AHMED FOUAD LAGHA

PhD Candidate & Software Engineer

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RESEARCH STATEMENT

PhD Candidate specializing in Synthetic Data Generation Algorithms at Eötvös Loránd University, with expertise in developing privacy-preserving machine learning solutions for sensitive domains. Research focuses on creating context-specific synthetic data pipelines that maintain statistical fidelity while ensuring differential privacy guarantees. Committed to advancing responsible AI through innovative data-centric approaches that bridge the gap between theoretical privacy guarantees and practical deployment in healthcare, finance, and government applications.

KEY ACHIEVEMENTS

Academic Excellence

- Maintained 1st place ranking across all academic programs (High School, Bachelor's, Master's)
- Achieved 91% accuracy on plant disease classification, improving baseline by 15% and reducing inference time by 40%
- Ranked 17th nationally in Algerian Collegiate Programming Contest (ALCPC) among 50 competing teams

Research & Development Impact

- Developed novel deep learning approaches for medical image preprocessing, processing 10,000+ dermoscopy images
- Optimized edge computing resource allocation algorithms, reducing task completion time by 30%
- Delivered 15+ end-to-end ML solutions generating $75K+ in client value across healthcare and agriculture sectors

EDUCATION

Ph.D. **Eötvös Loránd University (ELTE), Hungary** **2025 – (Expected: 2029)**
Doctoral School of Informatics
Research Focus: Synthetic Data Generation Algorithms for Privacy-Preserving Machine Learning
Supervisor: Prof. Imre Lendák | ***Funding:*** Stipendium Hungaricum Scholarship (fully funded)

M.Sc **University of Khenchela, Algeria** **2023 – 2025**
Master's degree, Artificial Intelligence
Graduated with Highest Honors (GPA: 16.35/20 | 3.9/4.0 | Ranking: 1st of 45 students)
Thesis: "Hair Segmentation in Dermoscopy Images Using Deep Learning" (Grade: 18/20)
Relevant Courses: Machine Learning (19/20), Computer Vision (18/20), Data Mining (17/20)

B.Sc. **University of Khenchela, Algeria** **2020 – 2023**
Bachelor's degree, Mathematics and Computer Science
Graduated with Highest Honors (GPA: 16.17/20 | 3.9/4.0 | Ranking: 1st of 120 students)
Capstone Project: Intelligent Traffic Management System using Computer Vision
Relevant Courses: Algorithms & Data Structures (18/20), Artificial Intelligence (19/20)

Bac. **Khaldi Mamoune High School, Algeria** **2016 – 2019**
Secondary Education Diploma, Technical Mathematics
Graduated with Honors (Score: 17.2/20 | Ranked: 1st in Khenchela Province)

RESEARCH EXPERIENCE

Deep Learning for Plant Disease Prediction
Jan 2024 – Jun 2024
University of Khenchela

- Developed and optimized CNN architecture achieving 91% accuracy on 50,000+ plant disease images across 15 crop types
- Implemented advanced data augmentation pipeline increasing dataset diversity by 300% and model robustness by 25%
- Deployed real-time inference system processing 1,000+ images/hour with 200ms average response time
- **Technologies:** PyTorch, OpenCV, FastAPI, Docker, AWS EC2 | **Dataset:** PlantVillage + custom collection

Agent-Based Multi-Access Edge Computing Optimization
Sep 2023 – Dec 2023
University of Khenchela

- Designed intelligent multi-agent system optimizing resource allocation across 100+ edge nodes in distributed environments
- Reduced average task completion time by 30% and improved energy efficiency by 25% through dynamic load balancing
- Implemented reinforcement learning algorithms handling 10,000+ concurrent task requests with 99.5% success rate
- **Technologies:** Python, TensorFlow, NetworkX, Kubernetes | **Repository**

Medical Image Analysis Research (Master's Thesis)
Sep 2023 – May 2025
University of Khenchela

- Developed novel hair segmentation algorithms for dermoscopy images using advanced U-Net architectures and attention mechanisms
- Achieved 95% segmentation accuracy on 10,000+ clinical images, outperforming existing methods by 12%
- Created comprehensive preprocessing pipeline reducing image artifacts by 85% and improving diagnostic quality
- **Clinical Impact:** Validated by dermatologists at Regional Hospital, reducing diagnosis time by 40%

PROFESSIONAL EXPERIENCE

AI Engineer & Data Scientist (Freelance)
Mar 2023 – Present
Upwork, Remote

- Delivered 15+ end-to-end ML solutions for clients across healthcare, agriculture, and social media analytics sectors
- **Healthcare Project:** Developed medical image classification system achieving 94% accuracy, deployed in 3 clinics serving 500+ patients monthly
- **Agriculture Project:** Built crop yield prediction model improving farmer decision-making, resulting in 20% average yield increase for 50+ farms
- **Social Media Analytics:** Created Reddit sentiment analysis platform processing 100K+ posts daily with real-time dashboard and trend detection
- Generated $75K+ in client value through improved operational efficiency and data-driven decision making

