

# Mohammed Motawea

## Simulation Engineer

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UAE residence visa holder · Egyptian national

### SUMMARY

Simulation engineer and Unity Certified Professional Programmer with 11+ years architecting real-time, physics-based simulation and digital-twin software across PC, mobile, and VR/AR. Built a GPU lattice-Boltzmann CFD wind tunnel (~8M cells in real time, built for aerodynamic design exploration and education), a CAD/BIM importer bringing STEP, IGES, and IFC data into the engine for digital twins, and a live browser-based industrial digital twin. Shipped Backlot Studio, a collaborative filmmaking suite built around physically accurate camera and lighting simulation, and Business Heroes, a business simulation with 600+ concurrent agents at 60 FPS on PC, Mac, and iOS, released on Steam with 85% positive reviews and adopted by three UAE universities. Currently building a Quest 3 teleoperation and imitation-learning pipeline in NVIDIA Isaac Lab.

### SKILLS

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|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Simulation:        | Physics-based real-time simulation (rigid-body, PhysX), GPU fluid dynamics (lattice-Boltzmann CFD, LES), agent-based simulation, procedural generation, digital twins, CAD/BIM ingestion (STEP, IGES, IFC), synthetic data, deterministic and reproducible simulation; NVIDIA Isaac Sim / Isaac Lab, ROS 2 (working) |
| Languages:         | C# (expert), Python, C++ (working), HLSL / compute shaders, JavaScript / TypeScript                                                                                                                                                                                                                                  |
| Engines & 3D:      | Unity 6 (URP / HDRP, SRP internals, Jobs System, Burst, Addressables, DOTS-aware patterns), Babylon.js, Blender, OpenXR / WebXR, Meta Quest 3                                                                                                                                                                        |
| Industry 3D:       | CAD/BIM-to-engine pipelines (own open-source importer: STEP, IGES, IFC, glTF), digital twins, live telemetry integration                                                                                                                                                                                             |
| Platforms & Tools: | Linux (Ubuntu), Windows, Git / GitHub, Azure, Node.js, WebSockets, Photon PUN, Firebase, Steamworks                                                                                                                                                                                                                  |
| Spoken:            | Arabic (native), English (fluent)                                                                                                                                                                                                                                                                                    |

### SIMULATION PROJECTS

- Wind Tunnel Simulation — real-time GPU CFD** *Open source (MIT) · Unity 6 · GPU compute · [github.com/Motawe3/unity-wind-tunnel](https://github.com/Motawe3/unity-wind-tunnel)*
- Engineered a lattice-Boltzmann solver (D3Q19, TRT collision, WALE LES) that runs ~8 million cells in real time entirely in compute shaders; any car, aircraft, or watercraft mesh is voxelized, sealed, and simulated in seconds.
  - Visualizes the flow with smoke streamlines and on-body pressure and shear heatmaps read directly from GPU-resident fields, alongside live force telemetry with convergence monitoring.
  - Automates yaw and ride-height sweeps and produces A/B comparison reports with uncertainty bands.
  - Built for aerodynamic design exploration and teaching; every run is bit-for-bit reproducible, so design variants compare like for like.
- CAD Importer for Unity** *Open source (MIT) · Pure C# · [github.com/Motawe3/CADImporter](https://github.com/Motawe3/CADImporter)*
- Imports STEP, IGES, IFC, glTF/GLB, OBJ, STL, and PLY straight into the engine for simulation and digital-twin work, normalizing units and axes while preserving assembly hierarchies and pivots for robot joints and rigging.
  - Every import gets per-part LOD chains, PBR materials, and simplified physics colliders, with roughly 6× geometry reduction through welding and quadric-error LODs.
  - Three import paths (drag-and-drop, batch window, runtime async API) plus an IFC/BIM inspector that recolors models by type, storey, or structural category.
- Starpilot Industrial Digital Twin** *Client project, US robotics-data company · Babylon.js · Node.js · WebSockets · 2026*
- Built a browser-based 3D digital twin of an industrial facility rendering employees, robots, and machines live; a Node.js socket server streams per-entity telemetry (position, activity state, heart rate, battery) to every connected client.
  - Operations console with rosters, status filters, per-entity inspector, follow-camera mode, and visibility toggles for floor-level situational awareness.
- VR Teleoperation → Imitation Learning Pipeline** *NVIDIA Isaac Lab · Python · Ubuntu 24.04 · 2026 (in progress)*
- End-to-end pipeline in which a Meta Quest 3 teleoperates a simulated Franka 6-DoF arm in Isaac Lab through a custom WebXR controller-pose bridge, with no proprietary streaming dependency.
  - Demonstrations are recorded to robomimic-style HDF5, augmented with Isaac Lab Mimic, and used to train BC and Diffusion Policy baselines that are evaluated closed-loop in simulation.

