Anurag Arnab

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Summary

I am a soon-to-graduate PhD student in Computer Vision and Machine Learning. I enjoy solving challenging problems and envisage putting my artificial intelligence and software engineering skills to use in a manner that is beneficial to society.

Education

2015–present **DPhil in Information Engineering (Computer Vision)**, *University of Oxford*, UK.
Research currently focuses on Deep Learning and integrating Probabilistic Graphical Models into deep architectures. I have published at leading venues about this line of work and its applications to semantic and instance segmentation respectively. Recently, I have also been exploring the robustness of neural networks to adversarial examples for these tasks.
Thesis defence date: July 2019
Supervisor: Professor Philip Torr

2011–2014 **BSc (Eng) Electrical and Computer Engineering**, *University of Cape Town*, South Africa.
Graduated as the top student in the entire Engineering faculty comprising of approximately 500 students. Undergraduate thesis on Biometric Vein Recognition advised by Dr. Andrew van der Byl.

Selected Publications

Anurag Arnab*, Carl Doersch, Andrew Zisserman. Exploiting Temporal Context for 3D Human Pose Estimation in the Wild. *Computer Vision and Pattern Recognition (CVPR)*, 2019

Qizhu Li*, **Anurag Arnab***, Philip H.S Torr. Weakly- and Semi-Supervised Panoptic Segmentation. *European Conference on Computer Vision (ECCV)*, 2018

Anurag Arnab, Ondrej Miksik, Philip H.S Torr. On the Robustness of Semantic Segmentation Models to Adversarial Attacks. *CVPR*, 2018

Anurag Arnab, Shuai Zheng, Sadeep Jayasumana, Bernardino Romera-Paredes, Måns Larsson, Alexander Kirillov, Bogdan Savchynskyy, Carsten Rother, Fredrik Kahl, Philip Torr. Conditional Random Fields meet Deep Neural Networks for Semantic Segmentation. *IEEE Signal Processing Magazine*, 2018

Anurag Arnab, Philip H.S Torr. Pixelwise Instance Segmentation with a Dynamically Instantiated Network. *CVPR*, 2017

Qizhu Li*, **Anurag Arnab***, Philip H.S Torr. Holistic, Instance-level, Human Parsing. *British Machine Vision Conference (BMVC)*, 2017

Anurag Arnab, Sadeep Jayasumana, Shuai Zheng, Philip H.S Torr. Higher Order Conditional Random Fields in Deep Neural Networks. *ECCV*, 2016

Anurag Arnab, Philip H.S Torr. Bottom-up Instance Segmentation using Deep Higher Order CRFs. *BMVC*, 2016

Anurag Arnab, Michael Sapienza, Stuart Golodetz, Julien Valentin, Ondrej Miksik, Shahram Izadi, Philip H.S. Torr. Joint Object-Material Category Segmentation from Audio-Visual Cues. *BMVC*, 2015

Stuart Golodetz, Michael Sapienza, Julien Valentin, Vibhav Vineet, Ming-Ming Cheng, Victor Adrian Prisacariu, Olaf Kaehler, Carl Yuheng Ren, **Anurag Arnab**, Stephen Hicks, David W. Murray, Shahram Izadi, Philip H.S. Torr. SemanticPaint: Interactive Segmentation and Learning of 3D Worlds. *ACM SIGGRAPH Emerging Technologies*, 2015

Relevant Experience

Research

June - Oct. 2018   **Research Scientist Intern**, *DeepMind*, London, United Kingdom.
Worked with Andrew Zisserman. A paper about the project was subsequently published in CVPR.

June - Sep. 2017   **Software Engineering Intern**, *Google Research*, Zürich, Switzerland.
Worked on large-scale image retrieval. The neural network I developed surpassed the previous system by a large margin and was subsequently put into production as part of Google Lens.

Jan. - July 2015   **Visiting Intern**, *Torr Vision Group*, University of Oxford, United Kingdom.
Visiting intern at Prof. Philip Torr's research group where I am now a graduate student. My project on incorporating audio information into semantic segmentation was published at the BMVC conference. Furthermore, I was involved in the "Semantic Paint" interactive 3D reconstruction and segmentation project which was demonstrated at SIGGRAPH.

July - Nov. 2014   **Undergraduate thesis - Biometric Vein Recognition**, *University of Cape Town*, South Africa.
Developed algorithms to identify individuals according to the patterns of the veins in their fingers. A conference paper about this method was accepted but had to be withdrawn as I could not attend.

Industry

June - July 2013   **Software Engineering Intern**, *ACI Worldwide*, South Africa.
Developed a system which identified dependencies between products in the code base by analysing the source code. This system could also integrate with other data sources used by the company for further analytics.

July, Dec. 2012   **Cluster Computing Competition**, *Centre for High Performance Computing*, South Africa.
Leader of a group tasked with designing and benchmarking a computing cluster built on a budget of R200 000 ($24 000 / £15 000). The team's cluster was adjudged to have the best design.

