Asra Aslam

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PROFILE

A qualified computer engineer (as well as PhD), with 7 years of research experience. Good grasp over cutting-edge Machine Learning, Computer Vision, Deep Neural Networks, and Internet of Multimedia Things; and several impactful publications in top-rated journals and conferences (including **CVPR**, **Journals and Conferences** of IEEE, Elseveir, ACM, and Springer). Before joining Ph.D. at the Insight Centre for Data Analytics, NUI Galway, Ireland, she received her M.Tech./M.S. and B.Tech./B.S. degrees in computer science, where she has completed multiple projects/dissertation in image processing. She completed her PhD in 2021 in Object Detection.

RESEARCH INTERESTS

- Deep Learning
- Object Detection
- Artificial Intelligence
- Weakly Supervised Learning
- Transfer Learning
- Anomaly Detection
- Computer Vision
- Deep Neural Networks
- YOLO, SSD, RetinaNet, Faster R-CNN, CNN
- MobileNet, ResNet, VGG, DarkNet, InceptionNet
- Multimedia Event Processing
- Unsupervised Learning
- Data Analytics
- Internet of Multimedia Things (IoMT)
- Image Processing

EDUCATION

Ph.D. (Computer Science) Insight Centre for Data Analytics, National University of Ireland (NUI), Galway, Ireland — ***April 2016 – April 2021***

M.Tech./M.S. (Computer Sc. & Engg.), Aligarh Muslim University (AMU), Aligarh, India. **CPI 9.67/10** — ***2013 – 2015***

B.Tech./B.S. (Computer Engg.), Aligarh Muslim University (AMU) Aligarh, India. **CPI 9.11/10** — ***2009 – 2013***

INDUSTRY EXPERIENCE

March 2021 - present

Job Title: Machine Learning Research Engineer (@mindtrace.ai)
Summary:
3D Point Cloud (ongoing): Investigating Semi-Supervised Approaches to improve performance of existing point cloud models like SPVCNN using Mean Teacher.
Defect Detection in X-Ray Images: Applying **Few-Shot Segmentation** using **RePRI** model and **Mask R-CNN**
Electricity Components based Problem Detection: Applying **Few-Shot Object Detection** techniques presently **FsDet** model, using **Detectron**
Anomaly Detection in Geodigital Images Project: Utilized **Facebook research** "Self-Supervised Vision Transformers with **DINO**" model, transformers, attention maps, **t-sne**, and **YOLOv5x** for post processing.
CVPR Challenge: Secured 11th rank **in CVPR retailers challenge 2021 as a team,** worked on data cleaning to remove noisy images from AliProducts dataset using **cleanlab**.
Insulator Defect Detection: Utilized "CutPaste" model for classification, template matching, and YOLOv5 for detection pipeline.
Unsupervised Learning: Using **SCAN: Learning to Classify Images without Labels**

Overall Libraries and Platforms: **TensorFlow, Pytorch, Pytorch Lightening, MLFlow, MMdetection, CUDA, cuDNN, OpenCV, cleanlab, Detectron.**
Hardware Used: Nvidia Titan Xp **GPUs** (Distributed Environments)

PUBLICATION STATS

Journal Papers: 05 | Citations: 351
Conference Papers: 07 | ResearchGate Score: 8.38

Google Scholar: https://bit.ly/2JPCUgj
ResearchGate: https://bit.ly/37HPlmm

RESEARCH EXPERIENCE

Title: Detecting Seen/Unseen Concepts Online while Reducing Response Time with/without Bounding Boxes using Domain Adaptive Multimedia Event Processing — ***Ph.D. Work (2016-2021)***

Summary: **Deep neural network-based techniques** are effective for image classification, but the limitation of having to **train classifiers** for **unseen concepts** may increase the overall response-time for multimedia-based event processing models. This work focuses on foundational aspects of the problem of reducing response-time for **online adaptive classifiers**-based multimedia event processing which includes introducing **object detection** operators, standardization of the concept of response-time, identification, and proposed multiple IoMT based deep neural network models while using object detection specifically You Only Look Once (**YOLO**), Single Shot MultiBox Detector (**SSD**), and **RetinaNet**, and applying **transfer learning**. Lastly, I report the best possible performance of current object detection models for the online construction of classifiers. The major challenge in training deep neural network-based models is the need to collect many images with bounding box annotations, which is impossible for millions of unseen concepts. My final specific work is the design of first and fast detector for the training of unseen classes using only image-level labels with no bounding box annotations. **It takes 10 min only to train an object detector**.
Languages: Python, C, Shell Scripting (Linux Platform)
Libraries: **TensforFlow, CUDA, cuDNN, Keras, OpenCV**
Hardware Used: Nvidia Titan Xp **GPU**
Publication Outcomes: **4 Journals, 5 Conference papers (in** CVPR **and Journals)**

