

# Pol Roca Cerdá

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Portfolio: <https://midnaaaaaa.github.io>

## EDUCATION

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- **Universitat Politècnica de Catalunya (UPC - FIB)** Barcelona, Spain  
*Master of Science in Innovation and Research in Informatics (MIRI)*  
*Specialization in Computer Graphics and Virtual Reality*  
Sep 2024 – July 2026
- **Universitat Politècnica de Catalunya (UPC - FIB)** Barcelona, Spain  
*Bachelor of Science in Computer Engineering*  
*Specialization in Computer Science*  
Sep 2020 – Jun 2024

## EXPERIENCE

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- **Hospital Universitario Valle de Hebrón** Barcelona, Spain  
*C++ Software Engineer and Research Intern*  
Sep 2025 – July 2026
  - Engineered a **medical imaging platform (C++, Qt, VTK, OpenGL)** akin to 3D Slicer, integrating real-time 3D volume rendering, synchronized multi-panel views, and interactive volumetric editing tools, used by medical professionals
  - Developed a specialized **computer vision pipeline for colon segmentation in CT scans**, utilizing a **custom A\* search algorithm** for robust medial axis extraction.
  - Formulated an advanced **A\* cost heuristic** that integrates anatomical parameters, raw medical image intensities, and tubularity filtering to navigate complex structures and occlusions.
  - Implemented the final volumetric segmentation using **Graph Cuts** optimization, computing **custom graph weights** derived from the medial axis spatial priors and a **3D watershed map**.
- **Research Center for Visualization, Virtual Reality and Graphics (ViRVIG)** Barcelona, Spain  
*Graphics Programming Intern*  
Oct 2024 – Sep 2025
  - **Engineered a real-time massive environment viewer in Unity**, leveraging **compute shaders, GPU instancing**, and **dynamic LOD** for optimal rendering performance
  - **Implemented advanced rendering techniques**, including **chunk-based terrain streaming, frustum culling, triplanar mapping**, and **custom water shaders**
  - **Built a procedural generation pipeline in Python** from OpenStreetMap data, modeling terrain path costs via feature histograms (e.g., slope, roughness) for **custom A\* pathfinding**
  - **Generated dynamic road networks using graph algorithms**, evaluating path variations based on difficulty predictions from a trained **Random Forest** machine learning model
  - **Adapted the rendering pipeline for Meta Quest VR**, optimizing performance and **integrating custom post-processing effects** like **distance-based fog**
  - **Awarded Best Undergraduate Final Project of 2025** at the Spanish Computer Graphics Conference (**CEIG 2025 – Eurographics**)
- **EY (Ernst & Young) - Technology Consulting** Barcelona, Spain  
*Fullstack Intern (Part-time)*  
Nov 2023 – Mar 2024
  - Developed backend services and frontend components using **Java Spring Boot** and **Vue.js** for a large-scale platform
  - Maintained unit tests to ensure system reliability and managed CI/CD pipelines with **Jenkins**

## PROJECTS

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- **Night Knight – 2D Game & Custom Engine**: Developed a 2D game and its custom engine from scratch using modern **C++** and **OpenGL**, implementing sprite animation systems, post-processing framebuffers, and proprietary level-building tools.
- **GPU Path Tracer**: Implemented a hardware-accelerated path tracer simulating global illumination, in Unity with multi-bounce light transport and importance sampling techniques.
- **SpaceVR – Zero Gravity VR Game**: Created an immersive physics-based VR experience for Meta Quest using Unity, featuring 6DOF object interactions, dynamic gravity control, and standalone rendering optimizations.
- **Physics Simulation Engine**: Built a real-time physics engine from scratch (**C++**, **Qt**, **OpenGL**), implementing custom numerical integrators to simulate complex fluid and cloth dynamics.

## SKILLS SUMMARY

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- **Graphics & Engine**: Unity, OpenGL, GLSL/HLSL, CUDA, Compute Shaders, GPU Instancing
- **Programming Languages**: C/C++, C#, Python, Java, JavaScript, SQL, Haskell, Erlang, Prolog
- **Libraries & Frameworks**: Qt, VTK, ITK, OpenMP, MPI, Scikit-learn, GDAL, NetworkX
- **Tools & Architecture**: Git, CMake, PlasticSCM, CI/CD, Linux, Windows
- **Languages**: Native: Spanish, Catalan; Proficient: English