Dr. Nicolas Jaccard

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Email: nicolas.jaccard@gmail.com
Swiss and French nationalities, born in 1983

Passionate researcher developing novel machine vision and learning methods to tackle challenges in biomedical imaging, bioprocess monitoring, and transport security.

Current position (since 2014)
Research Associate in the department of Computer Science in UCL working with Dr. Lewis Griffin:

- Automated detection of threats in X-ray cargo images (Deep Learning)
- Segmentation of cells on phase contrast microscopy images (collaboration with Prof. Nicolas Szita)
- Estimation of cell counts based on phase contrast microscopy images (collaboration with Prof. Nicolas Szita)

EDUCATION

2010-2014 **PhD in Biomedical Image-Processing**
University College London (London, UK)
Supervision: Prof. Nicolas Szita and Dr. Farlan Veraitch
Examination: Dr. Ivo Sbalzirini and Prof. Michael Hoare

Title: “Development of an image processing method for automated, non-invasive and scale-independent monitoring of adherent cell cultures”

Highlights of the project included:

- Development of novel microscopy image segmentation algorithms, including one based on machine-learning techniques (ensemble of decision trees)
- Bundling of the most promising algorithms with a graphical user interface and release as an open-source framework (https://github.com/nicjac/phantast-matlab)
- Experimental validation with various cell lines, microscopes, and cameras

2009-2010 **MRes in Modelling Biological Complexity**
University College London (UK)

- Distinction

2006-2009 **BSc in Life Science (Biotechnology Major)**
University of Applied Sciences Western Switzerland (Sion, Switzerland)

- Final grade 5.5 out of 6 (Swiss grades)
- Best overall grades (across all engineering sections)
- Best biotechnology diploma thesis (performed abroad at University College London)

2004-2005 **Computer Science studies**
Swiss Federal Institute of Technology (Lausanne, Switzerland)

2003 **Maturité Fédérale (A-level equivalent)**
Ecole Moser (Geneva, Switzerland)

- Type C (Advanced Mathematics, Physics, Chemistry and Biology)

RELEVANT EXPERIENCES

2015-2016 **Teaching**: supervision of final year UCL Computer Science project group

2015-2016 **Research supervision**: UCL MRes CoMPLEX project “Non invasive quantification of cell density in adherent cell cultures”

2014 **Research supervision**: UCL MRes CoMPLEX project “High Content Imaging Analysis of Mitochondrial Structure and Function”

2013 **Conference organisation**: CoMPLEX annual student conference in Cumberland lodge

2013 **Research supervision**: BSc project from HES-SO (Switzerland) “Quantitative analysis of endoplasmic reticulum stress induced apoptosis“

2011-2013 **Teaching**: Head demonstrator of biotransformation (enzyme kinetics) practicals in the department of Biochemical Engineering (University College London, London, UK)

2005-2006 **Research internship:** optimization of protocols for monoclonal antibody production by recombinant mammalian cell lines, including the development of a new imaging-based analytical method (EPFL, Lausanne, Switzerland)

KEY RESEARCH SKILLS

Computational

- Software development: MATLAB, Java, C++, Python, Mathematica, R, LabVIEW
- Machine vision: segmentation, object tracking, classification
- Machine learning: Random Forest, Support Vector Machine, Convolutional Neural Networks

Experimental

- Mammalian cell culture (CHO, BHK, Neuroblastoma, mouse and human embryonic stem cells) and analytical techniques (PCR, ELISA, HPLC, FACS)
- Microscopy (bright field, phase contrast, fluorescence, confocal)
- Recombinant vector design, transfection, establishment of stable recombinant cell lines
- Pluripotent stem cell (human and mouse) expansion and differentiation
- Microfabrication: CAD, micro-milling, moulding and casting of soft polymers

JOURNAL PUBLICATIONS

Detection of concealed cars in complex cargo X-ray imagery using deep learning
Jaccard N., Rogers TW, Morton EJ, Griffin LD; Submitted to Pattern Recognition (pre-print: arXiv:1606.08078)

