

Klenio Padilha

Independent AI Researcher — Mathematical Guarantees for Regulated AI

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PROFILE

Self-taught technology professional with **25+ years of experience** spanning four decades of computing — from legacy systems (Clipper, COBOL) through Delphi, C++, Java, PHP, Linux and databases to modern AI — with projects delivered across Europe (France, Germany, Portugal). Now leading independent research on **deterministic vector search** and **AI with mathematical proof guarantees** for regulated sectors, validated at 100M-vector scale and published as 23 DOIs on Zenodo. Philosophy: *mathematical guarantees, not probabilistic heuristics — every claim has a metric, every benchmark is honest.*

PROFESSIONAL EXPERIENCE

Independent AI Researcher — WINNEX Research Program (Madhava) 2024 – Present

Deterministic vector search, agent security, pre-patent architectures

- Designed a deterministic vector-search engine replacing probabilistic heuristics (HNSW, IVF) with Cauchy-Schwarz upper bounds — every discarded document carries the mathematical proof it could not be in the top-K.
- Validated at 100M vectors (BIGANN-100M): NDCG@10 = 1.000 with 0 bound violations; determinism and an auditable evidence chain for regulated markets.
- Authored WINNEX — a deterministic, training-free inference framework composing a spectral tokenizer, a manifold projector and the bound engine, shipped as three PyPI packages (C++20 cores).
- Applied the guarantee to agent security (Madhava-Sec): 98.1% reduction in LLM calls with 0 violations on 416 AgentHarm scenarios.
- Built pre-patent architectures for regulated domains: RAI multi-agent orchestration (Ed25519 audit trail), Solon (legal AI) and the Tracer product family for government, legal, healthcare and finance (recall@10 = 1.0000, 0 violations).
- Published 23 DOIs (Zenodo) and 17 public Kaggle notebooks; 6 bugs fixed publicly with full transparency.

AI Research & Machine Learning Engineer 2020 – 2024

Machine learning, embeddings, vector search

- Entered AI in 2020: machine learning, embeddings and vector search — foundations of the Madhava research program.
- Built spectral and manifold-based inference components with explicit, verifiable mathematics.

Software Engineer — Distributed Systems 2015 – 2020

Enterprise systems, integration, advanced SQL

- Built and integrated enterprise systems; deepened software architecture, advanced SQL and infrastructure.
- Contributed to production projects in France, Germany and Portugal.

Linux / Database Administrator and Systems Engineer 2010 – 2015

Linux administration, automation, deployment, relational databases

- Consolidated Linux administration (automation, deployment) and relational database design and optimization.

Software Developer — System Languages 2005 – 2010

C++, Java, object-oriented programming, Linux servers

- Developed systems in C++ and Java; first production experience with Linux as a server platform.

Software Developer — Desktop Applications 2000 – 2005

Delphi, data modeling, database administration

- Migrated to Delphi, building desktop database applications; learned data modeling and database administration.

Software Developer — Legacy Systems Early 2000s

Clipper, COBOL

- Started career as a programmer in Clipper and COBOL — the foundation of corporate systems of the era.

CORE SKILLS

Programming: Clipper, COBOL, Delphi, C++, Java, PHP, Python · **Linux:** systems & server administration · **Databases:** modeling, administration, optimization · **AI / ML:** vector search, machine learning, multi-agent systems, C++20 + AVX2 · **Research:** honest benchmarks, reproducibility (Kaggle/Zenodo/PyPI), EU AI Act compliance · **Soft skills:** self-taught learning, adaptability across 4 decades of change

SELECTED PUBLICATIONS & RESEARCH OUTPUT

WINNEX UB Width Forensic Supplement — the engine orchestrates proof and heuristics, exposing per-document exclusion source; honest benchmark: recall@10 = 1.0000 in 5/6 scenarios, 0 violations. DOI 10.5281/zenodo.21954024 (2026)

WINNEX — Weighted Inference Neural Network Enhancement — deterministic, training-free inference framework (spectral tokenizer + manifold projector + bound engine). DOI 10.5281/zenodo.21925977 (2026)

Winnex Tracer Series v5 — mathematical-proof retrieval for regulated domains (GOV/JUS/MED/GAP). DOI 10.5281/zenodo.21826594 (2026)

Madhava — BigANN C++ (100M vectors) — NDCG@10 = 1.000, 0 bound violations. DOI 10.5281/zenodo.21166403 (2026) · **Madhava Cascade** — founding article. DOI 10.5281/zenodo.20970487 (2026) · **Winnex RAI Architecture** — 21-page pre-patent, multi-agent orchestration with Ed25519 audit trail. DOI 10.5281/zenodo.21292595 (2026)

PsiQRH — Quaternionic-Harmonic Framework — reformulating transformer attention via quaternion algebra. DOI 10.5281/zenodo.17171112 (2025) · **Observing the performance of distribution systems with embedded generators** — peer-reviewed, European Transactions on Electrical Power (2004)

EDUCATION & LANGUAGES

Education: Self-taught — continuous independent learning across four decades of computing · **Languages:** Portuguese (native), English (basic), Spanish (basic)