Maxime Bombrun

PostDoc in Computerized Image Analysis

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Experience

Projects

2015–2017 **PostDoc**, *Centre for Image Analysis and SciLifeLab, Uppsala Universitet*, Uppsala, Sweden.

Supervisors: Prof. Carolina Wählby (Centre for Image Analysis and SciLifeLab)
Large-Scale Data Analysis for Digital Image Analysis Applications
Project Synopsis:

- I developed an open-source tool which combine the analysis of gene expression with quantification of cell and tissue morphology.
- I was in charge of a web platform for visualisation of large slide scanner images at different resolutions.

In this project, I developed the foundation of a five-year tool for automated quantification of cell and tissue morphology in digital images. The difficulties lied in the management and processing of more than 20 images of more than two giga-pixels in size. This framework aims to support clinicians' diagnosis and to complement visual assessment when investigating disease and/or drug response.

- As a side project, I developed an image processing algorithm for nucleus and lipid droplet segmentation and feature extraction in high-content/high-throughput microscopy screening.

2012–2015 **PhD Student**, *Université Blaise Pascal*, Clermont-Ferrand, France.

Supervisors: Prof. Andrew Harris (Laboratoire Magmas et Volcans (LMV)) and
Prof. Vincent Barra (Laboratoire Informatique, Modélisation et Optimisation des Systèmes (LIMOS))
Characterisation of Volcanic Emissions through Thermal Vision.
Projects Synopsis:

- I developed an algorithm to segment and track high-speed particles recorded on thermal videos.
- I designed a novel method to segment and parameterise volcanic plumes on thermal videos.
- I developed an algorithm to detect multiple change points in 2D radiometer data.
- I worked on a new process to detect hot spots in satellite imagery.

In this thesis, I concentrate on the different components of strombolian eruptions at the full range of remote sensing spatial scales. These range from millimeters (for individual particles in single thermal camera pixels) to kilometers (for the entire features imaged with the satellite field of view). Overall, I aim to provide a better understanding of plume dynamics through thermal vision.

2012 **Intern**, *Lawrence Berkeley National Laboratory (LBNL)*, Berkeley, USA, 6-month internship.

Supervisors: Dr. Sylvain Costes (LBNL), Dr. Davil Hill (LIMOS)
Java applications development for Detection and Tracking of DNA repair centers
The aim of this project was to improve the understanding of the nucleid organisation and the spatial distribution of the DNA repair center. Due to the large amount of data involved, I translated the existing codes in Java. Then, I developed an algorithm to segment, track and register nucleid through time.

2011 **Intern**, *Laboratoire des Sciences de l'Habitat (LASH)*, Lyon, France, 6-month internship.

Supervisor: Dr. Dominique Dumortier (LASH)
iPhone application development for lighting design
I developed an iPhone application to model luminance maps in interior spaces: iPhotoLux. I carried out several experiments to calibrate the camera of the iPhone4. Then, I updated an application which provides daily brightness data of a position to optimise photovoltaic panels unfolding.

Teaching

2015–2017 **Teaching Fellow**, *Uppsala Universitet/Karolinska Institutet*, Uppsala/Stockholm, Sweden.
Teaching Master and PhD students: Bioimaging and Cell Analysis, Image Analysis & Processing, CellProfiler (lectures and tutorials) *34h/year*

2013–2015 **Teaching Assistant**, *Université Blaise Pascal*, Clermont-Ferrand, France.
Teaching Master students in engineering school: Data structure (lectures and tutorials) *56h/year*

Education & Diplomas

2012–2015 **Doctorate**, *LMV/LIMOS*, *Université Blaise Pascal*.
Characterisation of Volcanic Emissions through Thermal Vision

2011–2012 **Master's degree**, *Université Blaise Pascal*, *Master's Degree in Image Processing*.

2009–2012 **Diplôme d'ingénieur**, *Institut Supérieur d'Informatique, de Modélisation et de leurs Applications (ISIMA)*, *Equivalent to a Master's Degree in Engineering, specializing in Computation and Scientific Modelling (Applied Mathematics)*.

Languages

French Native speaker

English Fluent, working language — *Experience: 6-month internship in California, 2-year postdoc in Uppsala, collaboration with English speaking colleagues*

Swedish Competent — *Experience: 2-year postdoc in Uppsala, Sweden*

German Basic

Japanese Basic

Key Skills

Imaging Science: Bio- and Geo-Image Analysis, Infrared Imaging, Segmentation & Tracking, High-Throughput/High-Content, Giga-pixel images

IT: C/C++/CImg, Python/OpenCV, Java/ImageJ, Matlab, Objective-C, JavaScript, PHP, Parallel Computing, Unix/Windows/Mac

Modelling: Partial differential equations, Solids and fluids mechanics, CATIA, UML

Industry-specific: Linear programming, Optimization, Operations Research, Graph theory

Other: Office suite, LaTeX

References

Image Processing

- Prof. Vincent Barra
- Dr. Sylvain Costes
- Prof. Andrew Harris
- Prof. Carolina Wählby

Journal Reviewer

Geology: Geochemistry, Geophysics, Geosystems Journal of Geophysical Research

Biology: Medical Image Analysis

Journal Articles

Maxime Bombrun, Hui Gao, Petter Ranefall, Niklas Mejhert, Peter Arner, and Carolina Wählby. Quantitative high-content/high-throughput microscopy analysis of subject-specific adipogenesis models. *Cytometry Part A*, 2017 **In Review**.

Maxime Bombrun, Petter Ranefall, Joakim Lindblad, Amin Allalou, Gabriel Partel, Leslie Solorzano, Xiaoyan Qian, Mats Nilsson, and Carolina Wählby. Decoding gene expression in 2D and 3D. In *Image Analysis*. Springer, 2017 **In Review**.

