Ayoub Abraich

AI Research Engineer — Data Scientist — Doctoral Researcher in Causal Inference

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Moroccan National — Available for Relocation

Professional Summary

AI Research Engineer with advanced doctoral training in causal inference, deep learning, and Large Language Model integration. Founded and scaled AI EdTech platform while maintaining active research career with 27+ publications. Transitioned from formal PhD to independent research and entrepreneurship in 2023, continuing to publish cutting-edge work in LLM compression and causal AI. Proven expertise translating theoretical research into production-ready systems with significant business impact.

Professional Experience

2024–Present **CTO & Co-founder**, *Deeprof*, Tunisia

- Architected and launched AI-driven educational platform leveraging advanced LLM integration for 10,000+ concurrent users
- Engineered highly scalable AWS cloud infrastructure
- Pioneered autonomous LLM tutoring agents with optimized inference through model compression techniques
- Implemented sophisticated microservice architecture using Redis caching and MongoDB for high-throughput operations
- Established comprehensive DevOps pipeline with automated testing (CI/CD), reducing release cycles by 60%
- **Key Technologies:** React, Next.js, FastAPI, LLM Agents, OpenAI API, LangChain, MongoDB, Redis, Docker, AWS

2020–2023 **Doctoral Researcher & PhD Candidate**, *LaMME, CNRS*, Université Paris-Saclay, France

- Led cutting-edge research in causal inference and deep learning, publishing 5+ papers
- Developed novel deep learning architectures for causal effect estimation, achieving 37% accuracy improvement
- Created the acclaimed SurvCaus framework with theoretical guarantees for survival analysis causal inference
- Optimized GPU-accelerated deep learning pipelines, reducing model training time by 45%
- Mentored 4 junior researchers in advanced deep learning techniques and causal inference methodologies
- *Strategically transitioned to independent research in 2023 to pursue entrepreneurial opportunities while continuing academic contributions*
- **Key Technologies:** PyTorch, TensorFlow, Causal ML, Advanced Statistics, GPU Computing, Scientific Computing

2019–Present **Senior Data Scientist (Freelance)**, *Malt — Upwork*, Remote

- Delivered high-impact AI/ML solutions for 50+ enterprise clients across fintech, healthcare, and e-commerce sectors
- Developed and deployed automated trading algorithm using compressed time-series models, achieving 22% annual return
- Built advanced customer segmentation models with optimized inference pipelines, increasing marketing conversion by 35%
- Implemented ML-based fraud detection system with model compression, reducing inference latency by 40%
- Engineered end-to-end ML pipelines with automated retraining, monitoring, and efficient deployment features
- Maintained exceptional 98% client satisfaction rating across diverse international projects
- **Key Technologies:** Python, Scikit-learn, XGBoost, PyTorch, TensorFlow, FastAPI, Docker, AWS, PostgreSQL

2019 **AI Research Intern**, *CMAP, École Polytechnique*, Palaiseau, France

Research on Visually Grounded Question Answering under Prof. Eric Moulines. Implemented multimodal deep learning architectures and reinforcement learning agents for conversational AI systems.

Independent Research & Continued Academic Contributions

2023–Present **Independent Researcher**, *Self-Directed Research*, Global Collaboration

- Continued publishing cutting-edge research in causal inference, and temporal modeling
- Published 12+ high-impact preprints in 2024-2025
- Developed novel theoretical frameworks for time-varying causal effects and representation balancing
- Collaborated with international research teams on AI compression and causal inference projects
- Maintained active research profile with 27,000+ reads and growing citation impact across multiple platforms

Education

2020–2023 **PhD Candidate in Data Science**, *Université Paris-Saclay*, Saclay, France
Advanced doctoral research in causal inference and deep learning applications — **Funding:** PhD Fellowship €57,000 (FMJH & EDMH) + Excellence Grant €14,000 — *Research focus strategically shifted to independent work and industry applications*

2018–2020 **Master's in Data Science - Finance (M1+ M2)**, *Université Paris-Saclay*, Saclay, France, *Top 5% Graduate*
Thesis: "Deep Learning for Causal Estimation" — **Specialization:** AI, Reinforcement Learning, Computational Statistics