Real-time monitoring of specific oxygen uptake rates of embryonic stem cells in a microfluidic cell culture device
Super A. & Jaccard N. (co-authors), Marques MPC, Macown RJ, Griffin LD, Veraitch FS, Szita N; J. Biotechnol. (2016) – Accepted

Segmentation of phase contrast microscopy images based on multi-scale local Basic Image Features histograms
Jaccard N, Szita N, Griffin LD; Comput. Method. Biomec:I&V. (2015)

Automated and online characterization of adherent cell culture growth in a microfabricated bioreactor
Jaccard N, Macown RJ, Super A, Griffin LD, Veraitch FS, Szita N; J. Lab. Autom. (2014)

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Automated method for the rapid and precise estimation of adherent cell culture characteristics from phase contrast microscopy images
Jaccard N, Griffin LD, Keser A, Macown RJ, Super A, Veraitch FS, & Szita N; Biotechnol Bioeng. (2014)
This article was featured in the journal's spotlight

Microfabricated Modular Scale-Down Device for Regenerative Medicine Process Development
Reichen M, Macown RJ, Jaccard N, Super A, Ruban L, Griffin LD, Veraitch FS, Szita N; PLoS One (2012)

Microfluidic approaches for systems and synthetic biology
Szita N, Polizzi K, Jaccard N, Baganz F; Curr Opin Biotechnol. (2010)

Calcium phosphate transfection generates mammalian recombinant cell lines with higher specific productivity than polyfection
Chenuet S, Martinet D, Besuchet-Schmutz N, Wicht M, Jaccard N, Bon AC, Derouazi M, Hacker DL, Beckmann JS, Wurm FM.; Biotechnol Bioeng. (2008)

New disposable tubes for rapid and precise biomass assessment for suspension cultures of mammalian cells
Stettler M, Jaccard N, Hacker D, De Jesus M, Wurm FM, Jordan M; Biotechnol Bioeng. (2006)

CONFERENCES

2016 **10th International Crime Science Conference, London, K**
Invited oral presentation: "Securing borders using X-ray imaging and Deep Learning"

SPIE Defense + Security 2016, Baltimore, USA
Oral presentation: "Tackling the x-ray cargo inspection challenge using machine Learning"

2015 **Defence and Security Doctoral Symposium, Defence Academy, UK**
Oral presentation: "Using deep learning on X-ray images to detect threats"
Won best paper/presentation award

2014 **11th IEEE International Conference on Advanced Video and Signal-based Surveillance, Seoul, South Korea**
Oral presentation: "Automated Detection of Cars in Transmission X-ray Images of Freight Containers"

Medical Image Understanding and Analysis 2014, London
Oral presentation: "Trainable segmentation of phase contrast microscopy images based on local Basic Image Features histograms"
Won best paper award

2013 **ESACT 2013, Lille, France**
Poster presentation: "A method for adherent cell culture monitoring based on phase contrast microscopy image processing"

Inter-disciplinary inter-DTC conference (id2), London, UK
Oral presentation: "Learning to detect cells in noisy phase contrast microscopy images"

2013 **2nd European Congress of Applied Biotechnology, The Hague, Netherlands**
Oral presentation: "High performance method for non-invasive adherent cell culture monitoring based on phase contrast image processing"

Computational Cell Biology 2013, Cold Spring Harbor, New York, USA
Oral presentation: "Detection of unlabeled pluripotent stem cells in phase contrast microscopy images using random forest classification of local image features histograms".

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2012 **COMPLEX Student Conference, Cumberland Lodge, UK**
Oral presentation: “Breaking the analytical bottleneck: A high-content screening platform for regenerative medicine bioprocessing”

2011 **Microscopic Image Analysis with Application in Biology (MIAAB) 2011, Heidelberg, Germany**
Poster presentation: ”Non-invasive imaging-based monitoring for characterisation and optimisation of stem cell cultures in a microfluidic bioreactor”

2011 **COMPLEX Student Conference, Cumberland Lodge, UK**
Poster presentation: “Breaking the analytical bottleneck: A high-content screening platform for regenerative medicine bioprocessing”