

VELI ATES

Research software for scientific machine learning

Stochastic simulation • computer vision • reproducible research pipelines

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PROFILE

M.Sc. Embedded Systems Engineering. I build research software that keeps its claims traceable — large-scale computer-vision pipelines, stochastic biochemical simulation, and evidence-grounded AI systems. My interest is probabilistic and simulation-based modelling of living systems.

SELECTED IMPACT

- 1.6M+ image/video frames processed
- 270+ automated tests across 273 simulation modules
- Every simulation parameter carries a cited source
- 3+ years quality operations alongside study

CORE SKILLS

LANGUAGES & TOOLING

Python • TypeScript • C++ (basic) • Git • Linux • $\text{\LaTeX}$

SCIENTIFIC COMPUTING

Gillespie SSA • chemical Langevin (CLE) • tau-leaping • reaction–diffusion (RDME) • ODE/SDE foundations • SBML • model validation

MACHINE LEARNING & VISION

NumPy • pandas • OpenCV • PyTorch • large-scale image pipelines • FAISS • Sentence Transformers • local LLMs

RESEARCH SOFTWARE

pytest • CI/CD • packaging & releases • CLI tooling • provenance and validation gates

RESEARCH INTERESTS

- Simulation-based inference and probabilistic modelling of living systems
- Stochastic and multiscale biological simulation
- Representation learning for biological data
- Reproducible, provenance-aware research software

LANGUAGES

Turkish — native
English — professional
German — B1–B2, improving

AVAILABILITY

Open to PhD and research-engineer positions in Germany. Willing to relocate.

SELECTED RESEARCH & PROJECTS

Cell — stochastic multiscale simulation of a human hepatocyte

Independent research software • 2026–present

- Stochastic biochemical engine in real units: exact **Gillespie SSA** for low-copy species and the **chemical Langevin equation** for high-copy species, switched as a hybrid
- Spatial layer via the **reaction–diffusion master equation**: a voxel lattice with compartment-confined diffusion hops and Poisson tau-leaping
- ~55,000 lines of Python across 273 modules; 270+ automated tests
- SBML integration; structural audit against Human-GEM and the König 2012 hepatic-glucose model
- **Provenance firewall**: every parameter carries a checksummed source reference, and rates that fail the validation gates are quarantined as exploratory rather than silently used
- Interactive 3D browser renderer (TypeScript) driven by engine state

DiversityLens — large-scale dataset auditing

M.Sc. thesis, DFKI Robotics Innovation Center • 2025–2026

- End-to-end Python package: image/video discovery, frame sampling, face detection and attribute analysis, structured aggregation, and interactive reporting
- Processed **1.6M+ frames across 10+ datasets**, with cross-backend comparison and evaluation against ground truth
- Delivered as reproducible research software: CLI, pytest, GitHub Actions, documentation, packaging, and automated releases
- Co-authored paper under review (CHIRA 2026)

AI Evidence Assistant — claim-to-source verification

Research project • 2025–present

- Planner, retriever, and verifier stages link each generated claim to supporting *and* contradicting source passages
- Local document ingestion, chunking, Sentence-Transformer embeddings, FAISS retrieval, prompt construction, token streaming, and resource-aware benchmarking

Edge AI tensor path

Independent project • 2026

- Compact 7–12–8–1 network trained with manual tensor mathematics and exported for a C++ loader, keeping weights inspectable at every stage

EDUCATION

M.Sc. Embedded Systems Engineering

Fachhochschule Dortmund • 2021–2026

Thesis research, implementation, and writing completed; formal submission and graduation procedures pending.

B.Sc. Mechatronics Engineering

Karabük University •

Foundation in programming, electronics, sensing, control, mechanics, and hardware–software integration.

PROFESSIONAL EXPERIENCE

Working Student — Content Moderation / Quality Operations

TELUS International / CCC Essen Digital GmbH • 2022–present

- Three years of consistent work in an international, quality-sensitive, deadline-driven environment alongside graduate study
- Guideline interpretation, consistency checks, independent decision-making, and communication across multicultural teams

WORKING STYLE

Builds complete research workflows end to end — ingestion, model integration, quantitative evaluation, visualization, testing, documentation, and release automation — and prefers models that state their own limits: explicit assumptions, cited parameters, and claims that can be traced back to evidence.