Deepak Kumar
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Research Interest

- **Computer Vision**: Cross-View, Multi-View & Multi-Modality Action Recognition and Prediction
- **Machine Learning**: Transfer Learning, Graph Attention, Knowledge Distillation, Adversarial Learning

Education

University of Massachusetts, Dartmouth   Dartmouth, MA
Ph.D. in Engineering and Applied Science   *Aug. 2018 - Aug. 2022*
- Department of Computer and Information Science (Full Scholarship)

University of Massachusetts, Dartmouth   Dartmouth, MA
M.S in Data Science   *Jan. 2016 - Aug. 2018*
- Program of Data Science

Shaheed Zulfikar Ali Bhutto Institute of Science and Technology   Karachi, Pakistan
B.S in Computer Science   *Aug. 2009 - June 2013*
- Department of Computer Science (Full Scholarship)

Experience

MIND Lab, UMass Dartmouth   Dartmouth, MA
Graduate Research Assistant, Ph.D. Supervisor: Dr. Ming Shao   *Sept. 2016 - Present*
- A lightweight SR-BigGAN single image super resolution model is proposed with priors information to improve the efficacy of SR images in terms of PSNR and SSIM for memory restricted devices. **ECCV-2022 Under Review**
- A graph induced adversarial attack is developed to exploit vulnerabilities of unsupervised learning especially ensemble clustering. [1]
- Identifying vulnerable components of multi-modality action recognition models and assessing their robustness to adversarial attacks, as well as proposing a defense mechanism to protect vulnerable models from adversarial attacks. [2,3]
- Addressed the issue of fewer training data on the target image dataset by exploring the different transfer learning methods to improve the classification accuracy of unlabeled target mammograms. [4]
- Feature learning using joint dictionary and transfer learning to improve the cross-view action recognition performance. **(Masters Thesis)**

Philips Research North America   Cambridge, MA
Research and Development Intern, Ultrasound Applications, UII, Mentor: Balasundar Raju   *May 2021 - Aug. 2021*
- A one-step approach was developed for lung ultrasound videos to handle the high memory utilization and slower inference time in two-step approach where two independent network are used to identify and localize the lung conditions.

Philips Research North America   Cambridge, MA
Research and Development Intern, Ultrasound Applications, UII, Mentor: Balasundar Raju   *May 2020 - Aug. 2020*
- A lightweight network was developed by compressing the larger network through Knowledge distillation to implement on embedded devices for the lung consolidation classification on ultrasound images.

Philips Research North America   Cambridge, MA
Research Intern at Ultrasound Imaging and Interventions, Mentor: Balasundar Raju   *May 2019 - Aug. 2019*
- Developed an automated AI based method for ultrasound image quantification

EDUENRICH   Karachi, Pakistan
Data Analyst, Mentor: Tauseef Raza   *Dec. 2013 - Dec. 2015*
- Designed and developed databases to collect data
- Wrote complex SQL queries using complex joins, grouping, aggregation, nested sub-queries, etc
- Performed statistical analysis and developed recommendations using R and Tableau. Worked closely with the project managers and analysts

Teaching Experience

- **Guest Lecturer** — UMass Dartmouth
  Department of Computer and Information Science — *Fall 2019*
  - **CIS 530 - Advanced Data Mining**: Assessed different data mining models and discussed the potential strategies to guide student in their projects

Publications

1. C. Kumar, **D. Kumar** and M. Shao. Generative Adversarial Attack on Ensemble Clustering in Winter Conference on Applications of Computer Vision, January 2022

2. **D. Kumar**, C. Kumar and M. Shao. Collaborative Knowledge Distillation for Incomplete Multi-view Action Prediction in Image and Vision Computing, January 2021

3. **D. Kumar**, C. Kumar, CW. Seah, S. Xia, and M. Shao. Finding Achilles' Heel: Adversarial Attack on Multi-modal Action Recognition. In Proceedings of the 28th ACM International Conference on Multimedia (MM '20), October 12–16, 2020, Seattle, WA, USA

4. **D. Kumar**, C. Kumar and M. Shao. Cross-database Mammographic Image Analysis through Unsupervised Domain Adaptation in 2017 IEEE International Conference on Big Data (IEEE BigData 2017), December 11-14, 2017, Boston, MA, USA

Technical Skills

Programmatical Python (Pytorch, Pandas, Scikit, Numpy, Tensorflow, Keras), Matlab, R, C/C++, Javascript, D3, Tableau, NLTK, SQL, LaTeX
Machine Learning Classification, Regression, Feature Engineering, Transfer Learning, Deep Learning

Talk

- Cross-view Action Recognition via Joint Dictionary Transfer Learning, 2018 New England Computer Vision Workshop, Boston, MA (Nov. 2018)

- Multi-View Action Recognition through Deep Learning, 2018 Three Minute Thesis Competition, Dartmouth, MA (April 2018)

- Cross-database Mammographic Image Analysis through Unsupervised Domain Adaptation, 2017 New England Computer Vision Workshop, Boston, MA (Nov. 2017)

Honors and Awards

- Received UMass Dartmouth Graduate Student Travel Grant to attend 2017 IEEE Big Data Conference

- I have been selected for feature stories of MS in Data Science of UMass Dartmouth

Professional Services

Reviewer: Journal of Electronic Imaging (JEI), IEEE Computational Intelligence Magazine, International Conference on Data Mining (ICDM), Conference on Information and Knowledge Management (CIKM), IEEE Conference on Big Data (IEEE BigData), European Conference on Artificial Intelligence, Conference on Computer Vision and Pattern Recognition (CVPR)
Program Committee: Association for Advancement of Artificial Intelligence (AAAI)