Teaching

Nov. 2017 - May 2018   **Lab Demonstrator**, *University of Oxford*, United Kingdom.
Assisted during laboratory sessions for a third-year signal processing course and a second-year C++ programming course.

2013 - 2016   **Developer**, *Hyperion Development*, South Africa.
Member of a student-run organisation which provided charitable teaching and training in computer programming. Primary role was developing the content of a free online course teaching Python, and also tutoring this course. Over 10 000 South African students took this course, and it was funded by grants from Facebook, Google and the Python Software Foundation among others.

Feb. 2012 - May 2014   **Tutor**, *University of Cape Town*, South Africa.
Tutored second- and third-year signal processing courses, and first- and second-year computer science courses. Duties included marking class tests and assignments, and assisting in laboratory sessions.

Awards and Honours

- **Clarendon Scholarship**, 2015-2018. Awarded to only two graduate students applying to the Department of Engineering Science at Oxford on the basis of academic merit.
- **Travel Grants** Awarded travel grants to the following conferences and summer schools:
  - CVPR Doctoral Consortium, June 2018. Salt Lake City, USA
  - Machine Learning Summer School, May 2016. Càdiz, Spain
  - Integrating Vision and Language Summer School, March 2016. Malta
- **Engineering Council of South Africa Medal of Merit**, 2014. Awarded to the best student graduating with the degree of BSc (Eng).
- **ESKOM Award**, 2014. Awarded to the best Engineering graduate at the University of Cape Town over the 4-year degree curriculum, out of approximately 500 students.
- **City of Cape Town Corporation Silver Medal**, 2013. Best engineering student across third year, out of approximately 500 students.
- **City of Cape Town Corporation Bronze Medal**, 2012. Best engineering student across second year, out of approximately 500 students.

- **Electrical and Computer Engineering Class Medal**. Best student in degree programme in each year of study from 2011 through 2014.
- **Top 3 in IBM Master the Mainframe Contest**, 2013. One of the top three entrants from South Africa in the final round.
- **BSG Prize**, 2012. Best second-year Computer Science student.
- **Class Medals** Awarded for achieving the highest marks in an individual course. Obtained seven medals in the following undergraduate courses:
  - Linear Algebra and Differential Equations *class size of about 500 students*
  - Operating Systems and C++ *class size of about 60*
  - Introductions to Concurrency, Computer Architecture and Human-Computer Interaction *class size of about 150*
  - Object Oriented Programming *class size of about 300*
  - Digital Systems *class size of about 30*
  - Electrical Engineering I *class size of about 160*
  - Africa: Culture, Identity and Globalisation *class size of about 160*

Invited Talks

Aug. 2017	**Computer Vision and Geometry Group**, *ETH Zürich*, Switzerland.
	Presented my work on semantic- and instance segmentation (CVPR 2017, BMVC 2017, ECCV 2016).
Oct. 2016	**ECCV Tutorial: Deep Learning Meets Model Optimization and Statistical Inference** , *Amsterdam*, Netherlands.
	Presented my ECCV and BMVC 2016 papers about incorporating mean-field inference of CRFs into neural networks for semantic- and instance segmentation respectively.
Feb. 2016	**Vision and Learning Seminar**, *Online*, Nankai University, China.
	Presented my BMVC 2015 paper which incorporated audio information into semantic segmentation, as part of a larger presentation of our research group's work.
Nov. 2015	**Centre for Vision, Speech and Signal Processing**, *University of Surrey*, United Kingdom.
	Invited to give a seminar about my BMVC 2015 paper about audiovisual semantic segmentation.

Programming Competencies

Fluent in	Python
Competent in	C++, C, CUDA, Java, MATLAB, Lua, C#, PHP, SQL, HTML, Javascript, CSS, Assembly (ARM and Motorola HCS08), VHDL, Verilog
Libraries Used	Tensorflow, Caffe, Torch, Thrust, OpenCV, Boost, NumPy, scikit-learn, Qt, Django, Flask, Android, .NET, VLFeat, OpenGL, Bootstrap
Github	https://github.com/hmph

Societies and Service

2017 - present	**Reviewing**.
	Reviewer for CVPR, ICCV, NeurIPS, ICML, T-PAMI, T-NNLS, IJCV and CVIU.
2011 - present	**Badminton Club**, Universities of Cape Town and Oxford.
	Regular member of badminton clubs at universities of Cape Town and Oxford.
2012 - 2014	**Writer**, *Varsity Newspaper*, University of Cape Town.
	Writer for the "Opinions" and "Sports" sections of the student-run university newspaper.
2011 - 2014	**Green Campus Initiative**, University of Cape Town.
	Promoted carpooling at the university by creating and maintaining a lift-matching website.

Languages

English	Fluent	*Lived in South Africa since childhood. Awarded English subject prize in secondary school.*
Bengali	Proficient	*Native speaker*
Afrikaans	Proficient	*Studied for 10 years in school*