



# Roberto Annunziata

## Curriculum Vitae

*"Getting infinitely rich in terms of money is just a matter of wearing the right glasses (made by J. Fourier)"*

### Education

26/08/2013 - **EU Marie Sklodowska-Curie Doctoral Fellowship (ITN)**  
till 08/2016 **Medical Image Analysis - REVAMMAD project.**

Host Institution School of Science and Engineering (Computing), University of Dundee, Dundee, UK.

Advisor Emanuele Trucco, Prof. of Computer Vision and Head of the Computing Dept.

Main clinical partners Prof. Dr Pedram Hamrah (Harvard Medical School, Boston, USA [till 07/2015]; now Director, Anterior Segment Imaging, Boston Image Reading Center, Tufts Medical Center, Boston, USA), Dr Ahmad Kheirkhah (Harvard Medical School, Boston, USA), Prof. Dr Axel Pries (Dean of the Charitè - University of Medicine, Berlin, DE), Dr Bettina Reglin (Charitè - University of Medicine, Berlin, DE).

2010 - 2012 **Master of Science in Electronics and Communications Engineering.**

Institution Department of Information Engineering and Mathematical Science, University of Siena, Siena, IT.

Final score 110/110 *summa cum Laude* (approx. "with Honors").

Average score 30/30 (8/11 exams passed "cum Laude")

Thesis *A novel unsupervised approach for automatic retinal blood vessel segmentation by using exudates estimation, eigenvalue analysis and regularization.*

2007 - 2010 **Bachelor's degree in Communications Engineering.**

Institution Department of Information Engineering and Mathematical Science, University of Siena, Siena, IT.

Final score 110/110 *summa cum Laude* (approx. "with Honors").

Average score 29.92/30 (18/27 exams passed "cum Laude")

*School of Science and Engineering (Computing)*

*University of Dundee, UK*

☎ +447908951100 • ✉ r.annunziata@dundee.ac.uk

📄 staff.computing.dundee.ac.uk/rannunziata/

Thesis *Complex entities recognition: SIFT and SURF in real-time applications.*

## Training Events and Summer Schools

- July 2014 **Medical Imaging Summer School (MISS2014), Favignana (IT).**  
Endorsed by MICCAI society.  
Organised by Prof. R. Cipolla (Univ. of Cambridge, UK), Prof. Julia Schnabel (Univ. of Oxford), Prof. G. M. Farinella & F. Stanco (Univ. of Catania, IT).  
Poster “*A Novel Unsupervised Method for Corneal Fibres Tortuosity Classification Using a Multi-Scale-Multi-Window Approach*”.
- Sept 2015 **Fourth EU ITN “REVAMMAD” training event, Padova (IT).**  
Topics Advanced modelling of eye vascular system, statistics, optics, practical aspects, EU funding.  
Presentation Current progress delivered to the REVAMMAD project fellows.
- Dec 2014 **Third EU ITN “REVAMMAD” training event, Berlin (DE).**  
Topics Mid-term review meeting; training focussed on: research skills, clinical factors for screening, eye diseases, writing and presenting research results, biological experiments.  
Presentation Current progress delivered to EU representatives for the project review.
- Jun 2014 **Second EU ITN “REVAMMAD” training event, Crete (GR).**  
Topics Machine Learning, Advanced vascular image processing, micro vascular modelling, lesion detection, Active Contours, ESR symposium, Media training.  
Presentations (1) Current progress delivered to the REVAMMAD project fellows; (2) *Vascular adaptive responses: tortuosity*.
- Dec, 2013 **First EU ITN “REVAMMAD” training event, Lincoln (UK).**  
Topics Clinical background on the “Eye”, vascular modelling, image processing, research skills, brainstorming.  
Presentation Background and current progress.

## Internships and Visits

- Sept-Dec 2015 **Visiting Researcher.**  
Institution Charité - University of Medicine, Berlin, DE.  
Hosts Prof. Dr A. Pries, Dr B. Reglin and their research group (world-leading experts of microcirculation, among others).  
Topics Experimental investigation of haemodynamic factors contributing/generating vascular abnormalities using Machine Learning.

School of Science and Engineering (Computing)  
University of Dundee, UK  
☎ +447908951100 • ✉ r.annunziata@dundee.ac.uk  
📄 staff.computing.dundee.ac.uk/rannunziata/

Jun-Aug 2015 **Visiting Researcher.**

Institutions MEEI, Harvard Medical School & Tufts Medical Center, Boston, USA.

Hosts Prof. Dr P. Hamrah , Dr Ahmad Kheirkhah and their research group (world-leading experts in corneal immunology, neuro-immunology and inflammation, among others).

Topics Segmentation of corneal nerve fibres in *in vivo* confocal microscopy images. Multi-dimensional, supervised tortuosity estimation.

