

Mahdi Marsousi

Principal AI / Machine Learning Engineer

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PROFESSIONAL SUMMARY

AI / ML engineer and technical leader with 15+ years of experience building and leading production-grade machine learning, computer vision, and perception systems across startup and enterprise environments. Strong background in software development, system architecture, and structured software design, with deep expertise in creating flexible workflows and scalable pipelines that enable efficient development, integration, and deployment of complex AI-driven applications.

Proven track record of translating advanced research into robust production systems spanning computer vision, sensor fusion, robotics, tracking, radar perception, and intelligent automation. Experienced in Python and modern C++ software development, model optimization, ML system architecture, and deployment across edge, GPU, and cloud environments.

TECHNICAL HIGHLIGHTS

- Architected and deployed production AI systems across computer vision, radar perception, and sensor fusion domains
 - Built scalable ML pipelines and software architectures spanning cloud, edge, and GPU-accelerated inference environments
 - Owned technical delivery of AI systems from research prototyping through production deployment across cross-functional engineering environments
 - Inventor on multiple patents and author of peer-reviewed publications in AI, imaging, and machine learning
 - Design and Implementation of vision pipelines using Transformers, LLMs/VLMs; RAG and Agentic AI systems; QLoRA fine-tuning; multimodal data pipelines including zero-shot, image-to-text, and image-to-image transformers
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CORE EXPERTISE

Machine Learning & AI

Deep understanding of modern machine learning paradigms, deep neural network architectures, and the structural and optimization mechanisms that govern learning behavior and model performance. Experienced in architecting custom training frameworks and scalable ML workflows for model development, evaluation, deployment, and continuous improvement across production-grade AI systems.

- Deep Learning, Machine Learning, Computer Vision, Sensor Fusion, and Perception Systems
- Supervised, Semi-Supervised, Self-Supervised, Multi-Task, Transfer, and Fine-Tuning Paradigms

- Model Architecture Design, Training, Optimization, Evaluation, and Scalable ML Pipelines
- End-to-End Training Pipeline Development in PyTorch and TensorFlow
- LLM Applications, Multi-Modal AI, and AI-Assisted Data Processing
- Applied VLMs, zero-shot learning, and image-to-text/image-to-image transformers for automated labeling and augmentation (weather, lighting), improving dataset scalability and diversity.

Computer Vision & Perception

Leveraged extensive prior industry and research experience to establish and scale an AI-driven startup focused on computer vision, real-time multi-spectral data processing, and deep learning-based perception systems.

- Object Detection, Multi-Object Tracking, Re-Identification, Keypoint Estimation, Segmentation, Classification
- 3D Point Cloud Processing, Radar Perception, Camera-Radar Fusion
- NeRF, Automated Camera Calibration and Placement
- Motion Modeling, Trajectory Estimation, Temporal Tracking, Kinematic Systems
- Clustering, Filtering, State Estimation, and Sensor Data Association

Algorithms & Methods

Develop novel algorithmic frameworks for complex perception and machine learning problems by integrating mathematical modeling, learning-based approaches, and system-level process design. Focus on combining algebraic reasoning, probabilistic methods, and data-driven techniques to build scalable and robust solutions.

- CNNs, Autoencoders, Attention Mechanisms, Transformers
- Kalman Filter, JPDA, DBSCAN, Agglomerative Clustering
- Feature Engineering, Representation Learning, Signal and Sensor Data Processing
- Statistical Modeling, Optimization, Geometry, and Pattern Recognition

Programming & Systems

Passionate about architecting scalable, maintainable, and high-performance software systems that bridge advanced AI with production engineering. Experienced in applying sound design patterns and architectural principles across the stack—from ASP.NET Core web platforms to edge-deployed AI pipelines optimized for runtime efficiency.