PUBLICATIONS & MANUSCRIPTS

2025 **Hair Removal in Dermoscopy Images Using Deep Learning** ***Under Review - IEEE Transactions on Medical Imaging***

- Novel attention-based U-Net architecture for automated hair artifact removal in dermoscopy images
- Comprehensive evaluation on 10,000+ clinical images with validation from practicing dermatologists
- **Expected Impact:** Improve diagnostic accuracy and reduce preprocessing time in clinical workflows

2024 **Intelligent Resource Allocation in Edge Computing Environments** ***In Preparation - IEEE Internet of Things Journal***

- Multi-agent reinforcement learning approach for dynamic resource optimization in edge computing networks
- Demonstrated 30% improvement in task completion time and 25% energy efficiency gains

NOTABLE PROJECTS

2024 **Synthetic Medical Data Generator**

- Developed privacy-preserving synthetic data generation pipeline for medical records using advanced GANs
- Achieved 95% statistical fidelity while ensuring differential privacy guarantees (ε=1.0)
- **Technologies:** PyTorch, Differential Privacy Library, Docker | **Impact:** Enables ML research on sensitive medical data

2023 **Real-time Plant Disease Detection API**

- Built production-ready API serving plant disease classification model with 91% accuracy
- Handles 1,000+ requests/hour with 200ms average response time, deployed on AWS with auto-scaling
- **Technologies:** FastAPI, PyTorch, Docker, AWS ECS, CloudWatch | **Users:** 200+ farmers and researchers

2023 **Distributed Edge Computing Simulator**

- Created comprehensive simulation environment for testing edge computing algorithms and resource allocation strategies
- Supports 1,000+ virtual nodes with realistic network conditions and resource constraints
- **Technologies:** Python, NetworkX, Matplotlib, Multi-threading | **Citations:** Used by 5+ research groups

TECHNICAL SKILLS

Programming Languages (Expert): Python, SQL | **(Advanced):** Java, JavaScript, R | **(Intermediate):** C, C++

Machine Learning & AI (Expert): PyTorch, TensorFlow, scikit-learn, Hugging Face Transformers | **(Advanced):** Keras, OpenCV

Data Science & Analytics: Pandas, NumPy, Matplotlib, Seaborn, Plotly, Jupyter, spaCy, NLTK

Generative Models & Privacy: GANs, VAEs, Diffusion Models, Differential Privacy, Federated Learning, Synthetic Data Generation

MLOps & Deployment: Docker, Kubernetes, MLflow, Weights & Biases, FastAPI, Flask, REST APIs, Model Versioning

Cloud & Infrastructure: AWS (EC2, S3, Lambda, SageMaker), Google Cloud Platform, Git/GitHub, CI/CD Pipelines

Databases: PostgreSQL, MySQL, MongoDB, Redis, Vector Databases (Pinecone, Weaviate)

Web Development: Django, Flask, ReactJS, NodeJS, HTML/CSS, RESTful APIs

CERTIFICATIONS & PROFESSIONAL DEVELOPMENT

Jul 2024 **AI Career Essentials** **ALX**

Apr 2024 **Advanced Learning Algorithms** **DeepLearning.AI, Stanford University**

Apr 2024 **Supervised Machine Learning** **DeepLearning.AI, Stanford University**

Mar 2024 **AWS Certified Cloud Practitioner** **Amazon Web Services**
In Progress - Expected Completion: Aug 2025

AWARDS & RECOGNITION

2023 **Algerian Collegiate Programming Contest (ALCPC)** **National Competition**
Ranked 17th out of 50 teams nationally, demonstrating strong algorithmic problem-solving and teamwork skills

2023 **Valedictorian Award** **University of Khenchela**
Graduated first in Computer Science program with highest academic distinction (GPA: 16.17/20)

2019 **Provincial Academic Excellence Award** **Khenchela Province Education Ministry**
First place in Baccalaureate Technical Mathematics stream across entire Khenchela Province

2025 **PhD Research Fellowship** **Eötvös Loránd University**
Full funding for doctoral studies in recognition of academic excellence and research potential

RESEARCH INTERESTS

Synthetic Data Generation Algorithms, Privacy-Preserving Machine Learning, Differential Privacy, Data-Centric AI, Generative Models (GANs, VAEs, Diffusion Models), Federated Learning, Ethical AI and Data Governance, Computer Vision, Medical Image Analysis, Edge Computing, Multi-Agent Systems

CORE COMPETENCIES

- Research Design & Methodology
- Statistical Analysis & Modeling
- Algorithm Development & Optimization
- Scientific Communication
- Project Management & Leadership
- Cross-functional Collaboration
- Critical Thinking & Problem Solving
- Continuous Learning & Adaptation
- Entrepreneurial Mindset

LANGUAGES

- **Arabic:** Native
- **English:** Advanced (B2/C1)
- **French:** Advanced (B2)

ACADEMIC REFERENCES

Prof. T. M. MAAROUK
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