Naren Doraiswamy

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Education

University of Michigan — **Ann Arbor, MI**
MS - Electrical and Computer Engineering — **April 2023**

Relevant courses: Computer Vision, Machine learning, Matrix methods for Machine learning, Optimization in ML, Advanced Computer Vision, ML and DS design lab, Adversarial Machine learning, Science of deep learning.

Visvesvaraya Technological University — **Bangalore, India**
BE - Electronics and Communication Engineering — **June 2016**

Skills

Languages: Python, C, C++, Matlab, Bash, HTML, LaTeX

Frameworks and Tools: Pytorch, TensorFlow, HuggingFace, NumPy, OpenCV, SciPy, Docker, Git, AWS, ONNX

Work Experience

Machine Learning Researcher - Intern — **Pittsburgh, PA**
Bosch Centre for Artificial Intelligence — **May 2022 - Aug 2022**

- Formulated a new algorithm for few-shot object segmentation task using self-attention module that increased accuracy over state-of-the-art (SOTA) by over 2%.
- Increased the accuracy of existing unsupervised segmentation method by 1.5% using multi-scale features.
- Implemented & presented final research findings to cross-functional research teams across Germany and USA.

Junior Researcher — **Bangalore, India**
Indian Institute of Science — **Aug 2018 - Nov 2020**

- Developed one of the first weakly-supervised few-shot object/video segmentation algorithms which achieved 5% improvement over the prior state of the art. **(Published at IJCAI and ICLRW)**
- Designed an active learning based domain adaptation algorithm that improved over the prior state of the art by 2%. **(Published at CVPRW).**
- Devised a low-latency real-time (60 fps) semantic segmentation algorithm specifically for Indian roads conditions. The algorithm was incorporated as part of autonomous mobility solutions by Wipro.

Software Engineer, Statistical Machine Learning — **Bangalore, India**
Robert Bosch, India — **Aug 2016 - Jun 2018**

- Piloted the shift of over 20 physics based models to data based machine learning models in a span of 2 years to establish a new engine management system.
- Initiated and led the development of prediction model for cylinder fill correction factor using calibrated data and improved accuracy by 4% over its predecessor models.
- Achieved over 97% accuracy in performance by building machine learning models for estimating crucial engine parameters like turbocharger lag & common rail pressure.
- Saved $15k per license by developing the above in-house models that overcame the reliance on external tools for simulation testing.
- Selected to present the work on developing the above mentioned ML models at Bosch Technical forum.

Projects

- **Query-Efficient Preference-Based Reinforcement Learning using Active Learning.** [Report]
  Composed a preference based reward function which is query efficient through various active learning methods. Reduced error rate by 96% over random elicitations. Showed Gaussian process can replace neural networks in developing a reward function based on preferences.
- **Evaluation of adversarial robustness for semi-supervised domain adaptation (SSDA) networks.** [Report]
  First method to evaluate the robustness of SSDA models. Proposed an adversarial robust SSDA model suitable for real world deployment of such models. Increased robust accuracy by over 40%.
- **On the role of Neural Collapse in Meta Learning based Few-shot Learning.** [Report]
  Investigated the presence of the neural collapse (NC) phenomenon in meta learning frameworks and showcased the existence of the four NC properties within meta-learning networks.
- **Real-time deployment of scene segmentation model using AWS.**
  Designed and created a web application for deploying scene segmentation models using AWS cloud and ONNX. Hosted the web application on Heroku to infer semantic segmentation results.
- **Approaching semi-supervised domain adaptation from two perspectives** [Report]
  Improved accuracy by over 2.5% by proposing the usage of a combination of mutual information maximization using Jenson Shannon divergence and a modified adversarial loss to develop a new method for SSDA.

Publications

- **Unsupervised Image segmentation with the aid of superpixelation - Under preparation.**
- **Improving semi-supervised domain adaptation using effective target selection and semantics.** [arXiv]
  Naren Doraiswamy*, Anurag Singh*, Sawa Takamuku, Megh Bhalerao, Titir Dutta, Soma Biswas, Aditya Chepuri, Balasubramanian Vengatesan, Naotake Natori - **CVPR L2ID 2021**
- **Weakly supervised few-shot object segmentation using co-attention with visual and semantic embeddings.** [arXiv:2001.09540]
  Mennatullah Siam*, **Naren Doraiswamy***, Boris Oreshkin*, Hengshuai Yao, Martin Jagersand - **IJCAI 2020**
- **One-shot weakly supervised video object segmentation.** [arXiv:1912.08936]
  Mennatullah Siam*, **Naren Doraiswamy*,** Boris Oreshkin*, Hengshuai Yao, Martin Jagersand - **ICLR PML4DC 2020**

Honors and Awards

- Ministry of Human Resource Development (MHRD) Scholarship, Government of India **2012-2016**
- International Science Olympiad finalist **2012**
- Jnanamitra Pratibha Puraskara award for outstanding performance in 10th Board Exams **2010**

Professional Activities

- **Reviewer:** WACV 2021-2023, ACML 2022, CVPRW 2022-2023, TMLR, TMM.
- **Teaching:** Teaching Assistant for **SI 671: Data Mining** & **SI 568: Introduction to Applied Data Science.**
- **Deep Learning Mentor:** Provided 1:1 mentoring & coached 45 students at **Udacity Nanodegree** programs.
- **AI Bootcamp Instructor:** Designed and instructed AI lectures at **AI Saturdays Bangalore Bootcamp**.
- **Bosch CSR:** Taught STEM classes for 60 underprivileged high school students for 6 months.
- **STEM-fellowship Mentor:** Mentored 4 high school students keen to pursue Computer Science college degrees.