- Python, C++, C#, JavaScript, SQL, Qt
- PyTorch, TensorFlow, Scikit-learn, OpenCV, NumPy, Pandas, SciPy
- ONNX, TensorRT, GPU Inference
- ML Infrastructure, Data Pipelines, CI/CD, Annotation and Evaluation Workflows

PROFESSIONAL EXPERIENCE

Lead AI Engineer, Perception & Sensor Fusion

Zadar Labs — Hybrid: San Jose, California, and Toronto, Ontario

2025 – Present

- Architect and develop perception pipelines for 3D radar point clouds using Doppler and SNR features to improve object separability and robustness in noisy sensing environments for real-world commercial sensing applications

- Develop clustering and segmentation workflows using DBSCAN and Agglomerative Clustering, improving object separability and robustness in noisy radar environments
- Build and optimize camera-radar fusion pipelines to improve object localization, trajectory consistency, and tracking robustness across sensing conditions
- Model vehicle kinematics and motion dynamics to improve prediction accuracy and state estimation in tracking systems
- Design and implement real-time object detection and multi-object tracking pipelines for dynamic 3D scenes using probabilistic tracking frameworks, motion estimation, and temporal filtering methods
- Implement high-performance software components in Python and C++, focused on modularity, maintainability, and real-time deployment

Selected Applications

- Indoor human tracking and fall detection using radar-based perception
- In-cabin occupant counting and localization
- Radar-camera person tracking and identification over wide-area coverage using PTZ camera systems

Co-Founder & Chief Technology Officer
EAIGLE — Markham, ON, Canada
2020 – 2025

- Co-founded and led the technical development of an AI-driven company delivering computer vision, machine learning, and intelligent sensing systems for smart infrastructure, automation, and real-time operational analytics
- Architected and implemented end-to-end deep learning and computer vision pipelines spanning data ingestion, annotation, model training, evaluation, deployment, and production integration
- Owned technical architecture and system design decisions across multiple production AI platforms, balancing performance, scalability, and extensibility constraints
- Designed and developed production-grade AI systems for detection, segmentation, tracking, OCR, multi-task learning, and event understanding across real-world enterprise environments
- Built and deployed edge + cloud AI architectures enabling low-latency inference on on-prem GPU systems with scalable downstream cloud processing, monitoring, and analytics
- Led technical design of AI systems leveraging CNNs, LSTMs, and LLM-integrated components across RGB cameras, multi-spectral imaging, and sensor-fusion workflows
- Leveraged VLMs, zero-shot models, and image-to-text and image-to-image transformers to automate data interpretation, labeling, and augmentation (e.g., weather and lighting variations), enabling scalable and diverse dataset curation.
- Architected a flexible, modular AI pipeline platform with a GUI-based workflow engine for dynamically composing and deploying computer vision and deep learning processes across production applications
 - Designed hybrid execution architecture combining C++ for performance-critical modules and Python for orchestration, flexibility, and rapid model integration
 - Enabled scalable system evolution through plug-in style extensibility, allowing efficient addition of new models, processes, and workflow components without redesigning the core platform
- Developed scalable ML workflows for data acquisition, annotation, feature engineering, model training, validation, optimization, and continuous model improvement

- Ensured production readiness through architecture decisions focused on performance, scalability, maintainability, and deployment reliability
- Led and mentored a 15-person cross-functional technical team including AI researchers, software developers, and field technicians

Selected AI / ML Systems Architected

- Designed and trained multi-task human perception models for body segmentation, body landmark estimation, and head pose prediction using 300K+ labeled images built from Microsoft COCO and custom annotations
- Led development of deep learning systems for face component segmentation, 3D human localization, object tracking, OCR, and event detection using 100K to 1M+ labeled images across multiple applications
- Architected large-scale vehicle perception pipelines using 1M+ labeled images and 500K+ unlabeled images for semi-supervised learning, supporting detection, segmentation, keypoint estimation, OCR, and structured vehicle datapoint extraction
- Developed AI systems across supervised, semi-supervised, transfer learning, fine-tuning, multi-task learning, and federated learning paradigms to improve model performance, data efficiency, and generalization
- Built perception and analytics pipelines across camera, multi-spectral, and radar data, including sensor-fusion workflows for tracking, environmental understanding, and occupancy estimation
- Directed annotation and data pipeline design across millions of labeled data points, including bounding boxes, segmentation masks, landmarks, keypoints, re-identification, OCR fields, and structured attributes

Senior Research Engineer, Computer Vision & Machine Learning
Huawei Technologies Canada — Markham, ON, Canada
2018 – 2020

- Designed and developed deep learning algorithms for object detection and tracking targeting mobile and embedded imaging applications
- Contributed to the design of advanced AI-based imaging pipelines for scientific and computer vision use cases
- Worked on research and development of high-performance computer vision systems bridging algorithmic innovation and practical deployment
- Supported software and architecture development for robust machine learning and vision-based applications