2017–2018 **Bachelor's in Applied Mathematics (L3)**, *Université d'Evry-Val d'Essonne*, Evry, France, *First-Class Honours*
Advanced Mathematical Foundations

2016–2017 **Engineer's Degree (Diplôme d'Ingénieur)**, *INP-ENSEEIHT*, Toulouse, France
Applied Mathematics & Computer Science — Elite French Engineering School

2014–2016 **CPGE - Mathematics & Physics**, *Lycée Pierre de Fermat*, Toulouse, France
Classes Préparatoires aux Grandes Écoles — Intensive preparation for French engineering schools

Research Publications & Academic Impact

Recent Publications (2024-2025) - LLM & Compression Focus

- **Theoretical Guarantees for LT-TTD: A Unified Transformer-based Architecture for Two-Level Ranking Systems** *Preprint*, May 2025
- **TV-SurvCaus: Dynamic Representation Balancing for Causal Survival Analysis** *Preprint*, May 2025
- **TempoCredit: Temporal-Aware Credit Scoring with Hierarchical Attention Networks** *Preprint*, May 2025
- **ON DYNAMIC REPRESENTATION BALANCING FOR TIME-VARYING TREATMENT EFFECTS IN LONGITUDINAL SURVIVAL ANALYSIS** *Preprint*, January 2025
- **Trajectory-Based Representation Balancing with Decomposed Uncertainty for Dynamic Treatment Regimes** *Preprint*, January 2025
- **Personalized Dynamic Treatment Regimes in Multi-Dimensional Action Spaces: A Causal Reinforcement Learning Approach with Bayesian Uncertainty Quantification** *Preprint*, June 2024
- **A New Dawn for Artificial Intelligence: Large Language Model Agents and the Quest for Artificial General Intelligence** *Conference Paper*, May 2024

Core Publications & Established Frameworks

- **Representation Balancing with Theoretical Guarantees for Survival and Classification Causal Inference with Multiple Treatments** *Journal Article*, January 2024
- **A Unified Framework for Causal Manifold Autoencoders: Disentangling Causal Factors and Geometrical Structures with Latent Confounders and Nonlinear Manifolds** *Preprint*, January 2024
- **SurvCaus: Representation Balancing for Survival Causal Inference** A. Abraich, A. Guilloux, B. Hanczar. *arXiv:2203.02245*, March 2022. **(8+ citations)**
- **Theoretical Guarantees for Representation Balancing in Survival and Classification Causal Inference with Multiple Treatment Lines** *Preprint*, November 2023

Technical Reports & Applied Research

- **Deep Learning for the Estimation of Individual Treatment Effects** *Technical Report*, October 2020
- **Deep Reinforcement Learning for Visual Question Answering** *Technical Report*, August 2019
- **Deep Learning on MIMIC-III: Prediction of Daily Mortality in ICU Patients** *Technical Report*, June 2018

Research Impact 27 publications, 27,128+ reads (ResearchGate), 8+ citations (Google Scholar), Active independent researcher with growing international recognition

Technical Skills

Artificial Intelligence & Machine Learning

Deep Learning **Expert:** PyTorch, TensorFlow, Transformers (BERT, GPT, T5), CNNs, RNNs, LSTMs, GANs, Attention Mechanisms

Advanced: Neural Architecture Search, Transfer Learning, Few-Shot Learning, Meta-Learning, Adversarial Training

Model Compression **Expert:** Quantization (INT8, FP16, Mixed-Precision), Structured/Unstructured Pruning, Knowledge Distillation

Advanced: Matrix Factorization, Low-Rank Approximations, Neural Architecture Search, Hardware-Aware Optimization

LLM Integration **Expert:** LangChain, OpenAI API, HuggingFace Transformers, Prompt Engineering, Fine-tuning

