

Marcellinus Aroli

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PROFILE SUMMARY

High-performance C++ Software Engineer with 6+ years of experience delivering in-silico cardiac electrophysiology simulators at MetaHeart (Computational Medicine Laboratory). Specializes in accelerating large-scale numerical simulations using MPI and CUDA on Linux, consistently improving runtime and reliability in research-grade software.

EDUCATION

PhD of Engineering <i>Kumoh Institute of Technology</i>	expected August 2026
Master of Engineering <i>Kumoh Institute of Technology</i>	August 2018
B. Sc. Information Technology <i>President University</i>	September 2015

RELEVANT COURSEWORK

Computational Physiology | Algorithm and Data Structure | Differential Equation | Applied Mathematics | Software Engineering

PROFESSIONAL EXPERIENCE

Computational Medicine Laboratory (MetaHeart) – Software Engineer & Team Manager

Sep 2018 – Present

- Designing and developing CardioSim, a C++-based cardiac electrophysiology simulation platform used by students and researchers for modeling and analysis.
- Implementing parallel programming with MPI and CUDA in performance-critical simulation kernels, improving overall runtime by approximately 30%.
- Building and maintaining a Qt Widgets-based GUI for CardioSim, enabling intuitive setup, execution, and visualization of complex simulation experiments.
- Collaborating with researchers to translate mathematical and physiological models into robust C++ components.
- Managing the development team that consists of 3 members and tracking their development progress with their respective works.

PT iForce Indonesia – Software Engineer (as vendor for Maybank Indonesia)

Dec 2015 – Aug 2016

- Improved and extended Maybank's Online Customer Registration System, delivering new features to streamline onboarding and automate document handling.
- Built and integrated scanned-document processing modules using the OpenText API, enabling accurate extraction of 15+ data fields per document and reducing manual data entry by ~40%.
- Refactored key backend components to improve performance, reducing average document-processing time from ~12 seconds to ~7 seconds (~40% faster).
- Collaborated closely with business analysts and technical teams to translate requirements into scalable, maintainable solutions aligned with banking compliance standards.
- Optimized processing workflows by refactoring legacy components, resulting in more reliable performance and reduced processing errors.

Aprisma Indonesia – IT Support (as vendor for ANZ Indonesia)

Jan 2012 – Jan 2014

- Resolved technical issues for 500+ internet banking users per month, helping maintain 99.9% system uptime and high customer satisfaction.
- Designed and implemented middleware integrations enabling credit card point redemption in online marketplaces within the Internet Banking platform.
- Coordinated deployment of 10+ major system updates, ensuring minimal downtime and adherence to banking security and compliance standards.
- Collaborated with cross-functional teams to analyze customer requirements and deliver solutions that improved system performance by approximately 15%.
- Monitored and tuned internet banking application and middleware components, proactively reducing incidents by around 20% through early detection.

TECHNICAL SKILLS & CERTIFICATION

- Programming & Software Engineering (C/C++, Qt, Java, CUDA, MPI, Python (basic), BaSH)
- Data Handling & Data Management (JSON, CSV, SQL (SQLite))
- High-Performance & Parallel Computing (GPU programming (CUDA), distributed computing (MPI))
- Data Analysis & Scientific Computing (Numerical methods, statistical simulation)
- Mathematical Skills (Differential Equations, Electrophysiology Mathematical Modelling)
- Medical Knowledge (Physiology, Electrophysiology, Mathematical Physiology)
- Software Tools & Build Systems (Git, CMake)
- Documentation & Technical Communication (LaTEX)
- Linguistic Skills (English (TOEIC 990, IELTS 6.0), Korean (KIIP 1))

PROJECT EXPERIENCE

MetaHeart – CardioSim Electrophysiology Simulator (<http://cardiosim.metaheart.kr:8080/>)

- Developed a high-performance cardiac electrophysiology simulator with an emphasis on numerical accuracy and computational efficiency.
- Implemented core simulation algorithms in classic C++, ensuring robust memory management (with pointers and references), deterministic execution, and minimal overhead.
- Optimized nonlinear ODE/PDE numerical solvers for simulating cardiac action potentials, reducing simulation time by up to 30% with the correct parameters.
- Designed and built the GUI using Qt, enabling intuitive visualization and interaction with complex electrophysiology models.
- Refactored legacy components into modular, testable C++ classes, improving maintainability and overall code quality.
- Implemented multi-threaded workloads using MPICH and CUDA GPU to accelerate simulation loops on multi-core architectures.
- Ensured numerical correctness through unit testing, validation against published electrophysiology models, and reproducibility checks.
- Integrated file I/O pipelines for simulation parameters, logs, and visualization outputs (JSON/CSV/binary formats).
- Collaborated in the design of the simulator architecture, ensuring scalable code structure suitable for future extensions (e.g., tissue-level modeling).

HONORS & AWARDS

KOSOMBE Best Poster Presentation Award

May 2023

- Recognized for an exemplary presentation for my laboratory project, CardioSim.