **here**
- ExpressMatch system (Java) – a system for creating ground-truthed datasets of online mathematical expressions: `https://code.google.com/archive/p/express-match/`

Honors and Awards

- Recipient of FAPESP scholarships: Research Internships Abroad (2013), PhD (2012), and Master's (2010), São Paulo, Brazil
- Graduated in the top ten percent of class – Computer Science School of National University of Trujillo
- First place in Secicomp Programming Contest (National University of Trujillo)
- First place in public exam to enter Computer Science School of National University of Trujillo

Technical Skills

- Programming: Python, Scikit-learn, Tensorflow, Java, C, C++, Matlab/Octave, R
- RDBMS and tools: MySQL, Java DB, SQL Server, Git

Teaching Experience

08/2012–11/2012 **Teaching Assistant**, *Introduction to Computer Science*, University of São Paulo.

03/2011–06/2011 **Teaching Assistant**, *Concurrent Programming*, University of São Paulo.

03/2009–06/2009 **Teaching Assistant**, *Programming Paradigms*, National University of Trujillo.

Languages

Spanish **Mother tongue**

English **Proficient**

Portuguese **Proficient**

French **Basic**

Additional Information

11/2016–12/2016 **Visiting Researcher**, *Institut de Recherche en Communications et Cybernétique de Nantes (IRCCyN)*, France.

Reviewer: *International Journal on Document Analysis and Recognition (IJDAR), International Conference on Frontiers in Handwriting Recognition (ICFHR), Conference on Graphics, Patterns and Images (SIBGRAPI)*

Publications

[1] Frank Julca-Aguilar and Nina Hirata. Image operator learning coupled with CNN classification and its application to staff line removal. In *14th IAPR International Conference on Document Analysis and Recognition (ICDAR)*, 2017. (To appear). [PDF].

[2] Frank Julca-Aguilar, Ana Maia, and Nina Hirata. Text/non-text classification of connected components in document images. In *30th Conference on Graphics, Patterns, and Images (SIBGRAPI)*, 2017. (To appear).

[3] Frank D. Julca-Aguilar and Nina S. T. Hirata. Symbol detection in online handwritten graphics using Faster R-CNN. *13th IAPR International Workshop on Document Analysis Systems (DAS)*, 2018. (To appear). [PDF].

[4] Frank Julca-Aguilar, Nina Hirata, Harold Mouchère, and Christian Viard-Gaudin. Subexpression and dominant symbol histograms for spatial relation classification in mathematical expressions. In *23rd International Conference on Pattern Recognition (ICPR)*, 2016. [PDF].

[5] Frank Julca-Aguilar, Christian Viard-Gaudin, Harold Mouchère, Sofiane Medjkoune, and Nina Hirata. Integration of shape context and neural networks for symbol recognition. In *Semaine du Document Numérique et de la Recherche d'Information (SDNRI)*, 2014. [PDF].

[6] Frank Julca-Aguilar, Christian Viard-Gaudin, Harold Mouchère, Sofiane Medjkoune, and Nina Hirata. Mathematical symbol hypothesis recognition with rejection option. In *14th International Conference on Frontiers in Handwriting Recognition (ICFHR)*, 2014. [PDF].

[7] Frank Julca-Aguilar, Harold Mouchère, Christian Viard-Gaudin, and Nina S. T. Hirata. Top-down online handwritten mathematical expression parsing with graph grammar. In *Proceedings of the 20th Iberoamerican Congress on Pattern Recognition (CIARP)*, 2015. [PDF].

[8] Frank Julca-Aguilar. *Recognition of Online Handwritten Mathematical Expressions using Contextual Information*. PhD thesis, University of São Paulo and University of Nantes, 2016. [PDF].

[9] Frank Julca-Aguilar and Nina Hirata. A general framework for the recognition of online handwritten graphics. *Submitted to TPAMI*, 2017. [PDF].

[10] Frank D. Julca-Aguilar and Nina S. T. Hirata. Expressmatch: A system for creating ground-truthed datasets of online mathematical expressions. In *Proceedings of the 10th IAPR International Workshop on Document Analysis Systems (DAS)*, 2012. [PDF].

[11] Alexandre Noma, Frank D. Julca-Aguilar, and Nina S. T. Hirata. Matching expressions by using structural belief propagation: First results. In *26th Conference on Graphics, Patterns, and Images (SIBGRAPI)*, 2013. [PDF].

[12] Nina S.T. Hirata and Frank D. Julca-Aguilar. Matching based ground-truth annotation for online handwritten mathematical expressions. *Pattern Recognition (PR)*, 2015. [PDF].