Chandra Kanth Nagesh

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Research Overview

My research interests are in the intersection of *Theoretical Machine Learning and Dynamical Systems*. I am generally fascinated about building models that can learn complex dynamical systems using machine learning or deep learning techniques. Currently, one of my main goals is to get models to learn physical systems governed by ODEs such as Damped Oscillator, Lotka-Volterra.

Education

University of Colorado, Boulder **2024 – present**

Ph.D., Computer Science

- Advisor: Dr. Sriram Sankaranarayanan
- Focus: Theoretical Machine Learning and Dynamical Systems

University of Colorado, Boulder **2022–2023**

Masters of Science, Computer Science - MSCS Research, CGPA: 4.0/4.0

R.V. College of Engineering, Bengaluru **2014–2018**

Bachelors of Technology, Computer Science - BTech, CGPA: 9.23/10.0; Magna Cum Laude

Teaching

Algorithms (CSCI 3104) **Fall 2022, Spring 2023, Fall 2023**

Instructor - University of Colorado, Boulder

- Instructor for CSCI 3104, Undergraduate Algorithms. Involved in preparing the course structure, assignments, quizzes and final exams. Co-Instructor for a class of 240 students in Fall 2022 along with Dr. Joshua Grochow, 250 in Spring 2023 with Dr. Ryan Layer, and sole instructor for a class of 250 students in Fall 2023.

Algorithms (CSCI 3104) **Spring 2022, Summer 2022**

Teaching Assistant - University of Colorado, Boulder

Publications

[1] **Chandra Kanth Nagesh***, Jarek Reynolds*, and Danna Gurari. Salient object detection for images taken by people with vision impairments. In *Proc. of Winter Conference on Applications of Computer Vision (WACV), Waikoloa, Hawaii*, 2024.

[2] **Chandra Kanth Nagesh** and Abhishek Purushothama. The birds need attention too: Analysing usage of self attention in identifying bird calls in soundscapes, 2022.

[3] Raghav Lakhotia, **Chandra Kanth Nagesh**, and Krishna Madgula. Identifying missing component in the bechdel test using principal component analysis method. In *Proc. of International Conference on Machine Learning and Applications (ICMLA), Copenhagen, Denmark*, 2019, BEST RESEARCH PAPER AWARD.

[4] **Chandra Kanth Nagesh**, Hemanth KN Rao, and Anjan K Koundinya. Secure handshake mechanism for autonomous flying agents using robust cryptosystem. In *Proc. of International Conference on Computational Systems and Information Technology for Sustainable Solution (CSITSS), Bengaluru, India*, 2017.

Work Experience

Stanford Research Institute International (SRI) **Menlo Park, California**

Research Scientist Intern – Computer Science Laboratory *May 2024 – Aug 2024*

- Lead novel efforts in developing an alternative to Physics Informed Neural Networks using Kolmogorov-Arnold Networks (KANs). Analyzed why traditional neural network architectures fail to conform and are unable to explain dynamical systems. Current effort seeks to develop a novel architecture that combines explainability and reproducibility of KANs to learn the dynamics of ODEs. We are able to observe ~95% accuracy for dynamical systems involving 2 state variables and 4 parameters. **(PyTorch)**

Amazon Science (AMZN) **Seattle, Washington**

Applied Scientist Intern – TMT Outbound Marketing *May 2023 – Aug 2023*

- Designed and developed a Deep Learning based Email-Click propensity model for customer segmentation for three major marketplaces in Amazon. Experimented with newer architectures involving Transformers and Graph Neural Networks for development of the

best performing click propensity model. Further performed robust analysis and developed custom metrics for quantifying the model performance on real time customer data.
- The final best performing model yielded a 45% improvement over current production model in terms of overall CTR for the three marketplaces. **(PyTorch, Spark, Optuna, SageMaker, S3, EMR)**

MakeMyTrip.com (MMT) **Bengaluru, Karnataka**
Senior Data Scientist – Data Science & Engineering, Hotels *Mar 2021 – Dec 2021*

- Development of a Reinforcement Learning solution for dynamic discount prediction using Contextual Multi-Armed Bandits (MAB). Model uses DNNs to understand the contexts generated by clickstream and bandit model performs Thompson sampling on learnt representations and discount arm configurations to suggest optimal discount percentage.
- Experiment is live in production and yields 5-10% improvement over the current models and is consistently providing upto $1.5-2k increase in revenue each week with minimal drop in conversion rate. **(Python, PyTorch, Tensorflow)**
- Developed a dynamically scaling version of Apache Airflow on AWS, as well as configuration scripts for AWS Sagemaker Notebook Instances, increasing team productivity. **(AWS EC2, Redshift, Athena, Shared Gateway, S3, Airflow)**

