Oindrila Saha

Research Fellow, Microsoft Research
Advisors: Dr. Prateek Jain & Dr. Harsha Vardhan Simhadri

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Google Scholar

Research Interests

Computer Vision, Deep Learning, Resource-Efficient Learning, Medical Imaging, Bio-Inspired Vision

Education

Indian Institute of Technology Kharagpur *2014 - 2019*
B.Tech (E&ECE) + M.Tech (Honours) in Visual Information Processing and Embedded Systems
Minor in Computer Science and Engineering
Cumulative GPA: 8.69/10

Publications

7. **RNNPool: Efficient Non-linear Pooling for RAM Constrained Inference.**
Oindrila Saha, Aditya Kusupati, Harsha Vardhan Simhadri, Manik Varma and Prateek Jain.
Spotlight *(3% acceptance) at Neural Information Processing Systems (**NeurIPS**), 2020.*
*WiCV workshop @ Computer Vision and Pattern Recognition (**CVPR**), 2020.*

6. **RecSal : Deep Recursive Supervision for Visual Saliency Prediction**.
Sandeep Mishra* and **Oindrila Saha***.
*British Machine Vision Conference (**BMVC**), 2020.*

5. **IDRiD: Diabetic Retinopathy–Segmentation and Grading Challenge**.
Prasanna Porwal, [and 56 others, including **Oindrila Saha**]
*Medical Image Analysis (**MedIA**) Journal, 2020 .*

4. **Learning with Multitask Adversaries using Weakly Labelled Data for Semantic Segmentation in Retinal Images**.
Oindrila Saha, Rachana Sathish and Debdoot Sheet.
Long Oral *at Medical Imaging with Deep Learning, (**MIDL**), 2019.*
🏆 **Selected for Special Issue submission in Medical Image Analysis journal**.

3. **Do events change opinions on social media? A case study of the 2016 US Presidential Debates**.
Sopan Khosla, Niyati Chhaya, Shivam Jindal, **Oindrila Saha** and Milind Srivastava.
*International Conference Social Informatics, (**SocInfo**) 2019.*

2. **Fully Convolutional Neural Network for Semantic Segmentation of Anatomical Structure and Pathologies in Colour Fundus Images Associated with Diabetic Retinopathy**.
Oindrila Saha, Rachana Sathish and Debdoot Sheet.
*Diabetic Retinopathy Challenge Workshop @ International Symposium of Biomedical Imaging (**ISBI**), 2018.*
🏆 **2nd in leaderboard and 3rd in on-site challenge workshop**.

1. **Crowdsourcing for Chromosome Segmentation and Deep Classification**.
Monika Sharma*, **Oindrila Saha***, Anand Sriraman, Ramya Hebbalaguppe, Lovekesh Vig and Shirish Karande.
*CVMI Workshop @ Computer Vision and Pattern Recognition, (**CVPR**), 2017.*

* - equal contribution

Software

1. **EdgeML: Machine Learning for resource-constrained edge devices**.
Don Kurian Dennis, Yash Gaurkar, Sridhar Gopinath, Sachin Goyal, Chirag Gupta, Moksh Jain, Ashish Kumar, Aditya Kusupati, Chris Lovett, Shishir Girish Patil, **Oindrila Saha** and Harsha Vardhan Simhadri.
Microsoft Research India, 2017 - present.
Stats as of August 2020: ★ 884, 242, >175,000, >2,700.

Research Experience

Computer Vision for Resource-Constrained Devices *2019 - present*
Research Fellow with Dr. Prateek Jain, Dr. Harsha Simhadri & Dr. Manik Varma, Microsoft Research India

RNNPool : Novel Pooling Operator to Reduce Memory Requirement [NeurIPS'20]

- Developed **RNNPool**, a single instance of which can be used to replace stacks of convolution blocks, reducing number of parameters, computations and **peak RAM** usage (by $6-8\times$) while maintaining accuracy.
- Compared RNNPool with standard pooling operators to show that it results in significant accuracy gain.
- Proved generalisability of RNNPool using empirical evidence in various vision applications and architectures.
- Implemented extremely cheap, accurate & privacy preserving models for face detection, deployed on Cortex-M4.

