PROMISE OSAINE EKPO

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RESEARCH INTERESTS

Post-Training & Alignment: RLHF, DPO, Reward Modeling, Multi-Objective Optimization for LLM Alignment, Constitutional AI

Optimization & Training: Lagrangian Methods, Constrained Optimization, Nash Equilibrium, Distributed Training, Model Scaling

Generative AI & LLMs: Large Language Models, Multimodal Learning, RAG, Prompt Engineering, Fine-tuning

Reinforcement Learning: Multi-Agent RL, Policy Optimization (PPO, MAPPO), Fairness-Aware RL, Human-in-the-Loop Learning

EDUCATION

Cornell University, Ph.D. in Computer Science (GPA: 3.94/4.0) August 2023 - May 2028

Advisor: Prof. Angelique Taylor, AirLAB | Focus: Multi-Agent RL, Fairness, Optimization, Healthcare AI

Princeton University, M.Sc. in Computer Science (GPA: 3.67/4.0) August 2021 - May 2023

Thesis: Investigating Persuasiveness in Large Language Models | Advisor: Prof. Jaime Fernández Fisac

HIGHLIGHTED RESEARCH PROJECTS

Fair Generalized Nash Equilibrium (Fair-GNE) for Multi-Objective Optimization *2024 - Present*

Cornell University AirLAB | Submitted to L4DC 2026 & IFAC 2026

• Developed novel constrained optimization framework using Lagrangian dual ascent for automatic penalty parameter learning, **eliminating manual hyperparameter tuning—directly applicable to KL penalty adaptation in RLHF/DPO**

• Designed game-theoretic multi-objective optimization with KKT conditions for convergence guarantees, addressing fairness-efficiency trade-offs in multi-agent systems **(parallels alignment challenges balancing helpfulness, harmlessness, honesty in LLMs)**

• Implemented distributed training experiments across 200+ concurrent GPU jobs on HPC clusters using SLURM, **demonstrating scalability to large-scale model training scenarios**

• Established rigorous experimental methodology with statistical significance testing (bootstrap resampling, effect size analysis) across 20-30 random seeds, ensuring reproducibility critical for production ML systems

• **Technical Stack:** PyTorch, EPyMARL, Weights & Biases, SLURM, CUDA, NumPy, JAX

AI Safety: Investigating Persuasiveness & Alignment in Large Language Models *2022 - 2023*

Princeton University Safe Robotics Lab | Advisor: Prof. Jaime Fernández Fisac

• Investigated emergent manipulative behaviors in LLMs (GPT-2/3/4, ChatGPT) **when combined with sequential decision-making, addressing alignment failures and reward hacking**

• Designed novel reward functions for evaluating persuasiveness as extension of Google BIG-BENCH benchmark, **contributing to AI safety frameworks for responsible deployment**

• Conducted systematic experiments revealing social biases and persuasive capabilities embedded in pre-trained language models, informing safety considerations for post-training alignment methods

• **Technical Stack:** Hugging Face Transformers, PyTorch, OpenAI API (GPT-3/4), Python

FairSkillMARL: Fairness-Aware Multi-Agent Reinforcement Learning *2023 - Present*

Cornell University AirLAB | Submitted to AAMAS 2026

• Established principled fairness and reward modeling framework for MARL addressing gaps between algorithmic definitions and real-world equity in AI systems

• Designed novel disparity metrics capturing workload balance and skill-task alignment, demonstrating that single-objective fairness can lead to inequitable outcomes—**analogous to multi-objective alignment in LLMs**

• Built MARLHospital simulation environment with heterogeneous agents, enabling reproducible evaluation of fairness-efficiency trade-offs with transparent metrics

• Benchmarked against QMIX, MAPPO, and fairness baselines with hyperparameter tuning using Weights & Biases, providing comprehensive ablation studies

PUBLICATIONS

Selected publications in reinforcement learning, generative AI, fairness-aware systems, and AI safety.

