César Perales

Systems Architect &
CS Student

Contact

- Lima, Perú
- c.casurpie@gmail.com
- cdecasurpie.github.io
- /cdecasurpie
- /cesar-perales

Education

Computer Science
UTEC - Universidad de Ingeniería y Tecnología
In Progress

🏆 **GPA: 3.8 / 4.0** (Top Tier)
Teaching Assistant: Data Structures & Algorithms.

Environment

🐧 **Arch Linux**
(Daily Driver / Advanced Config)

Core Skills

System Architecture
Strategy Pattern, MVC, Distributed Logic, Modular Design.

Algorithms
Inverse Kinematics, Spatial Indexing (R-Trees), Big O Optimization.

Mathematics
Linear Algebra, Vector Calculus, Verlet Integration.

Professional Profile

Computer Science specialist with a strong focus on **Software Architecture** and **Mathematical Modeling**. Passionate about building scalable systems from scratch, from physics engines to complex database kernels. I thrive in environments that require abstract reasoning, high-efficiency code, and deep understanding of memory management and algorithmic optimization.

Engineering Projects

Custom Multimodal Database Kernel ↗

PYTHON · B+ TREES · R-TREE · SQL PARSER

Developed a full-stack DBMS from scratch implementing 5 dynamic indexing strategies.
- **Core Engineering:** Implemented B+ Tree, Extensible Hash, and R-Tree algorithms manually for optimized $O(\log n)$ and $O(1)$ access.
- **Spatial Engine:** Built a spatial query processor supporting INTERSECTS, NEAREST, and range queries on WKT geometries.
- **Custom Parser:** Designed a recursive descent SQL parser extended with spatial syntax.

Procedural Quadruped Animation Engine ↗

GODOT · INVERSE KINEMATICS · VERLET INTEGRATION

Real-time procedural animation system for quadruped locomotion without pre-rendered assets.
- **Mathematical Modeling:** Implemented Inverse Kinematics (IK) and spring-mass physics (Verlet) to simulate organic inertia and weight.
- **Terrain Adaptation:** Developed a raycasting system that adjusts limb placement dynamically based on topography.
- **State Machine:** Engineered an 8-phase locomotion cycle using sigmoid interpolation for smooth motion blending.

Real-time Multiplayer Strategy Engine ↗

LUA · ROBLOX STUDIO · DISTRIBUTED SYSTEMS

High-concurrency "Tower Defense" architecture handling massive state replication.
- Engineered a low-latency replication system to synchronize game state across clients with minimal bandwidth usage.
- Optimized rendering pipelines and memory usage for stable performance on low-end devices.

More Projects

High-Performance Spatial Graph Library [↗]

C++ · CGAL · Memory Management

Custom library for spatial data handling and graph construction similar to OpenStreetMap.

· Implemented custom indexing mechanisms for efficient spatial queries on large datasets.
· Optimized memory allocation strategies to handle city-scale graph networks.

Rinder - Graph-based Matchmaking AI [↗]

Python · Flask · Graph Theory · AI

Freshman Year Capstone Project: Architecture for a dating platform utilizing matching algorithms.

· Designed a weighted graph algorithm to calculate compatibility scores based on multi-dimensional user vectors.
· Implemented Neural Networks for pattern recognition in user preferences.
· *Note: The linked demo is a visual demonstration of the frontend architecture.*

Professional Experience

Academic Instructor & Tech Mentor

CAPS-UTEC & Superprof   2022 – Present

Part-time specialist instructor for CS fundamentals.

· **Group Leadership:** Conducted rigorous sessions for groups of 15+ university students on Data Structures and Algorithms (CAPS).
· **Personalized Mentoring:** Delivered tailored 1-on-1 coaching for complex programming topics, adapting to individual learning curves.

Full Stack Developer

Haramara   2024 – 2025

· Architected a booking platform for aquatic activities using Next.js and Tailwind.
· Optimized database queries and frontend state management for seamless UX.

Software Developer

BenjiOr   2023 – 2025

· Developed comprehensive inventory and sales management systems using Python (Flask) and SQLite.
· Focused on modular code structure to ensure scalability and ease of maintenance.

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Tech Stack

Languages
C++, Python, Lua, JavaScript, TypeScript, GLSL, GDScript.

Frameworks & Libs
React, Next.js, Flask, Pygame, CGAL, PyQt5.

Databases
PostgreSQL, SQLite, Custom Indexing (B-Tree/Hash).

Dev Tools
Git, Docker, Vim/Neovim, Bash.

Languages

[A文]   Spanish (Native)
[A文]   English (Professional)

Creative Tech

Graphics & 3D
OpenGL/WebGL, Blender (Modeling), Godot Engine.