Learnable Quantization for Training Low Precision Networks

- Improved upon prior art techniques by modifying the quantization strategy for weights and activations updates.
- Currently exploring a multi scale quantized training scheme to improve accuracy through more refined step widths.

Biologically Inspired Saliency Prediction *2018-2019*
Independent Project [BMVC'20]

- Proposed optimising a different loss per output map & a multi-decoder model to exploit all levels of features.
- Designed recursive blocks to provide bio-inspired supervision with temporally/spatially sequenced metadata.
- Outperformed previous SOTA methods with 50-80% fewer parameters, while also performing consistently well across all evaluation metrics unlike prior art methods.

Multiclass Segmentation from Partially Labelled Multisource Datasets *2017 - 2019*
Master Thesis with Dr. Debdoot Sheet, IIT Kharagpur [MIDL'19, MedIA'20]

- Improved upon state-of-the-art vessel segmentation models using an additional adversary network & loss.
- Added a novel discriminator with the purpose of differentiating between each class, to better learn from datasets with disparate annotations, i.e. each dataset containing annotations of only few classes out of all.
- Resulting method achieved better performance scores than even task-specific SOTA models on each class.
- Extended the above approach using domain daptation to use multisource partially labelled datasets tackling the problem of scarcity of complete annotated data for segmentation of multiple retinal anatomies.

What affects Opinions on Social Media? *2018*
Research Intern with Dr. Niyati Chhaya, Adobe Research India [SocInfo'19]

- Developed target specific opinion detection neural network using handcrafted features and word embeddings.
- Improved performance by training word2vec with 0.5B tweets about the US Presidential Elections 2016.
- Analyzed a derived network structure of 11M users in database constructed from retweets, quotes & replies.
- Tracked user-specific opinion and polarity change to analyze dynamics affected by external trigger events.

Towards Automatic Karyotyping of Chromosomes *2017*
Research Intern with Dr. Lovekesh Vig, TCS Research, New Delhi [CVPRW'17]

- Developed an algorithm for automatically distinguishing and straightening curved chromosomes.
- Found relative strengths of features like length, centromere position and banding profile in SVM/XgBoost.
- Trained a CNN classifier using images and appended the features extracted with the handcrafted features for classifying types of chromosomes; the complete method is the first attempt in automatic karyotyping.

3D Pose Estimation in Operating Room Video Sequences *2017*
Research Intern with Dr. Nicolas Padoy, Laboratoire ICube, Strasbourg

- Proposed a technique to obtain 3D human body poses from frames of surgery videos in Operating Rooms.
- Used depth values and camera intrinsic parameters to project 2D poses to 3D in camera coordinate.
- Trained LSTMs account for temporal dependencies of video sequences to regress 3D pose given 2D pose.

Selected Awards and Honors

- Young Researcher at Heidelberg Laureate Forum (**HLF '20**). *2020*
- Awarded **Charpak Research Internship Scholarship** by Embassy of France (to top 20 students over India) to conduct research in a French Laboratory. *2017*
- Awarded **Best Project** among 23 research intern teams by Big-Data Experience Lab, Adobe. *2018*
- Among top 1% (300) students in India in Astronomy and Mathematics National Olympiads. *'10,'13,'14*
- Awarded KVPY Fellowship from Government of India. *2012*
- Awarded NTSE Scholarship from Government of India. *2009*

Responsibilities

- *Teaching Assistantship* - Dept. of Electronics and Electrical Communication Engineering, IIT Kharagpur
  - Digital Signal Processing - *Prof. Gautam Saha* *Autumn 2018*
  - Network Theory Lab - *Prof. Arijit De* *Spring 2019*
- *Captain, Inter IIT Aquatics Women's Team* - IIT Kharagpur *2017 - 2019*
  - 2 gold, 3 silver and 2 bronze medals