Francisco Blanco-Silva

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Education

M.Sc. and Ph.D. in Mathematics — August 2007
Purdue University, West Lafayette, Indiana. USA
Dissertation topic:
The Curvelet Transform—Generalized Definition and Approximation Properties

B.Sc. in Mathematical Sciences — September 1997
Universidad Complutense de Madrid, Madrid. Spain
Major in Pure Mathematics: Geometry and Topology

Skills

Languages:
Fluent in English: more than working-level that allows me, among other skills, to speak effectively, write concisely, listen attentively, express ideas, report information, edit, interview, and facilitate group discussions. El español es mi lengua materna.

Programming Languages:
AWK/GAWK, BASIC, Bourne/Unix shell (including bash, csh, tcsh, ksh and zsh), C/C++/Objective-C/CoCoA, Caml/OCaml, CSS, Lisp/Common Lisp/Emacs Lisp/Scheme, Fortran, HTML, Julia, Magma, Maple, Mathematica, MATLAB, Maxima, MPI, Octave, Pascal, Perl, PHP, Python, R, Ruby, Sed, asciidocs, TeX/LaTeX, markdown

Computer and OS:
Proficient in Ubuntu and RPM-based Linux; Windows 9x, XP, Vista, 7-8; Mac OS X; Unix; Virtualization of Windows and Linux guests using VMWare; OS installations (dual and triple boot)

Software:
Office suites (Microsoft Office, OpenOffice, GoogleDocs), Image Manipulation Programs (ImageMagick, Photoshop, Gimp), Web Application and Website creation (Outsystems Agile Platform)

Recent Work Experience

Owner — Tizona Scientific Solutions LLC — July 2011 – present
Scientific consulting company: Tizona delivers solutions to commercial clients through sophisticated analysis and development of graphic-intensive, easily accessible software suites.

Research Assistant Professor — August 2007 – August 2010
Instructor — August 2011 – present
Interdisciplinary Mathematics Institute and Department of Mathematics. University of South Carolina

- Research on systematic approaches to extracting high resolution information from HAADF–STEM images which will be beneficial to the characterization of beam sensitive materials

- Research on the development of multiresolution formulated algorithms to enable high compression rates using non-linear approximation methods, enhanced procedures for Hausdorff metric estimation, and the efficient structures for organization of digital urban terrain data.

- Developed parallel code to perform super-resolution of timeframes of micrographs in both `Matlab`, and C/C++ with the `CImg` libraries. The codes were run in a 16-processor `UNIX` machine property of the IMI, and a 272 core parallel computational cluster property of the University of South Carolina

- Scientific articles/books:

  - F. J. Blanco-Silva, *Learning SciPy for Numerical and Scientific Computing*. Packt Publishing (February 2013). ISBN 978-1-7821-6162-2

- P. Binev, F. J. Blanco-Silva, D. Blom, W. Dahmen, P. Lamby, R. Sharpley and T. Vogt, *High Quality Image Formation by Nonlocal Means Applied to High-Angle Annular Dark-field Scanning Transmission Electron Microscopy (HAADF-STEM)*. Modeling Nanoscale Imaging in Electron Microscopy. Springer, New York, 2012. ISBN 978-1-4614-2190-0
- F. J. Blanco-Silva, *Curvelet elements for low frequency analysis.* (submitted)
- P. Binev, F. J. Blanco-Silva, D. Blom, W. Dahmen, R. Sharpley and T. Vogt, *Super-resolution image reconstruction by nonlocal means applied to high-angle annular darkfield scanning transmission electron microscopy.* (submitted—preprint available)
  imi.cas.sc.edu/IMI/resources/technical-reports/2009/reports/0906.pdf
- F. J. Blanco-Silva, *A Generalized Curvelet Transform. Approximation Properties.* (submitted—preprint available)
  imi.cas.sc.edu/IMI/resources/technical-reports/2008/reports/0806.pdf

- Presented work in several Meetings and Research Institutes:
  - *Mathematical Imaging.* University of South Carolina. Columbia (South Carolina, USA) May 2013
  - *The Role of Approximation Theory in the Van Gogh Project.* SIAM Student Seminar. University of South Carolina. Columbia (South Carolina, USA) December 2012.
  - *Equivalence of smoothness spaces by means of frames of discrete shearlets on the cone and curvelets. Applications to Art Authentication.* Augusta State University. Augusta (Georgia, USA) November 2011.
  - *Super-resolution reconstruction in HAADF STEM.* SEMS Anual Meeting. Charleston (South Carolina, USA) May 2010.
  - *Super-resolution reconstruction in HAADF STEM.* Institut für Geometrie und Praktische Mathematik. RWTH Aachen University. (Aachen, Germany) July 2009.
  - *Equivalence of smoothness spaces by means of frames of discrete shearlets on the cone and curvelets.* 33$^{\mathrm{rd}}$ SIAM Southeastern-Atlantic Section Conference. University of South Carolina, Columbia (South Carolina, USA) April 2009.
  - *Super-resolution Reconstruction in Electron Microscopy.* IMI and Nanocenter International Seminar Series 2009—Imaging in Electron Microscopy. University of South Carolina, Columbia (South Carolina, USA) April 2009.
  - *Smart Multi-scale Nano-Imaging.* SC08 International Conference for High Performance Computing, Networking, Storage and Analysis. Austing Convention Center, Austin (Texas, USA) November 2008.
  - *The Hunt for a Bellman Function.* Analysis Seminar. University of South Carolina, Columbia (South Carolina, USA) September 2008.
  - *Edge Detection using the Hidden Markov Tree Model for the Complex Wavelet Transform.* IMI Seminar. IMI, University of South Carolina, Columbia (South Carolina, USA) May 2008.
  - *Analysis of point, line and corner singularities with the Dual-Tree Complex Wavelet Transform.* IMI Seminar. IMI, University of South Carolina, Columbia (South Carolina, USA) April 2008.
  - *Mathematical Imaging.* Computational Nano Meeting. Nanotechnology Center, University of South Carolina, Columbia (South Carolina, USA) Feb-March 2008.
  - *Hilbert Transform Pairs of Wavelets.* Classical Analysis and Approximation Theory Seminar. Department of Mathematics, University of South Carolina. Columbia (South Carolina, USA) October 2007.
  - *The Dual-Tree Complex Wavelet Transform.* IMI Seminar. Department of Mathematics, University of South Carolina. Columbia (South Carolina, USA) September 2007.