Apr, 2015 **Internship.**

Institution OPTOS plc/NIKON, Edinburgh, UK.

Hosts Dr J. van Hemert, Dr A. Fleming and the image processing group.

Topics Abnormal regions segmentation in retinal images captured with UWSLO (Ultra Widefield Scanning Laser Ophthalmoscope).

---

## Work Experience

26/08/2013 - **EU Marie Sklodowska-Curie Early Stage Researcher**  
till 08/2016 **Medical Image Analysis - REVAMMAD project.**

Host School of Science and Engineering (Computing), University of Dundee, Dundee,  
Institution UK.

Short description REVAMMAD (REtinal VAScular Modelling, Measurement And Diagnosis) is a multi-partner EU project involving several universities and companies worldwide, run by 13 Early Stage Researchers and their advisors. My role is to contribute with novel image processing and computer vision techniques to improve eye healthcare. Specifically, I developed a fully automated framework for automated curvilinear structure (e.g. corneal nerve fibres, blood vessels, neurites) segmentation and tortuosity estimation with the aim of providing ophthalmologists with a quantitative and objective eye image analysis tool.

9/1/2013- **Research Assistant**  
31/07/2013 **Medical Image Analysis.**

Institution Department of Information Engineering and Mathematical Science, University of Siena, Siena, IT.

Short description Research and development of novel image processing techniques for automated retinal blood vessel segmentation started with my Master's thesis. Furthermore, a user interface has been developed to dynamically interact with fundus images.

---

## Teaching Activities

Jan-Feb 2016 **Instructor - Lab Tutor.**

Institution School of Science and Engineering (Computing), University of Dundee, UK.

Course Programming Languages for Data Engineering.

Short description 5 lectures and related laboratory activities aimed at providing basics of data analysis using MATLAB.

*School of Science and Engineering (Computing)*

*University of Dundee, UK*

☎ +447908951100 • ✉ r.annunziata@dundee.ac.uk

📧 staff.computing.dundee.ac.uk/rannunziata/

Jan-Feb 2015 **Instructor - Lab Tutor.**

Institution School of Science and Engineering (Computing), University of Dundee, UK.

Course Programming Languages for Data Engineering.

Short description 5 lectures and related laboratory activities aimed at providing basics of data analysis using MATLAB.

2013/2014 **Thesis co-supervisor.**

Institution School of Science and Engineering (Computing), University of Dundee, UK.

Project A. Lisowska, *An Experimental Assessment of Five Indices of Retinal Vessel Tortuosity with the RET-TORT Public Dataset* (EMBS paper).

---

## Collaborative Activities

2014 **Brain Tumor Digital Pathology Segmentation Challenge - 2nd place, MICCAI 2014**, Member of the team (7 people).

2013-2016 **CVIP/VAMPIRE Journal Club**,  
As member of the VAMPIRE and CVIP groups I actively contribute to in-depth discussions about scientific papers in the Computer Vision and Medical Image Analysis fields (with approx. 15 people).

2013-2016 **REVAMMAD Journal Club**,  
As member of the REVAMMAD project I actively contribute to in-depth discussions about scientific papers in the Medical Image Analysis field (with 13 people).

---

## Awards

Oct 2015 **MICCAI Student Travel Award**,  
*The MICCAI Student Travel Awards scheme rewards the best (i.e. highest scoring) first author students and subsidises their attendance to present their work at the annual MICCAI conference.*

May 2015 **Best Paper Award for Outstanding Doctoral Student**,  
*PhD symposium, School of Computing, University of Dundee, Dundee, UK.*

June 2014 **REVAMMAD Machine Learning Challenge**,  
*Classification of image patches into lesion/non-lesion,*  
Second REVAMMAD training event held in Hersonissos, Crete, Greece.

Aug 2013 - **Marie Skłodowska-Curie Doctoral fellowship**,  
Aug 2016 *Three years Marie Curie Fellowship in the Seventh framework of Marie Curie Actions as Early Stage Researcher (ESR) for the REVAMMAD EU funded project, VAMPIRE and CVIP groups, School of Computing, University of Dundee, UK.*

Jan - June **Studentship**,  
2013 *Research Assistant on medical image analysis,*  
Image Processing Lab, University of Siena, Siena, IT.

