

## Suman Saha

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### Contact Information:

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### RESEARCH INTERESTS

*Computer Vision, Machine Learning and Deep Learning*

### RESEARCH EXPERIENCE

#### Disney Research Zurich

(April - July 2017)

*Research Intern*

Project title: *Unsupervised and semi-supervised learning of audience facial expressions using deep generative models*. Improved the classification accuracy by 9% over the existing method.

#### University of Bedfordshire

(June, 2013 - September, 2013)

*Research Intern*

Project title: *New Foundational Structures for Engineering Verified multi-UAVs*  
Collaborator: Department of Computer Science, University of Oxford

### DEEP LEARNING SKILLS

- **Deep CNN architectures:** AlexNet and VGG-16 (image and video classification); Faster-RCNN and SSD object detectors (for images); AMTnet and ACT human action detectors (for videos).
- **Deep generative models:** VAEs (Variational Autoencoders), GANs (Generative adversarial networks), semi-supervised deep generative models.
- **Deep learning software tools:** Torch, Caffe, Theano.
- **GPU application:** multi-GPU training / testing in Torch.

### EDUCATION

**PhD** in Computing and Mathematics

(September 2014 - Present)

**Artificial Intelligence and Vision research group**, Oxford Brookes University

Thesis direction: *Spatiotemporal human action localisation in videos*

Supervisors: Professor Fabio Cuzzolin, Professor Nigel Crook, Dr Tjeerd Olde Scheper

**MSc** in Computer Science

(September, 2012 - March, 2014)

**University of Bedfordshire**, United Kingdom

Grade: **double distinction** (Scored 94.27% marks)

Thesis: *A Monocular Vision Approach for Obstacle Detection and Collision Avoidance for Low-cost Quadcopters*.

Supervisors: Ashutosh Natraj, Sonia Waharte

Related Publication link, Project page link, MSc thesis poster

**Polytechnic Diploma Engineering** in Computer Science

(August, 1999 - June, 2002)

Siddaganga Polytechnic College, Tumkur, Karnataka, India

## PUBLICATIONS

- **Suman Saha**, Gurmurt Singh, Fabio Cuzzolin. 2017.  
*AMTnet: Action-Micro-Tube regression by end-to-end trainable deep architecture*, arXiv preprint arXiv:1704.04952. Accepted in **ICCV** (International Conference on Computer Vision, Venice), Italy, October, 2017.
- Gurmurt Singh, **Suman Saha**, Michael Sapienza, Philip H. S. Torr, Fabio Cuzzolin. 2017.  
*Online Real time Multiple Spatiotemporal Action Localisation and Prediction on a Single Platform*, arXiv preprint arXiv:1611.08563. Accepted in **ICCV** (International Conference on Computer Vision, Venice), Italy, October, 2017.
- **Suman Saha**, Gurmurt Singh, Michael Sapienza, Philip H. S. Torr, Fabio Cuzzolin. 2017.  
*Spatio-temporal human action localisation and instance segmentation in temporally untrimmed videos*, arXiv preprint arXiv:1707.07213 (2017).
- Fabio Cuzzolin, Michael Sapienza, Patrick Esser, **Suman Saha**, Miss Marloes Franssen, Johnny Collett, Helen Dawes. 2017.  
*Metric learning for Parkinsonian identification from IMU gait measurements*, Journal Gait & Posture 54 (2017): 127-132.
- **Suman Saha**, Gurmurt Singh, Michael Sapienza, Philip H. S. Torr, Fabio Cuzzolin. 2016.  
*Deep Learning for Detecting Multiple Space-Time Action Tubes in Videos*, In Proceedings of the 27-th British Machine Vision Conference (BMVC), York, United Kingdom. Our proposed method **achieved the state-of-the-art results to date** in spatiotemporal human action localisation in videos.  
Project page link, YouTube video link.
- **Suman Saha**, Ashutosh Natraj and Sonia Waharte. 2014.  
*A real-time monocular vision-based frontal obstacle detection and avoidance for low cost UAVs in GPS denied environment*, 2014 IEEE International Conference on Aerospace Electronics and Remote Sensing Technology, Yogyakarta, pp. 189-195. Project page link, Paper link.
- **Suman Saha**. 2014.  
*A Monocular Vision Approach for Obstacle Detection and Collision Avoidance for Low-cost Quadcopters*, MSc thesis, University of Bedfordshire, UK.
- **Suman Saha**. 2014.  
*Face Recognition using PCA and Multilayer Feedforward Neural Networks*, European Journal of Applied Sciences and Technology.
- **Suman Saha**. 2014.  
*Parallelization of Genetic Algorithms using MapReduce*, European Journal of Applied Social Sciences Research.