Damien Gaudin, Jacopo Taddeucci, Piergiorgio Scarlato, Andrew Harris, **Maxime Bombrun**, Elisabetta Del Bello, and Tullio Ricci. Characteristics of puffing activity revealed by ground-based, thermal infrared imaging: the example of stromboli volcano (Italy). *Bulletin of Volcanology*, 79(3):24, 2017.

Maxime Bombrun, Letizia Spampinato, Andrew Harris, Vincent Barra, and Tommaso Caltabiano. On the transition from strombolian to fountaining activity: A thermal energy-based driver. *Bulletin of Volcanology*, 78(2):1–13, 2016.

Walter Georgescu, Alma Osseiran, Maria Rojec, Yueyong Liu, **Maxime Bombrun**, Jonathan Tang, and Sylvain V Costes. Characterizing the dna damage response by cell tracking algorithms and cell features classification using high-content time-lapse analysis. *PloS one*, 10(6), 2015.

Maxime Bombrun, Vincent Barra, and Andrew Harris. Analysis of thermal video for coarse to fine particle tracking in volcanic explosion plumes. In *Image Analysis*, pages 366–376. Springer, 2015.

Maxime Bombrun, Andrew Harris, Lucia Gurioli, Jean Battaglia, and Vincent Barra. Anatomy of a strombolian eruption: Inferences from particle data recorded with thermal video. *Journal of Geophysical Research: Solid Earth*, 120(4):2367–2387, 2015.

Talfan Barnie, **Maxime Bombrun**, Michael R. Burton, Andrew Harris, and Georgina Sawyer. Quantification of gas and solid emissions during strombolian explosions using simultaneous sulphur dioxide and infrared camera observations. *J. Volcanol. Geotherm. Res.*, 2014.

Maxime Bombrun, Vincent Barra, and Andrew Harris. Algorithm for particle detection and parameterization in high-frame-rate thermal video. *J. Appl. Remote Sens.*, 8(1):083549, 2014.

A. J. L. Harris, S. Valade, G. M. Sawyer, F. Donnadieu, J. Battaglia, L. Gurioli, K. Kelfoun, P. Labazuy, T. Stachowicz, **M. Bombrun**, V. Barra, D. Delle Donne, and G. Lacanna. Modern multispectral sensors help track explosive eruptions. *Eos*, 94(37):321–322, 2013.

Conference Proceedings

Maxime Bombrun, Hui Gao, Petter Ranefall, Niklas Mejhert, Peter Arner, and Carolina Wählby. A new hybrid algorithm for quantitative high-content/high-throughput microscopy analysis of adipogenesis models. In *NEUBIAS2020 Symposium*, Lisbon, Portugal, February 2017.

Maxime Bombrun, Petter Ranefall, and Carolina Wählby. A web application to analyse and visualize digital images at multiple resolutions. In *3rd Digital Pathology Congress*, London, UK, December 2016.

Maxime Bombrun, Petter Ranefall, and Carolina Wählby. Tissuemaps: A large multi-scale data analysis platform for digital image application built on open-source software. In *4th Nordic Symposium on Digital Pathology*, Linköping, Sweden, November 2016.

Maxime Bombrun and Anne E. Carpenter. Scientific tutorial: Configuring accurate cell detection in images using cellprofiler. In *31st Congress of the Internation Society for Advancement of Cytometry*, Seattle, USA, June 2016.

Maxime Bombrun, David Jessop, Andrew Harris, and Vincent Barra. Plume tracking algorithm: Parameterisation of volcanic plume dynamics. In *IUGG General Assembly*, Prague, CZK, July 2015.

Maxime Bombrun, Vincent Barra, and Andrew Harris. Analysis of thermal video for coarse to fine particle tracking in volcanic explosion plumes. In *19th Scandinavian Conference on Image Analysis*, Copenhagen, Denmark, June 2015.

D. Gaudin, J. Taddeucci, A. Harris, T. Orr, **M. Bombrun**, and P. Scarlato. When puffing meets strombolian explosions: a tale of precursors and coda. In *2014 Fall Meeting, AGU*, San Francisco, Calif., December 2014.

P. Scarlato, J. Taddeucci, E. Del Bello, Gaudin D., T. Ricci, D. Andronico, L. Lodato, F. Cannata, T. Orr, J. Sesterhenn, R. Plescher, Y. Baumgarter, A. Harris, **M. Bombrun**, T. Barnie, B. Houghton, U. Kueppers, and A. Capponi. The 2014 Broadband Acquisition and Imaging Operation (BAcIO) at Stromboli volcano (Italy). In *2014 Fall Meeting, AGU*, San Francisco, Calif., December 2014.

M. Bombrun, A.J.L. Harris, V. Barra, L. Gurioli, and J. Battaglia. Anatomy of a strombolian plume: inferences from particle data. In *AGU Fall Meeting Abstracts*, volume 1, page 07, 2014.

M. Bombrun, V. Barra, and A. Harris. Particle detection and velocity prediction for volcanic eruptions: a preliminary study. In *IAVCEI*, Kagoshima city, Japan, July 2013.

S. Valade, A. Harris, Sawyer G., F. Donnadieu, P. Labazuy, K. Kelfoun, **M. Bombrun**, V. Barra, C. Hervier, M. Ripepe, D. Delle Donne, G. Lacanna, L. Chevalier, and T. Stachowicz. Full bandwidth remote sensing for total parameterization of volcanic plumes. In *IAVCEI*, Kagoshima city, Japan, July 2013.