Felix Hirwa Nshuti

Kigali, Rwanda | fhirwans@andrew.cmu.edu
Links: linkedin.com/in/fnhirwa | github.com/fnhirwa | https://fnhirwa.github.io

Research Interests

Systems for machine learning, compiler design for AI workloads, and hardware-software co-optimization. I am interested in how compilers represent and transform computation graphs, apply tensor-level optimizations, and generate hardware-aware schedules that close the gap between algorithmic intent and architectural execution. My focus is on building efficient, predictable, and scalable infrastructure for next-generation ML systems.

Education

- **Carnegie Mellon University (CMU-Africa)** *Kigali, Rwanda*
  Master of Science in Electrical and Computer Engineering *May 2025 – Present*
  Coursewok: Introduction to Machine Learning, Deep Learning, Machine Learning for Signal Processing
- **Pandit Deendayal Energy University** *Gujarat, India*
  Bachelor of Technology in Computer Engineering *October 2021 – May 2025*
  Coursework: Data Structures and Algorithms, Operating Systems, Compiler Design, Computer Architecture, Artificial Intelligence, Machine Learning, Computer Vision

Selected Projects

- **Enhancing Prophet with Question-Aware Captioning for Knowledge-Based VQA** *Aug 2025 – Dec 2025*
  Knowledge-Based Visual Question Answering *Python, PyTorch, Transformers, NLP, CV, VQA*
  - github.com/fnhirwa/fca
  - Aimed to improve the performance of knowledge-based VQA systems by integrating question-aware captioning techniques into the Prophet framework.
  - Developed a module that generates contextually relevant captions based on the input question, enhancing the model's ability to retrieve and utilize external knowledge effectively.
- **Context-Aware Demand Forecasting in Pittsburgh's Bike Share System** *Aug 2025 – Dec 2025*
  Time Series Forecasting with Contextual Features *Python, Pandas, NumPy, XGBoost, CatBoost, statsmodels*
  - github.com/fnhirwa/11755-MLSP-Final-Project
  - Developed a context-aware demand forecasting model for Pittsburgh's bike share system, incorporating temporal, weather, and event-based features to enhance prediction accuracy.
  - Employed advanced time series analysis techniques and machine learning algorithms to capture complex patterns in bike usage data.
- **TransISA, a lightweight CISC-to-RISC Transpiler** *Dec 2024 – May 2025*
  Compiler Design and Architecture Translation *LLVM, x86, AArch64, C++, IR, CFG*
  - github.com/fnhirwa/TransISA
  - Designed and implemented a compiler pipeline using the LLVM C++ API to translate x86 assembly to AArch64 assembly via LLVM IR.
  - Extracted and analyzed Control Flow Graphs (CFGs) of source programs to support instruction-level translation.
- **Scaling Deep learning backends with sktime** *May 2024 – Aug 2024*
  Machine Learning with time Series *Python, PyTorch, TensorFlow, Darts, CI/CD*
  - fnhirwa.github.io/gsoc2024
  - Added new classification models to sktime using PyTorch (GRU and GRU-FCNN Classifiers).
  - Efficiently migrated the classifier models from legacy sktime-dl to sktime main repository.
  - Implemented the modular interface of darts regression models in sktime.

Teaching Experience

- **Graduate Teaching Assistant** *Nov 2025 – Present*
  Carnegie Mellon University: Introduction to Deep Learning (11785), Spring 2026

Professional Experience

- **Contributor** *May 2024 – Aug 2024*
  Google Summer of Code, sktime *Remote, Remote*
  - Scaled Deep Learning backends with sktime, mostly worked with Darts and PyTorch.

- Implemented the modular interface of darts regression models in sktime.
- Presented my project progress at weekly mentorship meetings.

- **Machine Learning Engineer** *September 2022 – October 2023*
  Unify *London, United Kingdom*
  - Carried out the maintenance and development of Ivy, a unified Deep Learning framework, enhancing its functionality and performance.
  - Established a framework for monitoring adherence to Array API standards, identifying key areas for improvement, and engaging with developers in continuous feedback loops to enhance compliance.
  - Teamed up with the community member in the weekly paper reading group.
  - Led development and maintenance of the Numpy Frontend of Ivy.
  - Empowered community development through discusions, github issues and pull request reviews on open-source projects.
- **Apprentice Software Developer** *April 2021 – May 2021*
  Rohde & Schwarz *Kigali, Rwanda*
  - Developed Cybersecurity test software by using some automation libraries of Python like Selenium.
  - Facilitated team to deliver quality software over time.
  - Presented final product to the customer and delivered the product to production.

Volunteering Experience

- **Community Council Member and Core Developer** *Oct 2024 – Aug 2025*
  Sktime *Remote, Remote*
  - Facilitating decision making and conflict resolution through mediation on the roadmap planning.
  - Assisting contributors to get started with open-source and provide continous constructive feedback.
  - Collaborating with external organizations and looking for funds to drive the open-source ecosystem.
  - Engaging with community through discusions, github issues and pull request reviews on open-source projects.
- **Mentor** *August 2021 – April 2023*
  DeepLearning.AI *California, United States*
  - Mentored Learners taking TensorFlow Developer Professional Certificate on Coursera by proiding assistance with issues faced during the course.

Skills

Programming Languages Python, C/C++, CUDA, Assembly
Deep Learning Frameworks: PyTorch, Jax, TensorFlow, PaddlePaddle
Libraries & Tools: NumPy, Pandas, Scikit-learn, OpenCV, Git/GitHub, Docker
Natural Languages: English (fluent), Kinyarwanda (Proficient)