Amanuel Mersha

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Summary

- Introduced multiple efficient and high-performing deep learning models spanning NLP and computer vision.
- Demonstrated both theoretical and practical aspects of machine learning algorithms in production and research.
- Passionate about research and engineering of robust & efficient AI systems that solve real-world problems.

Work Experience

Software Engineer - *Bisrate Gabriel International School* Sept 2021 - Present

- Lead a development team that is building a school management system that serves over 6,000 students
- Built deep learning-based computer vision receipt analyzer and replaced the slow manual procedure
- Design & implement the architecture, security system, business logic, and front-end integration
- **Tech Stack: C#, ReactJs, NextJs, React Native, PostgreSQL, GitHub Actions, Docker, PyTorch, Sci-kit Learn**

Researcher & Lecturer - *Addis Ababa University* Sept 2016 - Present

- Teach courses - *Introduction to Artificial Intelligence*, *Algorithms and Data Structure*, *Web Programming*
- Led a team that built an Activity Planning, Monitoring, and Reporting System to manage over 500 of the university's offices and eliminated the tedious and error-prone paper-based reporting system
- Built a timetable scheduler using a genetic algorithm to schedule more than 50 courses across our school
- Developed a student-course analyzing tool using Probabilistic Graph Modeling, leading to a complete transformation of the curriculum.
- Supervised a team that designed and constructed a wheeled robot, capable of item retrieval and placement
- **Tech Stack: C#, Python, C++, ROS, ROS Viz, Gazebo, ReactJs, Docker, MaskRCNN**

Founder - *Sefere App* Sept 2021 - May 2022

- Founded a startup that created web and mobile apps to increase the visibility of small businesses - Play Store
- Developed the frontend (mobile & web) and backend
- Implemented self-improving content-based feed recommendation using neural network, word embeddings, and KNN
- **Tech Stack: ASP.Net Core, Kotlin, Java, SQL Server, TypeScript, ReactJs, Pytorch, Scikit-Learn**

RoboCup Developer - *Addis Ababa University* Apr 2017 - Sept 2018

- Built a ROS-based control system for a three-player RoboCup team and won the championship
- Implemented the game strategy & SLAM based on fused sensory inputs
- **Tech Stack: C++, Python, ROS, Gazebo, ROS Viz, OpenCV, Computer Vision, SciPy, Matplotlib**

Research Experience & Publications

RL based layer skipping Vision Transformer - GitHub Apr 2022 - July 2023

- Developed a transformer network that employs a reinforcement learning (RL) agent to learn to skip irrelevant layers during processing an input, resulting in a 40% increase in throughput compared to the vanilla ViT
- **Publication:** *DynamicViT: Making Vision Transformer faster through layer skipping* In: Vision Transformers: Theory and Applications Workshop at NeurIPS (Nov 2022)
- **Publication:** *Dynamic Transformer Network* In: Workshop on Dynamic Neural Networks at ICML (July 2022)

DistillEmb: Distilling word-embeddings via contrastive learning - GitHub Jun 2021 - May 2023

- Compressed word embeddings into a CNN to address out-of-vocabulary issues, conserve memory, and facilitate cross-lingual transfer, resulting in a 7% improvement in F1 accuracy and 1400% less memory usage, as well as out-of-the-box low resource cross-lingual transfer capabilities.
- **Publication:** *DistillEmb: Distilling Word Embeddings via Contrastive Learning* In: Transfer Learning for NLP Workshop at NeurIP (Nov 2022)

Boosting image retrieval with accurately labeled small data - GitHub Sept 2021 - Jan 2022

- Explored the utilization of a detailed labeled dataset to enhance the feature set in an image retrieval task, enabling a small, shallow network to surpass the performance of a more complex, larger model

Morphological generation for Wolayita using CNN based Seq2Seq model Apr 2018 - Sept 2019

- Constructed a CNN-based encoder-decoder morphological analyzer for the Wolayita language utilizing fewer parameters than LSTM-based models.
- **Publication:** *A translation-based approach to morphology learning for low-resource languages* In: Proceedings of The Fourth Widening Natural Language Processing Workshop (July 2020)

Morphology-rich alphasyllabary embeddings - GitHub Apr 2018 – Jun 2019

- Examined the relationship between language morphology and corresponding word embeddings, proposing a technique to enhance the syntactic features of embeddings.
- **Publication:** *Morphology-rich Alphasyllabary Embeddings* In: Proceedings of the 12th Language Resources and Evaluation Conference (May 2020)

Skills

- **Soft skills:** Problem-solving, Teamwork, Communication skills, Attention to detail, Curiosity & Adaptability
- **Major ML Areas:** Deep Learning, Information Retrieval, Image Retrieval, Computer Vision, Language Models, Reinforcement Learning, Prompt Engineering, Robotics, Bayesian Optimization, ML Debugging, Feature Engineering, Data Cleaning & Pre-processing, Genetic Algorithms, Optimization, Chatbots, Boosting, Ensambling, AutoML
- **Programming Languages:** Python, C/C++, Java, C#, Kotlin, JavaScript, TypeScript
- **ML Frameworks:** PyTorch, TensorFlow, Keras, TensorFlow.Js, Lightning, Sci-kit Learn, Pandas, Gensim, VectorDB, MLFlow, SciPy, ONNX, OpenCV, NLTK, SpaCy
- **ML Tools:** TensorBoard, Weight & Biases, Matplotlib, Seaborn, Bokeh, Google Cloud Platform (GCP), ROS, Gazebo
- **Mathematics:** Linear Algebra, Optimization, Statistics, Calculus, Probability
- **Application Frameworks:** Angular, ReactJs, AspNet Core, NodeJs, Django, Flask, FastAPI, Android, ReactNative
- **Databases:** MySQL, MS SQL Server, MongoDB, PostgreSQL, Redis, NoSQL, ORMS
- **Software Engineering:** Git, Docker, Github Action, CI/CD, MLOps, DevOps, GraphQL, REST, GraphQL, gRPC, Testing, OOP, Architecture Design, Distributed & Parallel Computing

Education

M.Sc. in Artificial Intelligence - Graduated with Excellence 2023

Addis Ababa University

- Thesis - Reinforcement Learning Based Layer Skipping Vision Transformer for Efficient Inference

B.Sc. in Software Engineering - Graduated with Distinction 2016

Addis Ababa University

- Capstone Project - AI-Based Traffic Congestion Management System

Selected Projects

- Science Question and Answering Chatbot - GitHub
- Urban Land Usage Optimization Using NSGAII - GitHub
- ROS and Gazebo-based Delta-3 robot model - GitHub

Leadership and Volunteer Activities

- ICLR Student Volunteer May 2022
  - International Conference on Learning Representation (ICLR) 2023 - Kigali, Rwanda
- Ambassador of Ethiopia, Zindi Africa - Addis Ababa, Ethiopia Oct 2021
- General Co-Chair Oct 2019
  - AI in Ethiopia Conference - Addis Ababa, Ethiopia
- Tutorial and Workshop Chair May 2019
  - Deep Learning IndabaX WSU Conference - Wolaita Sodo, Ethiopia