ABOLFAZL SAADAT (NEMO)

Software Architect, AI Systems Engineer & Computational Researcher

Computational Biotechnology · Geometric Deep Learning · Distributed Systems Architecture · 3D WebGL

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1. EXECUTIVE SUMMARY & ENGINEERING MANIFESTO

EXECUTIVE PROFILE

> Computational researcher and software architect with over 8 years of specialized engineering experience at the intersection of **computational biology, geometric deep learning (GNNs & RL in drug discovery), and enterprise-grade software architecture**. Proven track record of taking complex theoretical models from mathematical formulation to resilient, low-latency production platforms.
> **"Every problem does not require AI":** Firmly dedicated to solving fundamental friction through architectural precision. System backbones are anchored on deterministic databases, clean numerical solvers, and native code, with AI deployed strictly where it delivers genuine predictive or cognitive leverage.

2. TECHNICAL COMPETENCIES MATRIX

TECHNICAL MATRIX

Domain	Core Libraries, Languages & Tooling	Operational Mastery Level
Bio-AI & Drug Discovery	PyTorch, PyG (PyTorch Geometric), RDKit, SELFIES, AutoDock Vina, Smina, OpenBabel, BioPython	**Expert:** GNN architecture, PPO molecular RL, virtual screening, docking
Systems Architecture	Python (FastAPI, AsyncIO), Rust (Tauri Core), TypeScript, Modern ES6+, SQL, Docker, Microservices	**Principal:** Native desktop apps, distributed microservices, clean APIs
Data & Software Security	PostgreSQL, SQLite (Embedded High-Performance), Redis, MinIO, HMAC-SHA256, HWID Locking	**Mastery:** Double-entry ledgers, anti-tamper licensing servers, RBAC
Agentic AI & Workflows	Tool Calling / Function Calling, Model Context Protocol (MCP), ReAct Chains, SQLite Context Memory	**Advanced:** Autonomous agents with persistent memory & HITL governance
Scientific Simulation & WebGL	Three.js, WebGL, GLSL Shaders (GPU 100M Particles), Numerical RK4 Solvers, SCADA Telemetry	**Advanced:** Non-linear ODE solvers, industrial digital twins, real-time 3D
Bio-Signal Processing (BCI)	SciPy, NumPy, Butterworth Bandpass (0.5-50Hz), 1024-point FFT, Sequence Transformers	**Specialist:** Real-time EEG noise filtering & cortical pattern classification

3. FLAGSHIP ENGINEERED SYSTEMS & PLATFORMS

FLAGSHIP SYSTEMS

1. NeuroMol — Generative AI Platform for De Novo Molecular Design

`Lead AI Architect & Solo Engineer`

`Python 3.10+ · PyTorch Geometric · GATv2/MPNN · PPO RL · RDKit · SELFIES · FastAPI · Docker · 3Dmol.js`

End-to-end de novo molecular generation pipeline designed to discover novel therapeutic candidates targeting neurodegenerative biological targets (Alzheimer's BACE1 and GSK3β).

- **Graph Neural Network Encoders:** Hybrid GATv2 (Graph Attention) and MPNN layers capturing atomic features (atomic number, degree, formal charge, aromaticity, hybridization) over molecular graphs.
- **Reinforcement Learning Agent:** Proximal Policy Optimization (PPO) navigating the discrete grammar of SELFIES strings, ensuring 100% chemically valid candidate structures.
- **Pareto Multi-Objective Reward:** Formulated $R(m) = w_1 \cdot Docking + w_2 \cdot QED + w_3 \cdot (10\text{-}SAScore) + w_4 \cdot BBBPen$ for concurrent optimization of binding affinity, synthetic accessibility, and blood-brain barrier permeation.
- **Production Deployment:** Distributed containerized microservice stack with FastAPI and an interactive browser-based 3D molecular inspection canvas using 3Dmol.js.

2. ZarNegar — Industrial Gold & Silver Workshop ERP Platform

`Solo System Architect & Engineer`

`Tauri (Rust Core) · JavaScript ES6+ · Python 3 · FastAPI · SQLite · HMAC-SHA256 · Docker`

Comprehensive precious metal manufacturing ERP featuring real-time dual-entry weight vs fiat accounting, zero internet dependency, and hardware-locked cryptographic security.