**PROFESSIONAL EXPERIENCE** Tata Steel Limited, Jamshedpur, India (November, 2006 - August, 2012)  
**Software Analyst** at the Research and Development Division (R&D)

Link to reference letter-1

Link to reference letter-2

Major works include:

- Designed and developed a software to increase the thermal efficiency and reduce the fuel consumption of WRM (wire rod mill) reheating furnace.
- Designed and developed software to predict mill force, mean flow stress, strain, percentage elongation, yield strength using *ANN* (artificial neural networks).
- Maintained a software which predicts the mechanical properties of the hot rolled strip using a series of physical and microstructural based models, coupled with various techniques including *ANN* (artificial neural networks).
- Applied different Machine learning algorithms such as SVM (Support Vector Machine), PCA (Principal Component Analysis) for production data analysis.

SICT Pvt. Ltd. India  
**Software Developer**

(July, 2002 - October, 2006)

## TEACHING EXPERIENCE

### Oxford Brookes University, United Kingdom

- Delivered an introductory lecture on *Advance Computer Vision* to MSc students, 6th July 2015.
- Helped two MSc Computer Vision students with their final projects (2015-2016 batch).
- Teach undergraduate students *IT Skills* module (September 2016-2017 batch).

### Tata Steel Limited, Jamshedpur, India

- Guided 3 Bachelor in Computer Science summer interns at R&D division (2010).

## TECHNICAL REPORT, TALK

- Delivered a talk on spatio-temporal human action localisation at the Departmental Research Seminar, Oxford Brookes University, February 2016.
- *A survey report on Deep Learning Approach for Human Action Detection from Video* submitted to CCT Dept. Oxford Brookes University, September, 2015.
- *Performance analysis on temporal tubes: A benchmarking report* submitted to CCT Dept. Oxford Brookes University, 2014.
- *Streaming hierarchical graph based video segmentation*, a talk presented at research group seminar, Oxford Brookes University, November, 2014.
- *Streaming hierarchical graph based video segmentation: A step-by-step guide* submitted to CCT Dept. Oxford Brookes University, 2014.

## AWARDS AND ACHIEVEMENTS

- Our group won the reading group competition at *ICVSS 2015 Summer School* - 2015
- Received the prestigious University Research Studentship award, Oxford Brookes University - 2014
- Successfully passed ICVSS 2015 examination, July 2015.
- Nominated for the prestigious Overseas PhD Scholarship award Scheme, Aberystwyth University, United Kingdom (*declined*) - 2014
- *Best Overall Performance award* for MSc course, 3rd April, 2014
- *Best Masters Project award* on 3rd April, 2014
- *Merit Scholarship award* at Masters level, 2014
- Secured highest marks in Computers Science in standard X(96%) and XII(grade: A).
- Secured top rank in school in standard 'X' final board examinations.

## COURSES UNDERTAKEN

- CS231n: Convolutional Neural Networks for Visual Recognition, Stanford Vision Lab (mode - online).
- Machine Learning course, department of Computer Science, University of Oxford (mode - online).
- Attended International Computer Vision Summer School 2015, Sicily, Italy.
- Attended doctorate training programme for statistical methods of data analysis, Oxford Brookes University, 2015.
- Attended training session on the use of Oxford Brookes high performance computing facilities, 2015.

- Attended talk on *Visualizing and Understanding Recurrent Neural Networks* by *Andrej Karpathy*, Stanford Computer Science group, at Engineering and Science Department, Oxford University.
- Attended two reading groups in the Department of Engineering Science at University of Oxford, topic discussed Generative Adversarial Nets (GANs), Variational Autoencoders (VAEs), June, 2016.
- *MSc taught courses*: Intelligent Agents, Programming Embedded Systems, Distributed and Parallel Computing, Systems Architecture, Data Modelling and Management, Network Systems, Cryptography and Cryptanalysis, Professional Project Management.
- *Self-motivated learnings (MSc)*: Multiple View Geometry in Computer Vision, Probability Theory and its Applications, Linear Algebra, Single and Multi-Variable Calculus.
- *Polytechnic Diploma Engineering*: Applied Mathematics, Applied Science, Digital Electronics and Introduction to Microprocessor, Electrical and Electronic Engineering, Computer Network and Architecture, System Programming, Software Engineering, Operating System, Advanced C programming and Data Structures.

## SERVICES AND PARTICIPATION

- Presented a poster on *Deep Learning for Detecting Multiple Space-Time Action Tubes in Videos* in the *MURI Meeting* at St. Catherines College, Oxford, UK, 1st August, 2016.
- Presented a poster on *Online Human Action Localisation based on Appearance and Motion Cues* at *(ICVSS) 2015*, Sicily, Italy, July 2015.
- Actively participated in the TeenTech event at London, 1st December 2015.
- Attended the Ambassadors visit at Gipsy Lane campus, Oxford Brookes University, UK, 30th September, 2015.
- Actively participated in the BBC News live broadcast at BBC broadcasting hub, London, 14th September, 2015. Watch: [video1](#) , [video2](#).
- Taking humanoid robot Artie to Magna Carta event on 18th June 2015.
- Actively participated in the Outburst Festival with humanoid robot Artie and the Naos, 9th May, 2015.
- Actively participated in the Joint University Alliance and Deloitte research showcase, Royal Institution, 21 Albemarle Street, London, W1S 4BS, UK, 12 March, 2015.
- Attended the Real World Impact filming event organised by University Alliance on 31st January, 2015 at Gipsy lane campus, Oxford Brookes University, UK, 31st January, 2015.

