Denis Kinyugo Maina

Machine Learning Researcher

kinyugomaina@gmail.com +254790317770

https://github.com/Kinyugo
denis-kinyugo
Kinyugo
ORCiD

WORK EXPERIENCE

Machine Learning Researcher
(Jul 2022 - Present)

Self Employed

Specialized in generative AI with a focus on developing efficient and high-quality neural synthesis models.

Achievements:

- Designed and developed Msanii, a leading-edge music synthesis model that delivers rich soundscapes with improved efficiency
- Released Msanii as open-source, increasing accessibility for researchers and developers globally
- Created interactive demos and integrated the model with Weights and Biases for improved experiment tracking and reproducibility
- Demonstrated proficiency in training and deploying machine learning models on cloud platforms

https://arxiv.org/abs/2301.06468

Bioinformatics Intern
(Feb 2022 - Jun 2022)

ICIPE - International Centre of Insect Physiology and Ecology

Worked on projects integrating computer science and biological sciences while interning at icipe.

Achievements:

- Led a team of three to develop efficient computational pipelines for pangenomic and phylogenetic analysis, resulting in a 50% improvement in quality and speed of analysis and increased user-friendliness
- Implemented data mining software to support large scale bioinformatics analysis
- Lead a team to reproduce a research work, presenting the findings and methods to benefit the scientific community
- Delivered presentations on the application of machine learning in biological sciences, inspiring other researchers to incorporate these methods into their workflows
- Designed and developed the bioinformatics department website, increasing department's outreach to a wider audience

http://www.icipe.org/

Software Developer
(May 2022 - Aug 2022)

Authentic Sparrows

Contributed to the research, design, and development of software supporting the company's main services.

Achievements:

- Created a fleet management system that significantly reduced operation costs
- Designed and developed the company's website, attracting new customers to the business
- Led a team of three to integrate a mobile application with the existing web app, enhancing asset management through easier accessibility

https://site.authenticsparrows.co.ke/

EDUCATION

Dedan Kimathi University of Technology
(Mar 2018 - Dec 2021)

Bachelor's degree, Computer Science

Second Upper Division

I majored Artificial Intelligence, where I developed an AI system for transforming live action footage to animated video.

Thesis:

LiAn: A Deep Learning Approach For Creating Animation From Live Action

https://www.dkut.ac.ke/

Artificial Intelligence, Programming

PUBLICATIONS

Msanii: High Fidelity Music Synthesis on a Shoestring Budget
(Jan 2023)

arXiv

A publication that describes the development of a cutting-edge music synthesis model, Msanii.

Key Features of Msanii:

- Combines the expressiveness of mel spectrograms
- Incorporates the generative abilities of diffusion models
- Utilizes the vocoding capabilities of neural vocoders

Demonstration of Effectiveness:

- Synthesizes 190 seconds of high-fidelity stereo music at 44.1 kHz
- Does not rely on concatenative synthesis, cascading architectures, or compression techniques

Significance:

- First work of its kind to successfully employ a diffusion-based model for synthesizing such long music samples at high sample rates

https://arxiv.org/abs/2301.06468

PROJECTS

Msanii
(Jul 2021 - Present)

A novel diffusion-based model for synthesizing long-context, high-fidelity music efficiently.

Developed Msanii, a novel music synthesis approach that efficiently generates high fidelity audio. The approach exploits advances in diffusion models and allows synthesis of long-context (190 seconds) of audio at high sample rates (44.1 kHz).

Responsibilities:

- Analyzed the limitations of existing long-context high-fidelity music synthesis approaches
- Designed and implemented a novel music synthesis approach that scales efficiently to long audio samples
- Wrote and published a research paper detailing the approach
- Developed an online demo that users can interact with to test the capabilities of the approach

Skills Utilized:

- Deep Learning
- PyTorch
- Music Processing
- Python
- Cloud Computing
- Research Skills

Outcomes:

- Successfully developed and demonstrated the effectiveness of the Msanii model for synthesizing high-fidelity music efficiently
- Contributed to the creation of a demo and open-source code for the Msanii system, which can be found online
- Improved the state of the art in music synthesis by successfully synthesizing long music samples at high sample rates without the use of concatenative synthesis, cascading architectures, or compression techniques.

https://github.com/Kinyugo/msanii

odewel
(Jan 2023 - Present)

Neural Network Library for On-Demand Weights Loading

Developed a tiny library called odewel that enables running any neural network model on any hardware. This library exploits the layered structure of neural networks and loads only the necessary weights for each layer to fit into the memory of everyday devices.

Responsibilities:

- Analyzed the limitations of existing solutions for on-device computation of neural networks
- Designed and implemented a library that takes advantage of the layered structure of neural networks
- Implemented techniques for efficient weight loading and pre-loading for improved speed
- Tested the library on various models and hardware configurations to ensure its functionality and performance

Skills Utilized:

- Deep Learning
- Python Programming
- PyTorch
- Performance Optimization
- Testing and Debugging

Outcome:

The library is capable of running large neural network models on devices with limited memory and computation resources, providing an accessible solution for the average user to experiment with these models. The project is still a work-in-progress with better performance improvements to be added in the future.

https://github.com/Kinyugo/odewel

VOLUNTEER EXPERIENCE

PyTorch Lightning
(Jul 2021 - Jul 2021)

OpenSource Contributor

Contributed to the open-source development of the lightning-flash library.

Achievements:

- Designed and implemented audio classification support for the lightning-flash library
- Curated and pre-processed audio spectrogram datasets for use in the library
- Worked collaboratively with a remote team to seamlessly integrate contributions into the library

SKILLS

Deep Learning	**Natural Language Processing (NLP)**	**Data Mining**	**PyTorch**
Tensorflow	**Huggingface: Transformers, Datasets, Diffusers**	**Docker & Kubernetes**	**Git & GitHub**
HPC: Slurm & PBS	**Python**	**Weights & Biases (W&B)**	

REFERENCES

Dr Caleb Kibet
Principal Investigator Bioinformatics (icipe)
+254722894039
ckibet@icipe.org

Michael Kagiri
Lecturer Dedan Kimathi University of Technology
+254715998222
michael.kagiri@dkut.ac.ke

Ephantus Karari
C.E.O Authentic Sparrows
+254742753510