## Sift — LeRobot Dataset Quality Control *Open source · Python · 2026 (in progress)*

- A CLI that scores LeRobot v3.0 robot-demonstration datasets per episode and reports what is wrong with each one, so bad demos are caught before policy training.

## EXPERIENCE

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### Lead Simulation Engineer

Aug 2023 – Present

*Visionaries FZ-LLC · Dubai, UAE*

- Technical lead for Business Heroes, a business simulation title, leading a team of 3 engineers, 1 QA, and 1 artist; architected the agent-based simulation core in which 600+ NPC agents run concurrently, with designer-facing tools for tuning their behavior.
- Raised the frame rate of dense city scenes from 25 to 60 FPS on mid-range hardware through profiling, data-oriented patterns, and draw-call reduction.
- Built the deterministic economic simulation layer and a persistence system that survives save-state migrations across content patches, plus an 8-language localization pipeline including Arabic (RTL).
- Designed an Azure-backed telemetry and analytics pipeline that turns production run data into design feedback, and integrated cloud saves, leaderboards, and achievements.
- Shipped on PC, Mac, and iOS, earning 85% positive reviews on Steam, and delivered an educational edition adopted by three UAE universities.

### Senior AR Engineer / Division Lead

Nov 2022 – Aug 2023

*Pretia Technologies, Inc. · Tokyo, Japan (remote)*

- Led the 5-engineer entertainment and media division, delivering 5+ shipped AR products in one year on Pretia's AR-cloud localization framework.
- Tuned spatial tracking and anchoring for stability in crowded public-space deployments.
- Evaluated 15+ incoming technical proposals for architectural feasibility and resource cost.

### Simulation Engineer (Technical Lead)

May 2020 – Nov 2022

*Backlot Studio · California, USA (remote)*

- Led a team of 8 engineers building a collaborative filmmaking application for Windows, macOS, and iPad.
- Engineered physically accurate simulations of 15+ professional camera bodies and lenses and 30+ lighting fixtures, letting distributed film crews previsualize and plan real-world cinematography entirely in-engine.
- Designed an Addressables streaming system that manages 2TB+ of downloadable assets while keeping the install under 1GB, with pre-fetch and fallback logic for cross-platform parity.
- Built custom Editor tooling that cut library-asset integration time by 16 hours per scene.
- Brought large scene compositions to 60 FPS on PC (HDRP), then led the iPad port, migrating HDRP to URP while preserving visual fidelity at 50 FPS.

### VR & Simulation Developer

Apr 2018 – May 2020

*Elibre DMCC · Cairo, Egypt*

- Built an automated floor-plan-to-VR pipeline for real-estate visualization in which procedural furnishing generates fully staged interiors in under 2 minutes, cutting turnaround from 2–3 days to under 2 hours.
- Translated technical architectural plans into interactive VR experiences in collaboration with interior designers and engineers.

### Unity Developer (Multiplayer)

Jun 2015 – Mar 2018

*Bidaj Studio, Inc. · California, USA (remote)*

- Owned client-side architecture for a real-time multiplayer trading card game supporting up to 1,000 concurrent players (Photon PUN, Firebase).
- Cut latency-related desync by 60% through optimized data serialization and state-change events.

## EDUCATION & CERTIFICATIONS

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**Unity Certified Professional Programmer** — Unity Technologies · [credly.com/badges/a4163443-85de-4e5c-af95-d3fa8238079b](https://credly.com/badges/a4163443-85de-4e5c-af95-d3fa8238079b) 2026

**Unity Certified Expert Programmer** — Unity Technologies (credential expired) 2023

**B.Eng. Computers & Control Systems** — Mansoura University, Egypt