Harivallabha R

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EXPERIENCE

Microsoft
July 2021 - Present
Software Engineer
Hyderabad, India

Microsoft 365 Mobile: Intelligence Engineering (Nov 2022 - Present)

• Leveraging generative AI workflows and building Copilots for M365 mobile (Union Copilot, Scan Copilot). Orchestrating retrieval augmented generation (RAG) pipelines.
• Improving image search experiences and more: computer vision on resource-constrained devices [auto-tagging, document classification, image segmentation]

OneDrive and SharePoint (Jul 2021 - Nov 2022)

• Building and Scaling "Fluid", a framework for building distributed, and low-latency real-time collaborative applications.
• Primarily worked on Scaling Fluid APIs (worked on an infrastructure to generate service load simulations by spinning up an AKS cluster that modelled client traffic at scale), and Media Support for Fluid (help the fluid file format understand and interpret video attachments).

UC Berkeley
Dec 2020 - July 2021
Undergraduate Thesis
Berkeley, CA

Bayesian Inference for Sparse Vector Autoregressions

• Bayesian temporal modelling for high-dimensional time series data; Developed a flexible Three-Parameter-Beta-Normal (TPBN) based global-local shrinkage prior for sparse vector autoregressions, improving over current state-of-the-art.
• Paper accepted at NBER-NSF SBIES Conference, 2021.

Microsoft
May 2020 - July 2020
Software Developer Intern
Hyderabad, India

Deep Learning for Computer Vision; Intelligence Engineering

• Designed and implemented a number of image segmentation algorithms for resource-constrained devices.
• Successfully prototyped and validated a key differentiator for Office Lens in the document scanning space.

Cerenaut.ai
Dec 2019 - May 2020
Remote Research Engineer
Melbourne, Australia

Towards General Purpose Machine Learning | Self Organizing Neural Nets

• Implemented causal machine learning models for in-house learning algorithms | Explainable and Interpretable DL models.
• Implemented a bio-inspired self-organizing neural network architecture emulating the functional self-organization between different neocortical regions.
• Paper accepted at AJCAI, 2020; Accepted at Cold Spring Harbor Laboratory (CSHL), From Neuroscience to Artificially Intelligent Systems (NAISys), 2020.

EDUCATION

Birla Institute of Technology and Science, Pilani
Aug 2016 - Aug 2021
Dual Degree
B.E. Computer Science & M.Sc. Mathematics (GPA: 8.93/10)

- Minor in Data Science
- Top 3%, University Merit Scholarship Holder
- Teaching Assistant for course on Real Analysis

INTERNSHIPS

MILA: Montreal-Quebec AI Institute   Jan 2021 - Mar 2021
Remote | Unsupervised Algorithms for Reinforcement Learning

- Unsupervised representation learning to improve the sample efficiency and performance of model-free, pixel-based reinforcement learning algorithms on procedurally generated environments.
- Implemented CTNs (color transformation networks) and STNs (spatial transformer networks), and a cross-domain, cross-task transfer learning framework to achieve improved sample efficiency and generalisation. Designed learnable regressors for color transformations in the hsv space.

King's College London   Sep 2020 - Jan 2021
Remote | Adversarial Machine Learning for Network Intrusion Detection Systems

- Worked with the Systems Security Lab to develop adversarially robust algorithms for network intrusion detection systems (NIDS), with an emphasis on explainability.
- Improved over current state-of-the-art autoencoder based NIDS, by learning robust contrastive representations.

Technische Universität Kaiserslautern   Apr 2019 - Oct 2019
Remote | Investigation of Learning Techniques for Regression Problems

- Developed a novel Tikhonov regularization method to improve the accuracy and stability of sparse Mahalanobis metric learning for gradient-enhanced kernel regression.
- Implemented in C++ as part of the RoDeO (Robust Design Optimization) package maintained at TU - Kaiserslautern. GPU parallelized with CUDA. Automatic Differentiation with the in-house package CoDiPack.