School of Science and Engineering (Computing)  
University of Dundee, UK

☎ +447908951100 • ✉ r.annunziata@dundee.ac.uk

📄 [staff.computing.dundee.ac.uk/rannunziata/](http://staff.computing.dundee.ac.uk/rannunziata/)

- 28/06/2013 **Certificate of Excellence**,  
*Best graduate in Electronics and Communications Engineering*,  
 University of Siena, Siena, IT.
- 2007-2012 **Studentship**,  
*Diritto allo Studio Universitario (DSU) studentship (fees + stipend) for pursuing  
 the Bachelor's degree and Master of Science*,  
 University of Siena, Siena, IT.
- Nov 2006 **Certificate of Excellence and money prize**,  
*Best student award*,  
 Industrial Technical School (high school) "A. Pacinotti", Scafati, Italy.
- Nov 2006 **National Contest in Electronics and Communications**,  
*Participation (4<sup>th</sup> place)*,  
 Mestre, Italy.

## Computer skills

- Basic JAVA, LINUX, HTML
- Intermediate C/C++, VISUAL C++, OPENCV library
- Advanced MATLAB, L<sup>A</sup>T<sub>E</sub>X

## Software development

- VAMPIRE **Large MATLAB sw application for semi-automated retinal image analysis**,  
 My contributions include: curvilinear structure segmentation module (SCIRD),  
 tortuosity estimation module (multi-scale-multi-window curvature estimation),  
 VAMPIRE group, Dundee, UK.

## Selected Scientific Publications (Full list, see my webpage)

### Journals

- May 2016 **R. Annunziata** and E. Trucco, "**Accelerating Convolutional Sparse Coding for Curvilinear Structures Segmentation by Refining SCIRD-TS Filter Banks**",  
*IEEE Transactions on Medical Imaging*.
- Apr 2016 **R. Annunziata**, A. Kheirkhah, S. Aggarwal, P. Hamrah, E. Trucco, "**A Fully Automated Tortuosity Quantification System with Application to Corneal Nerve Fibres in Confocal Microscopy Images**",  
*Medical Image Analysis*.
- Dec 2015 **R. Annunziata**, A. Kheirkhah, S. Aggarwal, B. M. Cavalcanti, P. Hamrah, E. Trucco, "**Two-Dimensional Plane for Multi-Scale Quantification of Corneal Subbasal Nerve Tortuosity**",  
*Investigative Ophthalmology & Visual Science*.

School of Science and Engineering (Computing)  
 University of Dundee, UK

☎ +447908951100 • ✉ r.annunziata@dundee.ac.uk  
 🏠 staff.computing.dundee.ac.uk/rannunziata/

May 2015 **R. Annunziata**, A. Garzelli, L. Ballerini, A. Mecocci, E. Trucco, “**Leveraging Multiscale Hessian-based Enhancement with a Novel Exudate Inpainting Technique for Retinal Vessel Segmentation**”, *IEEE Journal of Biomedical and Health Informatics*.

#### Conferences

May 2015 **R. Annunziata**, A. Kheirkhah, P. Hamrah, E. Trucco, “**Scale and Curvature Invariant Ridge Detector for Tortuous and Fragmented Structures**”, *Proceedings of Medical Image Computing and Computer Assisted Interventions (MICCAI) 2015, Munich, Germany*.

May 2015 **R. Annunziata**, A. Kheirkhah, P. Hamrah, E. Trucco, “**Boosting Hand-Crafted Features for Curvilinear Structure Segmentation by Learning Context Filters**”, *Proceedings of Medical Image Computing and Computer Assisted Interventions (MICCAI) 2015, Munich, Germany*.

Jun 2015 **R. Annunziata**, A. Kheirkhah, P. Hamrah, E. Trucco, “**Combining Efficient Hand-Crafted Features with Learned Filters for Fast and Accurate Corneal Nerve Fibre Centreline Detection**”, *Proceedings of IEEE Engineering in Medicine and Biology Society (EMBS) 2015, Milan, Italy*.

Sept 2014 **R. Annunziata**, S. Aggarwal, A. Kheirkhah, B. M. Cavalcanti, P. Hamrah, E. Trucco, “**Tortuosity Classification of Corneal Nerves Images Using a Multiple-Scale-Multiple-Window Approach**”, *Proc. of the Ophthalmic Medical Image Analysis (OMIA) Workshop, MICCAI 2014, Boston, USA*.

Aug 2014 A. Lisowska, **R. Annunziata**, E. Trucco, D. Karl, G.K. Loh, “**An Experimental Assessment of Five Indices of Retinal Vessel Tortuosity with the RET-TORT Public Dataset**”, *Proceedings of IEEE Engineering in Medicine and Biology Society (EMBS) 2015, Chicago, USA*.

---

#### Languages

Italian **Mother tongue**

English **Fluent - IELTS - C1 level - 7.0/9.0**

---

#### Interests

- Reading
- Soccer
- Philosophy
- Economics
- Chess
- and everything unknown to me

School of Science and Engineering (Computing)

University of Dundee, UK

☎ +447908951100 • ✉ r.annunziata@dundee.ac.uk

🏠 staff.computing.dundee.ac.uk/rannunziata/