Title: Image Segmentation using Fuzzy Multi-Criteria Decision Making
Summary: Image segmentation refers to the separation of objects from the background. Practically it is impossible to design a segmentation algorithm that has 100% accuracy. In this dissertation, two methods of segmentation are proposed: the first one is the Improved Sobel **Edge Detection** algorithm and the second is the Falling Ball algorithm. Our Falling ball algorithm which is a region-based segmentation algorithm, an alternative to **watershed** transform (based on waterfall model) and applies **Fuzzy Logic** for the segmentation. Simulation results show that the proposed algorithms give superior performance over conventional Sobel edge detection methods and watershed segmentation algorithm.
Languages: C, Java, Shell Scripting (Linux Platform)
Publication Outcomes: **2 Journal**

Masters Dissertation Thesis (2013-2015)

Title: Edge Detection using Ant Colony Optimization
Summary: In this work, a **multi-threading**-based implementation of **Ant Colony Optimization (ACO)** is proposed for identifying edges in images. It combines multi-threading with ACO for increasing the randomness among the artificial ants. Simulation results show that the proposed method has significantly lower execution time as compared to conventional ACO for **edge detection**.
Languages: C, Java, Shell Scripting (Linux Platform)
Libraries: POSIX
Publication Outcomes: **1 Conference paper**

Masters Project (2013-2014)

Title: Framework development and implementation of stereoscopic website
Summary: In this work, we worked on 3D images for the development of a **Stereoscopic** Website. We analyzed **MPO** and **anaglyph** 3D image formats. Moreover, we presented a new algorithm for obtaining depth information (for **Depth-Map**) pertaining to a depicted scene from a set of available pair of stereoscopic images.
Languages: C and HTML (Linux and Windows Platform)
Hardware Used: 3D television and stereoscopic glasses
Publication Outcomes: 1 arxiv paper and Book "Towards Stereoscopic Websites"

Undergraduate Major Project (2012-2013)

Simulation of M/G/1 Queue and Text to Speech Converter
Languages: C, Java, Shell Scripting

Undergraduate Mini Projects (2010-2012)

PUBLICATIONS

1. **Asra Aslam.** "Detecting Objects in Less Response Time for Processing Multimedia Events in Smart Cities." Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition CVPR 2022. — ***CVPR 2022*** ***Rank: A****

2. **Asra Aslam** and Edward Curry. "Investigating Response Time and Accuracy in Online Classifier Learning for Multimedia Publish-Subscribe Systems", *Multimedia Tools and Applications, Springer*, 2021 — ***Journal*** Impact Factor: 2.757

3. **Asra Aslam** and Edward Curry. "A Survey on Object Detection for the Internet of Multimedia Things (IoMT) using Deep Learning and Event-based Middleware: Approaches, Challenges, and Future Directions", *Image and Vision Computing, Elsevier*, 2020 — ***Journal*** Impact Factor: 3.012

4. **Asra Aslam** and Edward Curry. "Towards a Generalized Approach for Deep Neural Network Based Event Processing for the Internet of Multimedia Things." *IEEE Access* 6: 25573-25587, 2018 — ***Journal*** Impact Factor: 4.098

5. **A. Aslam**, E. Khan and M.M.S. Beg, "Improved Edge Detection Algorithm for Brain Tumor Segmentation," Elsevier Procedia Computer Science, 58,430 – 437. 2015 — ***Journal*** Impact Factor: 1.26

6. Syed Sahil Abbas Zaidi, Mohammad Samar Ansari, **Asra Aslam**, Nadia Kanwal, Mamoona Asghar, Brian Lee. "A survey of modern deep learning based object detection models", Digital Signal Processing, 2022 — ***Journal*** Impact Factor: 4.24

7. **Asra Aslam** and Edward Curry. "UnseenNet: Fast Training Detector for Any Unseen Concept with No Bounding Boxes" — *ECCV 2022 workshop (in review)*

8. **Asra Aslam** and Edward Curry. "Reducing response time for multimedia event processing using domain adaptation." *Proceedings of the 2020 International Conference on Multimedia Retrieval*, ACM. 2020 — ***Conference*** Rank A2

9. **Asra Aslam**. "Object Detection for Unseen Domains while Reducing Response Time using Knowledge Transfer in Multimedia Event Processing." *Proceedings of the 2020 International Conference on Multimedia Retrieval*, ACM. 2020 — ***Conference*** Rank A2

10. **A. Aslam**, S. Hasan, and E. Curry. "Challenges with Image Event Processing: Poster." *Proceedings of the 11th ACM International Conference on Distributed and Event-based Systems*, ACM. 2017 — ***Conference*** Rank B

11. **A. Aslam**, M.S. Ansari and S. Varshney. "Non-Partitioning Merge-Sort: Performance Enhancement by Elimination of Division in Divide-and-Conquer Algorithm," *Proceedings of the Second International Conference on Information and Communication Technology for Competitive Strategies*, ACM. 2016 — Proceedings Impact Factor 0.62

12. **A. Aslam**, E. Khan and M.M.S. Beg. "Multi-Threading based Implementation of Ant-Colony Optimization Algorithm for Image Edge Detection," *Annual IEEE India Conference (INDICON)*, IEEE. 2015 — ***Journal*** Impact Factor 0.52