Software Developer II
Seiko Epson Corporation — Markham, ON, Canada
2017 – 2018

- Developed robotic vision algorithms for precision automation and machine-guided operation
- Implemented AI-based object recognition and gesture tracking models for embedded and robotics-oriented systems
- Contributed to computer vision software components supporting automation and intelligent sensing applications

Research & Development Engineer
Magna International — Brampton, ON, Canada
2016 – 2017

- Designed and developed perception algorithms for automated parking systems
- Built sensor fusion workflows combining ultrasonic sensors and cameras for parking spot detection, self-alignment, and collision avoidance
- Contributed to intelligent vehicle-environment understanding and automated maneuvering systems

EDUCATION

Ph.D. in Electrical & Computer Engineering
University of Toronto — Toronto, ON, Canada
2012 – 2016

M.A.Sc. in Electrical & Computer Engineering
Toronto Metropolitan University (formerly Ryerson University) — Toronto, ON, Canada
2010 – 2012

M.Sc. in Biomedical Engineering
K. N. Toosi University of Technology — Tehran, Iran
2006 – 2008

B.A.Sc. in Electrical & Computer Engineering
University of Tehran — Tehran, Iran
2000 – 2005

SELECTED PATENTS

System and Method for Automated Crowd Temperature Monitoring
M. MARSOUSI, A. MISHRA, A. HOSSEIN
US Patent App. 18/763,674, 2026

Systems and Methods for Processing Images to Detect Text
M. Marsousi, A. Hossein, B. Sekar, A. Mishra
US Patent App. 18/734,938, 2025

Systems and Methods for Automating Access
M. MARSOUSI, A. HOSSEIN, B. Sekar, A. MISHRA
US Patent App. 18/734,898, 2025

Computer-Aided Diagnosis for Detecting Abdominal Bleeding with 3D Ultrasound Imaging
S. Stergiopoulos, P. Shek, K. Plataniotis, M. Marsousi
US Patent 2015/0201907 A1, 2015

Automated Diagnostics in 3D Ultrasound System and Method
S. Stergiopoulos, M. Marsousi, K. Plataniotis
US Patent App. 16/708,964, 2021

Vehicular Control System

M. Marsousi, Harold E. Joseph, Nikhil Gupta, Alexander Velichko
US Patent App. 18/464,373, 2023

System and Method for Occupancy Monitoring

M. Marsousi, A.K. Mishra, A.H. Hosseini
US Patent App. 16/905,426, 2021

System and Method for Automated Water Operations for Aquatic Facilities Using Image-Based Machine Learning

M. Marsousi, A.K. Mishra, A.H. Hosseini
US Patent 10,725,438, 2020

SELECTED PUBLICATIONS

FedCMR: A Library for Federated Continual Model Refinement

X Wang, C He, S Avestimehr, M Marsousi
(FLSys) Workshop, MLSys, 2023

Kidney Detection in 3-D Ultrasound Imagery via Shape-to-Volume Registration Based on Spatially Aligned Neural Network,

M. Marsousi, K.N. Plataniotis, S. Stergiopoulos
IEEE Journal of Biomedical and Health Informatics, 2018

An Automated Approach for Kidney Segmentation in Three-Dimensional Ultrasound Images

M. Marsousi, K. Plataniotis, S. Stergiopoulos
IEEE Journal of Biomedical and Health Informatics, 2016

Computer-Assisted 3D Ultrasound Probe Placement for Emergency Healthcare Applications

M. Marsousi, K. Plataniotis, S. Stergiopoulos
IEEE Transactions on Industrial Informatics, 2016

An Adaptive Approach to Learn Overcomplete Dictionaries with Efficient Numbers of Elements

M. Marsousi, K. Abhari, P. Babyn, J. Alirezaie
IEEE Transactions on Signal Processing, 2014

Complete list > Google Scholar: <https://scholar.google.ca/citations?user=BCI8VVsAAAAJ&hl=en>

AWARDS & RECOGNITION

Co-Founder, EAIGLE — 2018–2025

Contributed to building and scaling an AI-driven technology company from inception to commercial products

Ontario Graduate Scholarship — 2014–2016

Awarded for academic excellence and research contributions at the University of Toronto

Queen Elizabeth II Graduate Student Research Award — 2012–2014

Awarded for outstanding academic performance and research contributions