	Advanced: RAG (Retrieval-Augmented Generation), LLM Agents, Chain-of-Thought, In-Context Learning
Causal Inference	**Expert:** Counterfactual Reasoning, Treatment Effect Estimation, Representation Balancing
	Advanced: Survival Analysis, Dynamic Treatment Regimes, Causal Discovery, Instrumental Variables
Computer Vision	**Advanced:** Vision Transformers (ViT), ResNet, YOLO, Object Detection, Image Segmentation
	Proficient: GANs for Image Generation, Style Transfer, Multi-modal Vision-Language Models
NLP	**Expert:** BERT, GPT, Transformer Architectures, Text Classification, Named Entity Recognition
	Advanced: Sentiment Analysis, Machine Translation, Question Answering, Text Summarization
Classical ML	**Expert:** Scikit-learn, XGBoost, Random Forests, SVM, Clustering (K-Means, DBSCAN)
	Advanced: Ensemble Methods, Hyperparameter Optimization, Feature Engineering, Cross-Validation

Software Engineering & Full-Stack Development

Frontend	**Expert:** React, Next.js, HTML5, CSS3, JavaScript ES6+, TypeScript
	Advanced: Redux, React Hooks, Material-UI, Tailwind CSS, Responsive Design
Backend	**Expert:** FastAPI, Python Flask, RESTful APIs, WebSocket, Microservices Architecture
	Advanced: Node.js, Express.js, GraphQL, API Gateway, Event-Driven Architecture
Databases	**Expert:** MongoDB, Redis (Caching), PostgreSQL, MySQL, SQL Query Optimization
	Advanced: Vector Databases (Pinecone, FAISS, Qdrant, Milvus), Database Design, Indexing Strategies

DevOps, Cloud & Infrastructure

Cloud Platforms	**Expert:** AWS (SageMaker, EC2, S3, Lambda, RDS, CloudFormation)
	Advanced: Azure ML, Google Cloud Platform, Multi-cloud Architecture
Containerization	**Expert:** Docker, Docker Compose, Container Optimization
	Advanced: Kubernetes, Helm, Container Orchestration, Pod Autoscaling
MLOps	**Expert:** Model Deployment, CI/CD Pipelines, Model Monitoring, A/B Testing
	Advanced: MLflow, Kubeflow, Model Versioning, Automated Retraining, Feature Stores
Monitoring	**Advanced:** Prometheus, Grafana, ELK Stack, Application Performance Monitoring
	Proficient: Log Analysis, Error Tracking, Infrastructure Monitoring

Programming Languages & Specialized Tools

Programming	**Expert:** Python (NumPy, Pandas, Matplotlib, Seaborn), SQL
	Advanced: JavaScript/TypeScript, C++, Bash/Shell Scripting
	Proficient: R, MATLAB, LaTeX, Git/GitHub
Data Processing	**Expert:** Pandas, NumPy, Dask, Apache Spark
	Advanced: ETL Pipelines, Data Streaming, Real-time Processing
Specialized Areas	**Reinforcement Learning:** Deep Q-Networks, Policy Gradients, Actor-Critic Methods, Multi-Agent RL
	Time Series: LSTM, ARIMA, Prophet, Temporal Convolutional Networks, Forecasting
	Optimization: Bayesian Optimization, Genetic Algorithms, Gradient-Free Methods
	Statistics: Bayesian Methods, MCMC, Variational Inference, Probabilistic Programming

Certifications, Languages & Research Focus

Professional Certifications	Deep Learning Specialization (DeepLearning.AI, 2019) — Machine Learning (Stanford University/Coursera, 2018) — Machine Learning for Trading (Data World, 2020)
Languages	**French:** Native Speaker — **Arabic:** Native Speaker — **English:** Professional Working Proficiency (C1)
Research Interests	Large Language Model Compression, Quantization Techniques, Knowledge Distillation, Efficient Transformer Architectures Causal Inference, Dynamic Treatment Regimes, Educational AI, Healthcare Applications
Awards & Honors	PhD Fellowship €57,000 (FMJH & EDMH, 2020-2023) — Excellence Grant €14,000 (FMJH, 2021) — Top 5% Graduate - Master's Program — First-Class Honours - Bachelor's Degree

Additional Information

Project Management	**Methodologies:** Agile, Scrum, Kanban — **Leadership:** Team Leadership, Cross-functional Collaboration, Mentoring
Professional Skills	Technical Writing, Scientific Communication, Peer Review, Conference Presentations, International Collaboration