COURSEWORK

- **Computer Science**
  Data Structures and Algorithms | Database Systems | Object-Oriented Programming | Logic in Computer Science | Operating Systems | Computer Architecture | Theory of Computation | Principles of Programming Languages | Computer Networks | Compiler Construction | Design and Analysis of Algorithms | Computational Geometry

- **Data Science**
  Information Retrieval | Foundations of Data Science | Machine Learning | Parallel Computing | Applied Statistical Methods | Optimization

- **Mathematics**
  Partial Differential Equations | Functional Analysis | Numerical Analysis | Graphs and Networks | Differential Geometry | Topology | Operations Research | Real Analysis | Discrete Mathematics | Multivariable Calculus | Operations Research | Ordinary Differential Equations | Cryptography

Tech Stack:
- **Advanced:** C++ | Python | C# | C | Java | CUDA | PyTorch
- **Intermediate:** Theano | Tensorflow | Keras | Julia | SQL
- **Misc:** git | Docker| Flask | Keras | Azure

PROJECTS

GPU Accelerated Kinetic Meshfree Solver for Inviscid Compressible Flows | M.Sc. Mathematics Thesis | Aug - Dec, 2020

- Developed q-LSKUM based meshfree solver for aerodynamic shape optimization, in C++. GPU Parallelized the solver with CUDA.
- The solver employs a least squares based spatial discretization of partial derivatives, for the numerical solution of Euler equations that govern inviscid compressible fluid flows [Deshpande et. al].

Flatness, Feature Robustness and Adversarial Examples | Monash University

- Established theoretical connections between feature robustness and robustness to adversarial examples, and empirically validated the theoretical findings.
- Validated on CIFAR and MNIST.
- Implemented various neural nets for image classification, with PyTorch. Performed extensive experiments with the MNIST and CIFAR-10 datasets. Writing up a workshop draft. Currently working on implementing the Stick-Breaking representation of the Dirichlet Process.

Locality Sensitive Hashing based Plagiarism Detector - Information Retrieval

- Implemented a plagiarism detector based on an approximate nearest neigbhour techinque - LSH.
- Compared and validated the effectiveness of various norms - Manhattan, Euclidean, Jaccard, Cosine and Hamming for Locality Sensitive Hashing.

Latent Dirichlet Allocation - Topic Modeling based Probabilistic Search Engine + Sentiment Analysis based Trend Predictor

- Implemented LDA with a Collapsed Gibbs Sampling inferencer in Python, for a Financial Tweets Corpus. Search results are ranked based on a hybrid "topic score" (Hellinger Distance between the search query and the documents) + "string-matching score".
- Displays a positive or negative trend predicted from a particular tweet based on Sentiment Analysis (using the R SentimentAnalysis package).

AWARDS AND RECOGNITIONS

- Selected for GAH-2020, organized by OpenACC, C-DAC and NVIDIA under the aegis of National Supercomputing Mission (NSM)
- Selected for the Google Summer of Code, 2019
- Selected for the Indian Academy of Sciences Fellowship, 2019
- Selected for Indian National Olympiad in Informatics (INOI) [Twice]
- Selected for the Zonal Group Mathematical Olympiad (GMO)
- Best Student Award for five consecutive years [Grades 8 through 12, at P.S. Senior Secondary School, Chennai]

CHESS

- National Level Chess Player, FIDE Rating: 1604
- Participated in over 60 State Level, 7 National Level and 4 International FIDE Rated Chess Tournaments.

A Bit About Me:

Data Science | High Performance Computing | Machine Learning | Deep Learning | Scientific Computing

Passionate about driving the latest research to a state of realization in the industry. I'm looking for challenging exposure that would enable me to ideate, design, deploy, and maintain reliably robust large-scale learning systems.

Link to Personal Blog: https://harivallabha.github.io/