[1] **Promise Ekpo**, Angelique Taylor, Lekan Molu. "A Generalized Nash Equilibrium-Seeking Scheme for Trauma Resuscitation." Submitted to IFAC Conference 2026. [PDF]

[2] **Promise Ekpo**, Lekan Molu, Angelique Taylor. "Generalized Nash Equilibrium-Seeking Fairness in Multiagent Healthcare Automation." Submitted to L4DC 2026. [PDF]

[3] **Promise Ekpo**, Gonzalo Gonzalez Pumariega, Lekan Molu, Angelique Taylor. "Skill-Aligned Fairness in Multi-Agent Learning for Collaboration in Healthcare." Submitted to AAMAS 2026. [PDF]

[4] **Promise Ekpo**. "Investigating Persuasiveness in Large Language Models." M.S.E. Thesis, Princeton University, 2023. [PDF]

[5] Tauhid Tanjim, **Promise Ekpo**, Hee Rin Lee, Angelique Taylor et al. "Human-Robot Teaming Field Deployments: A Comparison Between Verbal and Non-verbal Communication." IEEE RO-MAN Workshop 2025. [PDF]

[6] Oluwatosin Ogundare, Tolu Owadokun, Temitope Ogundare, **Promise Ekpo**, Ha Linh Nguyen, Stephen Bello. "Integrated Artificial Intelligence in Healthcare and the Patient's Experience of Care." Scientific Reports (Nature), 2024. [PDF]

INDUSTRIAL EXPERIENCE

AI Safety & Verification Research Intern, *Siemens (Robust Intelligence Team)* *June 2023 - August 2023*

• Developed explainable AI (XAI) framework for graph neural network medical diagnosis systems using GNNExplainer, **improving model interpretability for safety-critical healthcare applications**

• Built multimodal safety monitoring system combining computer vision (deep learning) with real-time localization for warehouse robotics, engineering data fusion algorithms for seamless sensor integration

• Designed and executed proof-of-concept experiments on real-world medical datasets, informing production deployment decisions for AI safety systems

TECHNICAL SKILLS

Languages: Python (expert), Java, C++, SQL, JavaScript

ML Frameworks: PyTorch (primary), TensorFlow, JAX, Hugging Face Transformers, Stable Baselines3

LLM & Gen AI: OpenAI API (GPT-3/4), Anthropic Claude, Hugging Face (BERT, GPT-2/3, LLaMA), Prompt Engineering, Fine-tuning

RL Libraries: EPyMARL, RLlib, Stable Baselines3, OpenAI Gym, PettingZoo, PDDL/PDDLGym

Distributed Computing: SLURM (HPC clusters), CUDA, Multi-GPU training, Distributed PyTorch, Ray

MLOps & Tools: Weights & Biases, TensorBoard, Docker, Git, Conda/pip, Jupyter, VS Code

Scientific Computing: NumPy, SciPy, Pandas, Matplotlib, Scikit-learn, Statistical Testing (bootstrap, t-tests)

SELECTED AWARDS & HONORS

- CMD-IT/ACM Richard Tapia Conference, Best Poster Award - Graduate Category (1st Place, $1,500) 2025
- NeurIPS Women in Machine Learning Grant ($990) + Netflix & RTC Grant ($3,000) 2025
- Cadence Technology Award - Women in Tech Category (8% acceptance, $5,000) 2023
- Gordon Wu Fellowship, Princeton University (0.03% acceptance rate) 2021
- Dean's Honor Award, Best Graduating Student, Dept. of Computer Engineering, University of Benin 2020

TEACHING EXPERIENCE

Teaching Assistant, Cornell University September 2023 - May 2024

• CS 4780/5780 "Introduction to Machine Learning" and CS 4789/5789 "Introduction to Reinforcement Learning"

Teaching Assistant/Preceptor, Princeton University September 2022 - May 2023

• COS 126 "Computer Science: An Interdisciplinary Approach" (Java Programming)