NITIN KISHORE SAI SAMALA

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Work history

Staff Data Scientist **Oct 2021 – Present**
Walmart Global Tech **Bangalore, India**

- Architected a custom RL gym environment using OpenAI Gym integrated with Lightning Modules for Inventory Management simulation, and an **Action-Branching Dueling DQN** and Optimal Transport solver reward.
- Developed a **cooperative multi-agent RL** solution for inventory Targeting and Placement, in collaboration with IIT Madras, reducing shortage and holding costs for medium velocity items while achieving an **SLA of 99.95** across 10 FCs
- Set up Weights and Biases (**Wandb**) logging system for tracking 200+ experimental runs, enabling cross-experiment comparisons and feature/model monitoring
- Established **CUDA** DataProc clusters for GPU acceleration of RL training, significantly improving training times through code optimization, **Ray** parallelization and **DDP** strategy for million episode runs
- Developed complex **SQL** queries and **PySpark ETL** workflows for Safety Stock data, Item placement Benefits, Sales allocation vectors and Uber H3 Geo-demand forecasts
- Conducted extensive Household-UPC level **demand pattern classification**, analyzing billions of stores and eComm transactions at nation-wide scale, directly addressing executive requirements to identify high-volume clusters and small businesses for InHome-Replenishment
- Spearheaded the development of a **52-week sales forecast model** for new-to-store items using **GNN** Edge regression, achieving optimal performance across 15 different forecasting metrics, across 3300+ stores
- Built a sliding window graph dataset spanning 2 years at Group-Subcategory level, enabling quarterly model updates and GPU-accelerated training for Sales predictions
- **Patent** filed for **End-to-end supply chain simulation** using Graph Neural networks (**GNN+RL**) for the Mobius Simulation Platform

Staff Data Scientist **Apr 2021 – Sept 2021**
Walmart Labs **Sunnyvale, CA**

- Developed a comprehensive GNN framework for supply chain optimization, creating a **Dynamic Temporal Heterogenous Graph** data object using **pytorch-geometric** to model millions of customers, shipping centers, and product interactions to train regional models on node, edge and graph learning tasks
- Modeled daily transactions at order-item granularity through edge-regression (**Link Prediction**) to predict actual **delivery time** in hours of the predicted **net order quantity** and map solutions to Sourcing and capacity **vehicle-routing** problem to devise golden routes.
- Wrote production-grade code utilizing **pytorch-lightning** and **hydra** and trained 10 regional models capable of handling 20 million daily transactions across all 50 states, 9 million customers and 100k products
- Leveraged **BERT** and **sentence transformers** for enhanced product embeddings, improving contextual relevance and semantic similarity over existing node embeddings and trained graph **clustering** networks to generate future demand topology of orders
- Framed a sequential MDP process of graph-based tasks for **policy evaluation** and **network evolution** in the RL gym environment
- **Patent** filed for Inappropriate content detection system (InCDS) developed as part of **Trust and Safety Framework**

Sr. Data Scientist (Sr. Software Engineer) **Jan 2020 - Apr 2021**
Walmart Labs **Sunnyvale, CA**

- Built an end-to-end automated pipeline for "Inappropriate content detection" for UGC items on Walmart eCommerce using **Vader Sentiment**, Topic Modelling, **Snorkel** and **BERT**
- Synthetic structured data generation for data sparsity in **Apparel** to compute lost sale estimates for 500 million datapoints per department
- Handled projects for **True demand**, size-color distribution, **seasonal-demographic assortment** ranking
- Code Vectorization, Multiprocessing and **AirFlow DAG** runs to onboard multiple departments and SQL ETLs for data prep and publishing outputs
- **Franz Edelman Award Laureate** and **Lead author** of scientific paper published in **INFORMS Journal 2020**

Machine Learning Engineer (Software Engineer III) **Jan 2019 - Jan 2020**
Walmart Labs **Sunnyvale, CA**

- Constructed an adaptable **open AI SubprocVecEnv gym** environment to simulate store clearance sales for training the **RL agent** (**DDQN** with Prioritized Experience Replay) ensembled with **Black–Scholes** partial differential heat equation to modulate exponential decay. This is in production and applied to 3000+ stores across the US
- Coded an **Auto-Encoder Regressor Network** to validate **CPLEX** outputs for deciding category assortment capacity and shelf-space utilization
- Attended **ICML 2019**, INFORMS 2019 and functioned as a substitute **Paper reviewer** for CVPR, AAMAS and AAAI conference submissions

Machine Learning Engineer **July 2018 - Jan 2019**
VerifAI (previously Inzone.AI**)** **San Francisco, CA**

- Worked with **Pieter Abbeel** on using reinforcement learning, to generate stimulus for static code coverage in design verification code, to reduce simulation cycles and save hours of manual work and labor
- Developed a robust ML platform for **Automatic feature engineering** and Selection pipeline, **EDA**, Prediction Interpretability, Visualization and Hyper-parameter tuning
- Improved the accuracy on semiconductor bug classification from 63 to **97%** and made it production-ready

