

## Dr. Nicolas Jaccard

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Email: [nicolas.jaccard@gmail.com](mailto:nicolas.jaccard@gmail.com)

Swiss and French nationalities, born 27<sup>th</sup> July 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

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### 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

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- 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

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### 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

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### 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. Biomech: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)

### 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**

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### **2016 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 11<sup>th</sup> 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 2<sup>nd</sup> 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".

### **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**

2011 Poster presentation: "Non-invasive imaging-based monitoring for characterisation and optimisation of stem cell cultures in a microfluidic bioreactor"

**COMPLEX Student Conference, Cumberland Lodge, UK**

Poster presentation: "Breaking the analytical bottleneck: A high-content screening platform for regenerative medicine bioprocessing"