- **Dual-Entry Accounting Engine:** Completely resolved IEEE-754 floating-point drift by implementing integer fixed-point arithmetic across pure metal weight ledgers (750 & 925 carats) and fiat balances.
- **12 Manufacturing Modules:** Casting flask volume modeling ($V = \pi r^2 h$), melting assay titration, 3D wax resin tracking, gemstone inventory, and precious metal refining reclamation balances (قالکاری).
- **Native Desktop Architecture with Tauri (Rust):** Slashed memory footprint to under 15MB RAM (>90% leaner than Electron) with native sandboxed execution and 100% offline operability on SQLite.
- **Cryptographic Licensing Server:** Anti-tamper licensing engine using HMAC-SHA256 signatures locked to CPU serial and BIOS hardware identifiers (HWID lock) with anti-cracking heartbeats.

3. Mazut Flue-Gas Cleaning Digital Twin — Industrial Simulation Platform

`Simulation Architect & Process Engineer`

`TypeScript · Three.js (WebGL) · Numerical ODE Solvers · Industrial SCADA UI · CEMS Telemetry`

8-stage thermodynamic and chemical process engineering digital twin for Heavy Fuel Oil (HFO 380) flue-gas cleaning (Combustion → SCR → Dry ESP → Wet FGD → WESP → CEMS).

- **Electrostatic Precipitator (ESP):** Implemented deterministic Deutsch-Anderson model $\eta = 1 - exp(-wA/Q)$ achieving verified 99.2% particulate capture efficiency.
- **Wet Limestone FGD Kinetics:** Continuous numerical integration of limestone dissolution, dynamic pH scaling (5.5–6.2), and gypsum crystallization, delivering 97.5% SO_2 reduction.
- **Fault Injection Laboratory:** Interactive simulation of 6 acute industrial failure scenarios with real-time CEMS telemetry response.

4. NEMO Pharma Lab — Computational Drug Discovery & BCI Ecosystem

`Bioinformatics & 3D Simulation Engineer`

`TypeScript · Three.js (WebGL) · AutoDock Vina Approximator · Python · BCI Signal Pipeline`

Bioinformatics ecosystem featuring real-time 3D molecular docking at steady 60 FPS, virtual screening of 520+ FDA-approved clinical compounds with Lipinski Ro5 compliance, ProteusAI multi-head structural attention for free binding energy estimation (ΔG), and CortexLink BCI pipeline (Bandpass → FFT → Transformer).

5. AGENT//LAB — Autonomous AI Studio

`Python · Function Calling · MCP · SQLite · Telegram`

Autonomous tool-calling agents adhering to the Model Context Protocol (MCP), multi-tier persistent SQLite conversation memory, and Human-in-the-Loop admin escalation with sub-800ms latency.

6. Chaos Lab — Non-Linear Dynamics

`WebGL / GLSL · Three.js · RK4 ODE Solver · Web Audio`

Adaptive Runge-Kutta 4th-order (RK4) integrator, 12 verified strange attractors (Lorenz, Aizawa, Rössler), 100M GPU particle shaders, and Lyapunov divergence simulation ($\lambda \approx +0.9056$).

7. Universal Solution Configurator

`Adaptive Logic · Scoping Engine · JSON Spec v2.0.0`

51-question adaptive bank across 7 stages, 26 solution archetypes, 65 modular capabilities with automated dependency resolution, 5 complexity tiers, and instant Markdown/JSON Spec v2.0.0 generation.

8. SMC Algorithmic Trading Engine

`Python · MetaTrader 5 API · Pandas · Risk Compounding`

Institutional Smart Money Concepts (SMC) order block and Fair Value Gap (FVG) detection, fixed fractional capital compounding, and sub-50ms execution via MT5 API.

4. RESEARCH PROGRAMS & THEORETICAL INTERESTS

RESEARCH PROGRAMS

• **De Novo Molecular Generation via Geometric Deep Learning:** Exploring 3D molecular graphs and reinforcement learning for BBB-permeable therapeutics in Alzheimer's and Parkinson's.
• **Structural Bioinformatics & Protein-Ligand Kinetics:** Formulating physics-guided machine learning estimators for binding affinity and mega-library screening.
• **Non-Linear Dynamics in Biological Systems:** Numerical integration of Hodgkin-Huxley neuronal membrane kinetics, physiological oscillators, and cellular chaos.
• **Resilient & High-Assurance Software Systems:** Offline-first native desktop software in Rust, HWID hardware-bound data cryptography, and GPU compute in the browser.

5. NATIVE & INTERNATIONAL LANGUAGES

LANGUAGES

Azerbaijani Turkish: Native Language | **Persian:** Native / Bilingual Fluency | **English:** Full Professional & Academic Proficiency (Authoring scientific papers, reading Q1 journals, drafting architectural specifications, international technical negotiation) | **Japanese:** Professional Working Proficiency (Technical & Conversational) | **Arabic:** Professional Working Proficiency (Technical & Scientific Texts).