Education

Master of Science - **Computer Science** **Sep 2016 - May 2018**
University of Massachusetts Amherst **Amherst, MA**

- Coursework – Deep Learning, Advanced NLP, Machine Learning, Probabilistic Graphical models; GPA- 3.81
- Minor in Data Science – Algorithms for Data Science, Systems and Database design
- Teaching Assistant for – Advanced Machine Learning, Secure Distributed Systems (Blockchain)

Bachelor of Engineering (Honors) - **Electronics and Communication** **Aug 2011 - July 2015**
Birla Institute of Technology and Science **(BITS Pilani)** **Hyderabad, India**

Research Experience

NLP Summer Research Intern **May 2017 - Sep 2017**
Information Extraction and Synthesis Laboratory (IESL) **Amherst, MA**

- Worked under **Prof. Andrew McAllum** on Extractive **Single-Document Summarization** via tree constrained **inference** and recursive cardinality potentials on NYT corpus in **TensorFlow**
- Coded a transition-based **Dependency parser** in **PyTorch** for scientific and biomedical literature
- Created BLESS datasets in multiple languages for unsupervised hypernym detection

Technical Skills

- **ML/AI Coding** – PyTorch, Lightning, Scikit-learn, TensorFlow, Keras, PyG, StableBaselines, OpenAI
- **Big Data** – SQL, PySpark, Pandas, Dask, NumPy
- **Tools** – Wandb, Matplotlib, Hydra, Streamlit, Gradio, Seaborn
- **Cloud/DevOps** – Google Cloud Platform, AWS, Linux, Git, Flask, CUDA

Certifications

- **Coursera** certified for the **Deep Learning Specialization** (2018) and **Math for ML Specialization**(2024) by Andrew Ng (Deeplearning.ai)
- **Udacity Nanodegrees -** Deep Reinforcement Learning (2019) and AI for Trading (2022)
- **CIFAR (DLRL) Summer School, Canada** (2021) by **Amii, MILA** and **Vector Institute**
- **FSDL**- Full Stack Deep Learning Course (2022) by **UC Berkeley**
- **Hugging Face** Transformers Course (2022)
- Practical Deep Learning for coders, I and II (MOOC) by **fast.ai** (2024)

Projects

1) **Capsule-GANs**
   Used capsule network as discriminator for a generative adversarial network, trained using several hacks, which outperformed CNN-GANs at modeling image data distribution of MNIST, CIFAR10 and CelebA
2) **Improving Open Domain Dialogue-Systems (Chatbots)**
   Built a seq2seq neural conversational model in PyTorch using attention with intention and a diversity promoting objective function to prevent irrelevant generic outputs
3) **Multilingual embeddings for cross-language NLP**
   Created language agnostic word embeddings via artificial code-switching to share structure across languages for any NLP task when you have less labeled data
4) **DSR Reinforcement Learning to navigate a Labyrinth**
   Applied successor representations within an end-to-end deep reinforcement learning framework and compared its efficacy to DQN in a grid-world domain (Mazebase) on AWS EC2

Accomplishments

- **Franz Edelman Award Laureate,** for Achievement in Advanced Analytics, Operations Research, and Management Science, 2020
- First place in **Google Hackathon -** Used Firebase and Google maps API to develop an app, **InTheBin!** that renders crowd-sourced locations of nearby trash cans
- Promoted twice in 3 years and rated consistently as **Top Performer**
- Granted a patent, where I am the sole inventor

Publications

1. Nitin Kishore Sai Samala, Y Chen, Prakhar Mehrotra et al. **A Multi-Objective Optimization for Clearance in Walmart Brick-and-Mortar Stores** (In INFORMS Journal on Applied Analytics, 2020 Volume 51, Issue 1)

Patents

- **US20230087738 -** SYSTEMS AND METHODS FOR REMOVING NON-CONFORMING WEB TEXT**,** https://patents.google.com/patent/US20050210008A1/en
- **US2024 -** SYSTEMS AND METHODS FOR SUPPLY CHAIN DIGITAL TWIN MODELING AND PREDICTION USING GRAPH NETWORKS AND REINFORCEMENT LEARNING (**Filed**)

Talks

- **Revealing Uncommon Tricks: 25 Obscure Pandas & NumPy Hacks learnt over 5 years of being a Data Scientist**
  – PyCon India, JNTU, Hyderabad, India (Sept. 2023)
- **Digital sandbox for end-to-end counterfactual simulations using GNNs**
  – Spark Tech summit, Bangalore, India (Apr. 2023)
- **Heterogenous Graph Neural Networks for Supply Chain Simulation— Delivery time predictions of Order forecasts**
  – WALMART AI summit, Bangalore, India (Apr. 2022)
- **ML Applications and Challenges in Brick-n-Mortar Retail**
  – RE-WORK Applied AI summit, San Francisco, CA (Jan. 2020)