- Assisted in the preparation of several grant proposals based on the research projects above

- Assistant editor for the IMI and Nanocenter International Seminar Series 2009—Imaging in Electron Microscopy

- Teaching up to four courses per semester in Mathematics: several levels of Calculus and Mathematical Imaging

- Co-organization of Workshop "Getting to Know the Courses" with Professor A. Schep for the Graduate Student Organization Program during the Fall 2008 semester

Graduate Student and Teaching Assistant   August 1999 – July 2007
Department of Mathematics, Purdue University.

- Wrote triangulation code for PDE solvers in `scheme`
- Colaborated with Forestry Engineer C. Rizcalla and Mathematician S. Gruver to produce a scientific paper on epidemiology, studying the impact of ebola on different populations. Also wrote the codes that performed the numerical simulations for this model in `C/C++`, and run them in a 4-processor `UNIX` machine
    - F. J. Blanco-Silva, S. Gruver, C. Rizcalla, *Modeling the impact of Ebola and bushmeat hunting on western lowland gorillas.* EcoHealth (June 2007).
    - *Modeling the impact of Ebola and bushmeat hunting on western lowland gorillas.* The Society of Sigma Xi Graduate Student Research Poster Competition, Purdue University, West Lafayette (Indiana, USA) 2006.
- Assisted with code development in `scheme` to build a computer system to perform "Homework on the Web." (`www.math.purdue.edu/about/purview/summer2005.pdf`)
- Developed a series of scripts in `OCaml` to compute and manipulate wavelet coefficients of 1-D and 2-D signals. With them, one is able to perform high-level image processing like denoising and edge detection
- Developed a series of scripts in `python` to solve a problem in kinetics of networks of enzymatic reactions. The scripts allow input of a single enzyme, and retrieval of all possible networks in which the enzyme is present (from the online databases at `www.enzyme-database.org`) One is also able to input the initial concentration of substrates present in the chemical reactions, and the codes will compute the concentration of all components at any given time. The computations were usually performed by two multiprocessing systems: a 4-processor `UNIX` machine property of the Department of Mathematics of Purdue University, and for a brief period of time, an `IBM` supercomputer property of the University of Kentucky
- Presented work in the following Meetings and Research Institutes:
    - *Function Spaces via Curvelet Decompositions.* IMI Seminar. Department of Mathematics, University of South Carolina, Columbia (South Carolina, USA) May 2007.
    - *An Alternative Construction of Curvelets. Applications to Characterization of Regularity.* Simpòsio Sobre Problemas Inversos Honrando Alberto Calderón. IMPA, Rio de Janeiro (Brazil) January 2007.
    - *Curvelets and Approximation Theory.* Seminar. Institute of Mathematics and its Applications (IMA), University of Minnesota, Minneapolis (Minnesota, USA) 2006.
    - *Wavelets vs. Curvelets—Mathematical Models for Natural Images.* Workshop of Natural Images (together with Bradley J. Lucier). IMA, University of Minnesota, Minneapolis (Minnesota, USA) 2006.
    - *Applications of the Curvelet Transform to Imaging.* The Society of Sigma Xi Graduate Student Research Poster Competition, Purdue University, West Lafayette (Indiana, USA) 2006.
- Lecturer and recitation instructor for undergraduate and graduate level courses in Algebra, Trigonometry, Calculus, Geometry, Differential Equations and Measure Theory
- Assisted in the edition of the book "Lecture Notes in Analysis" by Profesor Rodrigo Bañuelos (`www.math.purdue.edu/~banuelos/site/Analysis%20Notes`)
- Graduate Representative (December 2001–January 2003)
- Teaching Assistant Peer Mentor (April 2003–July 2005)

Additional Relevant Experience

Universidad Complutense de Madrid   1998
Developed a simple system for Mechanical Geometry Theorem Proving in `Maple`, `CoCoA` and `sage`. The system allows a computer to prove the validity of conjectures in plane Euclidean Geometry, thus potentially offering proofs to Theorems. Wrote a research article on the subject:

F. J. Blanco-Silva, *Sobre demostración automática de un problema geométrico.* Bol. Asoc. Prof. Puig Adams (October 1999) 78–81.