TECHNICAL SKILLSET

- **Languages** — Python, C, Java, Linux Shell Scripting, HTML, Assembly Language
- **Frameworks/Libraries** — Keras, Pytorch, TensorFlow, CUDA, cuDNN, OpenCV, POSIX, Scikit-learn
- **Tools** — LaTeX, Esper, Apache ActiveMQ, MATLAB
- **Platforms** — Ubuntu Linux 12.04, 16.04, 20.04; Windows XP, 7, 8, 10
- **Hardware** — Nvidia Titan Xp GPU, NVIDIA Jetson TX2

TEACHING EXPERIENCE

Lecturer (Computer Engineering Department, AMU, India)

- CO 406, Compiler Design Course (1 semester)
- CO315, Computer Graphics Course (1 semester)
- CO191, Computer Programming Lab (2 semesters) ***2015-2016***
- CO395, Colloquium (1 semester)
- CO393, Software Lab (1 semester)

Teaching Assistant (at College of Engineering & Informatics, School of Computer Science, NUI Galway, Ireland)

- CT5135 Research topics in AI ***2019-2020***
- CT5103 Case Studies in Data Analytics ***2017-2020***
- CT5112 Data Analytics Project ***2017-2018***

Teaching Assistant (at Computer Engineering Department, AMU, India)

- CO191, Computer Programming Lab (2 semesters) ***2013-15***
- CO291, Programming Lab (1 semester) ***2013-2014***
- CO292, Data Structure Lab (1 semester) ***2014-2015***

PROFESSIONAL TRAININGS UNDERTAKEN

- Winter School, Big Data 2017 ***University of Bari, Italy***
- Summer School on Deep Learning 2018 ***DCU, Dublin, Ireland***
- C Programming Course ***APTECH, Aligarh, India***
- Java Programming Course ***APTECH, Aligarh, India***

ACHIEVEMENTS

- Award for In-person registration waiver for **CVPR 2022** ***Louisiana, US***
- Travel and Registration award for **ICML 2022** ***Maryland, USA***
- Travel Award from Women in Computer Vision (WICV) for CVPR 2022 ***Louisiana, US***
- **NVIDIA GPU Grant** for Titan Xp GPU by the NVIDIA Corporation 2018 ***NUIG, Ireland***
- AISTATS 2022 Grant, The 25th International Conference on AI and Statistics
- PhD Fellowship by Science Foundation Ireland (2016 to present) ***NUIG, Ireland***
- Graduate Aptitude Test in Engineering (GATE) Score 713 **All India Rank 597 out of 115,425 candidates** (Scholarship from 2013 to 2015) ***India***
- Recipient of the prestigious IDB Scholarship (2009 – 2013) ***Jeddah***
- Sir Syed Scholarship (2009 – 2013) ***AMU, India***
- Secured Third Position in M.Tech. (Computer Engineering) 2015 ***AMU, India***

LEADERSHIP ROLES & EXTRA CURRICULAR ACTIVITIES

- **Mentorship** at ML4H for **NeurIPS** Conference 2022 ***July 2022 to present***
- Industry Talk Speaker at **University of Toronto** and the Vector Institute 2022
- **Area Chair** for Women in Machine Learning event at NeurIPS Conference 2022
- Mentorship at DS4A Correlation One ***June to Aug 2022***
- Leading Breakout Session in Women in Machine Learning @ICML 2022 ***July 2022***
- Presenting Poster @39th International Conference on Machine Learning (ICML 2022)
- Student Representative, Insight Centre for Data Analytics, NUIG ***2017-2018***
- The Insight Hackathon (**2nd Position**), UCD, Dublin, Ireland ***2016***
- **Coordinator**, Workshop on LaTeX, in Electronics Engineering Dept., AMU ***2015***
- **Coordinator** of Technical Events in Zarf'13, ZHCET, AMU ***2013***
- Member of Core Organizing Team in Zarf'13, ZHECT, AMU ***2013***
- **Organizer**, Chess, Zarf'13, ZHCET, AMU ***2013***
- Common Room **In-Charge**, Bibi Fatima Hall, AMU ***2014-15***
- Member of Student's Grievance Cell of Bibi Fatima Hall, AMU ***2014-15***
- Member of Organizing Committee of EDS'2012 IDB, Jeddah ***2012***
- **Winner** of College Chess Championship (in Zarf'11 ZHCET, AMU) ***2011***
- **Winner** of College Chess Championship (in Zarf'10 ZHCET, AMU) ***2010***

- **Winner** of Creating Writing Competition, AMU ***2013***
- **Winner** of Coding Frenzy, Zarf'13, ZHCET, AMU ***2013***

Hobbies

- Playing Chess (Won and Organized multiple competitions),
- Coding in C (Won Coding Competition at college level, participated in Google APAC multiple times (before Ph.D.), Won Hackathon during Ph.D., Also received "Best Programming" award at college fest),
- Writing Poetry (Won Competitions at College and School Levels)

References available upon request

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