General Electric (GE) Digital **Bengaluru, Karnataka**
Data Scientist – Data Science & Engineering *Aug 2019 – Feb 2021*

- Design and development of a cloud based Deep Learning solution for distant monitoring of engine room staff, to ensure wearing of right safety equipment's (PPE) in critical installations. Deep Neural Network models such as YOLOv5, Faster R-CNN, Mask R-CNN are trained on Nvidia Tesla V100s and finetuned on custom object detection datasets. Model inference (0.015s) driven by on-site surveillance footage fed to the model on AWS. The model hones a test IoU of 0.925 and is in production at a GE Power Plant. **(Tensorflow, PyTorch, Python, Torch, Shell, AWS Kinesis)**
- Development of Deep Learning solution using Faster R-CNN (ResNet18) / Neural Style Transfer and Tesseract OCR for serial number identification to aid lean manufacturing in shop floor. This solution involves image transformations combined with models deployed on edge devices (Google Coral). Experimented and developed model with FAIR's Rosetta Architecture for performing OCR. **(Tensorflow, PyTorch, Python)**
- Development of a solution for the Power MAX Accounts Receivables, whose goal is to forecast the cash flow to improve the Cash Billing and Collection process. Logistic regression, 4-layered DNN and Random Forest models have been experimented and trained on 2M+ dataset, by performing robust feature engineering. Model has a R2 score of 0.924 on 'Blind Test' dataset. **(Scikit Learn, Optuna, Tensorflow, AWS Sagemaker, Python)**

General Electric (GE) Digital **Bengaluru, Karnataka**
Software Engineer (Intern + FTE) – Data Science & Engineering *Jan 2018 – July 2019*

- Principal architect for the design and development of an end-to-end data lineage product that builds dynamic knowledge graphs of GE's datalake objects using graph database. **GE has now licensed this product to Orion Governance**. The core engine of this product parses through source systems in the entire datalake, to create a map of the objects. This product rivals the current Data Lineage products in the market and is estimated to provide a savings of $250k/year to the organization. **(Neo4j, Cypher, Python, VueJs, Elasticsearch, JavaScript, MongoDB, Shell)**
- Architect for development of an efficient, fully automated solution for analyzing datalake logs for identifying and optimizing efficient usage of cloud resources. The software built analyzes >3TB of monthly logs using high-performance computing tech- stacks by achieving a performance improvement of 75%. **(Spark, PySpark, Python, Shell)**

Skills & Abilities

Languages: C, C++, OCaml, Python, SQL
ML: Tensorflow, Scikit-Learn, PyTorch, OpenCV, Keras
Databases: MongoDB, Spark, Redis, PostgreSQL
Cloud: AWS, Sagemaker, Kinesis, ELK, Athena
Analytics/NLP: NumPy, Plotly, Pandas, NLTK, Spacy
Fullstack: NodeJs, Django, Flask, VueJs, HTML5

Academic Mentoring

I have been fortunate to work/mentor the following undergraduate students:

- **Olivia Brobin** (Student Researcher @ Laboratory for Atmospheric and Space Physics, Boulder, CO)
- **Jishnu Raychaudhuri** (Masters in Computer Science @ University of California, San Deigo, CA)

Fellowships and Awards

Dynamics Days Travel Award **2025**
43rd annual Dynamics Days US Conference, Denver, Colorado

Bellman Family Endowed CS Fellowship Award **2023 – 2024**
University of Colorado, Boulder – College of Engineering

Endowed CS Founder's Fellowship Award **2022 – 2023**
University of Colorado, Boulder – Department of Computer Science

Outstanding Graduate Part-Time Instructor **2023**
University of Colorado, Boulder – College of Engineering

Outstanding Research Expo Award (In Progress); Publication Recognition Award **2023; 2024**
University of Colorado, Boulder – Department of Computer Science

5 x Impact Award; 2 x Above and Beyond Award; Go-Tripper of the Month **2018 – 2021**
GE Digital and MakeMyTrip, along with 1st place at 'GE NexTech challenge 2019'

Certifications

Deep Learning Specialization **October 2020**
Deeplearning.ai + Coursera

Spark and Python for Big Data **April 2020**
Udemy

GE Analytical Engineering Program **April 2019**
GE Digital

Statistical Learning **July 2018**
Stanford University; Trevor Hastie and Robert Tibshirani