Suman Saha

Email: suman.saha13814@gmail.com, **Webpage:** https://sahasuman.bitbucket.io/

Contact Information:
The Visual AI Laboratory: room no. E212, E Block, Wheatley Campus
AI and Vision Research Group
Department of Computing and Communication Technologies
School of Engineering, Computing and Mathematics
Oxford Brookes University, OX33 1HX United Kingdom
Mobile: +44 7899265467/7448306073

RESEARCH INTERESTS	*Computer Vision, Deep Learning and Machine Learning*

RESEARCH EXPERIENCE

Oxford Brookes University   (*December 2017 - Present*)
Post doctoral research fellow
Project title: *Action tube formulation using deep convolutional neural networks.* A transition matrix based network has been proposed for spatio-temporal human action localisation in videos. The related work has been submitted to ECCV 2018.

Disney Research Zurich   (*April 2017 - 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:** PyTorch, Torch, Caffe, Theano.
- **GPU application:** multi-GPU training / testing in PyTorch.

EDUCATION

Ph.D. in Computer Science and Mathematics   (*September 2014 - May 2018*)
Artificial Intelligence and Vision research group, Oxford Brookes University
Thesis title: *Spatio-temporal Human Action Detection and Instance Segmentation in Videos.*
Supervisors: Professor Fabio Cuzzolin, Professor Nigel Crook, Dr Tjeerd Olde Scheper.
Thesis assessment committee: Professor Mubarak Shah, Professor Andrea Vedaldi, Dr Faye R Mitchell.

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 Quadrocopters.
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**, Rajitha Navarathna, Leonhard Helminger, Romann M. Weber. 2018.
  Unsupervised Deep Representations for Learning Audience Facial Behaviors, accepted in **CVPR** (Computer Vision and Pattern Recognition) workshop, Salt Lake City United States, June 2018.

- **Suman Saha.** 2018.
  Spatio-temporal Human Action Detection and Instance Segmentation in Videos, PhD thesis, Oxford Brookes University, UK.

- Gurkirt Singh, **Suman Saha**, Fabio Cuzzolin. 2018.
  Transition Matrix Network for High-Performance Spatio-temporal Action Localisation, submitted to **ECCV** (European Conference on Computer Vision), Munich Germany, September 2018.

- Harkirat S. Behl, Michael Sapienza, Gurkirt Singh, **Suman Saha**, Fabio Cuzzolin, Philip H. S. Torr. 2018.
  Incremental Tube Construction for Human Action Detection, arXiv preprint arXiv:1704.01358, 2018.

- **Suman Saha**, Gurkirt Singh, Fabio Cuzzolin. 2017.
  AMTnet: Action-Micro-Tube Regression by End-to-end Trainable Deep Architecture, arXiv preprint arXiv:1704.04952. **ICCV** (International Conference on Computer Vision), Venice Italy, October 2017.

- Gurkirt 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. **ICCV** (International Conference on Computer Vision), Venice Italy, October 2017.

- **Suman Saha**, Gurkirt 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**, Gurkirt 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 Quadrocopters, 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 netowrks).

- 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 netowrks).

- Applied different Machine learning algorithms such as SVM (Support Vector Machine), PCA (Principal Component Analysis) for production data analysis.

SICT Pvt. Ltd. India   (*July 2002 - October 2006*)

Software Developer

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, Net-Beans.
- **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

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

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

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

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

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

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 Limitied, 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 Limitied, 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 Limitied, India
   - Position: Researcher at R&D division
   - E-mail: dvr019@gmail.com