## COMPUTING SKILLS

- **Programming Languages**: C/C++, Matlab, Lua, Python, Java.
- **Scientific computing software tool**: Torch, Caffe, Theano, OpenCV.
- **GPU application**: multi-GPU training/testing in Torch.
- **Operating Systems**: Linux and Windows.
- **Development Environments**: PyCharm, Lua Development Tool, GCC, NetBeans.
- **Productivity Applications**: LaTeX, Bitbucekt, Github, Vim, Kate, MS Office, Libreoffice.
- **Multi-media development software**: Inkscape, Openshot, Audacity, GIMP.

## REFERENCES

### Academic references

1. Professor Fabio Cuzzolin
  - Relationship: Director of studies and PhD Supervisor.
  - Organization: Oxford Brookes University
  - Position: Professor of Artificial Intelligence
  - Website URL: <http://cms.brookes.ac.uk/staff/FabioCuzzolin/>
  - E-mail: [fabio.cuzzolin@brookes.ac.uk](mailto:fabio.cuzzolin@brookes.ac.uk)
2. Professor Nigel Crook
  - Relationship: PhD co-supervisor
  - Organization: Oxford Brookes University
  - Position: Head of the Computing and Communication Technology Department
  - Website URL: <https://www.brookes.ac.uk/profiles/staff/nigel-crook/>
  - E-mail: [ncrook@brookes.ac.uk](mailto:ncrook@brookes.ac.uk)
3. Dr Tjeerd Olde Scheper
  - Relationship: PhD co-supervisor and research tutor
  - Organization: Oxford Brookes University
  - Position: Senior Lecturer at Computing and Communication Technology Department
  - Website URL: <http://cct.brookes.ac.uk/staff/tjeerdoldescheper.html>
  - E-mail: [tvolde-scheper@brookes.ac.uk](mailto:tvolde-scheper@brookes.ac.uk)
4. Dr Michael Sapienza
  - Relationship: PhD advisor
  - Organization: University of Oxford
  - Position: Postdoctoral research fellow
  - Website URL: <https://sites.google.com/site/mikesapi/>
  - E-mail: [michael.sapienza@eng.ox.ac.uk](mailto:michael.sapienza@eng.ox.ac.uk)
5. Dr Ashutosh Natraj
  - Relationship: MSc supervisor
  - Organization: University of Oxford
  - Position: Postdoctoral research fellow
  - Website URL: <https://www.cs.ox.ac.uk/people/ashutosh.natraj/>
  - E-mail: [ashutosh.natraj@gmail.com](mailto:ashutosh.natraj@gmail.com)
6. Dr Sonia Waharte
  - Relationship: MSc co-supervisor
  - Organization: University of Oxford
  - Position: Postdoctoral research fellow
  - Website URL: <https://www.cs.ox.ac.uk/people/sonia.waharte/>
  - E-mail: [sonia.waharte@gmail.com](mailto:sonia.waharte@gmail.com)

### Professional references

1. Dr Romann Weber

- Relationship: Project leader / supervisor
  - Organization: Disney Research Zurich
  - Position: Research Scientist
  - E-mail: romann.weber@disneyresearch.com
  - Link to the reference letter received
2. Dr Rajitha Navarantha
- Relationship: co-supervisor
  - Organization: Disney Research Pittsburgh
  - Position: Associate Research Scientist
  - E-mail: rajitha.navarathna@disneyresearch.com
3. Dr Sumitesh Das
- Relationship: Project leader
  - Organization: Tata Steel Limited, India
  - Position: Chief (Global Research Programmes) at Tata Steel Limited
  - Website URL: Google Scholar link
  - E-mail: sumitesh.das@tatasteel.com
  - Link to the reference letter received
4. Dr Abhishek Raj (M. Tech. and PhD, IIT Mumbai, India)
- Relationship: Project advisor
  - Organization: Tata Steel Limited, India
  - Position: Researcher at R&D division
  - E-mail: abhishek.raj@tatasteel.com
  - Link to the reference letter received
5. Raju Venkat Dasu (M. Tech. IIT Delhi)
- Relationship: Project leader
  - Organization: Tata Steel Limited, India
  - Position: Researcher at R&D division
  - E-mail: dvr019@gmail.com