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Summary

Computer Vision & Spatial AI Engineer *with 4+ years of industry experience and an M.Sc. in Visual Computing (Germany), specializing in real-time perception, 3D reconstruction, and spatial AR systems. Skilled at optimizing deep learning and graphics pipelines for low-latency edge, mobile, and server inference and integrating them into scalable production architectures. Experienced technical lead adept at mentoring engineers and facilitating the transition from cutting-edge AI/ML research to real-time model deployment.*

Professional Experience

CAD-IT Consultants (Asia) Pte Ltd - Computer Vision Engineer (Indonesia) **Nov 2020 – Apr 2023**

- Supervised a team of 4 engineers delivering 14 end-to-end machine learning, computer vision, and augmented reality (AR) solutions for clients in Southeast Asia and Europe from ideation to deployment. Some of closely related projects are:
  - ➢ *Object detection & track : warehouse inventory, raw materials, industrial tools, agricultural monitoring, and automated microbiological counter.*
  - ➢ *Robotics & Industrial AI : real-time warehouse drone feed inference, anomaly/defect detection, operator guidance systems, OCR-based data acquisition.*
  - ➢ *Action recognition : hand gesture and pose recognition pipeline for assembly guidance system.*
  - ➢ *Spatial AR & Navigation : mobile indoor navigation apps and 3D building interior viewer.*
- Optimized model performance using ONNX formats and built TensorRT (.engine) compilation pipelines to maximize inference throughput for real-time visual computing solutions across edge and server deployment platforms.
- Collaborated directly with product managers to define technical requirements, explain complex ML concepts, and ensure solution alignment with business goals.
- Enforced version control (Git) for clean code and reviews, and produced technical documentation, developer tutorials, and step-by-step integration guides for smooth project handover.
- Recognized in the top 10% of employees for innovation and measurable contributions to company growth.

Self-Employed Consultant - Computer Vision Engineer (Singapore) **Jan 2021 – Apr 2022**

- Delivered 6 computer vision projects for Singapore-based clients, covering GAN-based image generation, image enhancement, super-resolution, image matting, image quality assessment, face recognition, and OCR.
- Implemented solutions in Python using PyTorch and classical ML techniques, optimizing for performance and scalability.
- Deployed models within a microservices architecture for seamless integration into existing client software pipelines, ensuring maintainability and rapid iteration.

Multipolar Technology - Application Developer (Indonesia) **Nov 2019 – Nov 2020**

- Configured bare-metal and API protection infrastructure for enterprise Identity and Access Management (IAM) systems supporting high-concurrency mobile and web banking services.
- Executed system load testing and performance profiling to ensure reliable sub-second response times for high-volume REST APIs.

Bandung Institute of Technology - Mechatronics laboratory assistant (Indonesia) **Aug 2018 – June 2019**

- Instructed 2nd–4th year Mechanical and Mechatronics Engineering students in laboratory courses on electrical components, PLC programming, and microcontroller systems (Arduino), covering both theory and hands-on applications.

Robomarine Indonesia - Robotics Simulation Intern (Indonesia) **June 2018 – Aug 2018**

- Utilized ANSYS Fluent for CFD-based optimization, performing meshing, geometry preprocessing, and simulation parameter tuning to maximize hydrodynamic efficiency.
- Optimized Autonomous Underwater Vehicle (AUV) design using physical-based Computational Fluid Dynamics (CFD) simulation, allowing higher performance on underwater operating periods by 306% of its initial design.

Research Experience

Computer Graphics Group, Universität des Saarlandes - Master Thesis Researcher (Germany) **Aug 2024 – Sept 2025**

- Developed a high-performance GPU-accelerated volume path tracer using CUDA and NVIDIA OptiX to simulate complex physically based rendering (PBR) and light transport in heterogeneous volumes.
- Integrated neural inference pipelines (TinyCUDA-nn) into interactive rendering workflows, achieving a 1600% throughput increase and 60% memory footprint compression for low-latency, bandwidth-constrained environments.
- Optimized 3D data processing pipelines and low-level memory access using NVIDIA Nsight Compute, eliminating latency bottlenecks to achieve stable 1080p rendering (~30-60 FPS).
- Modified the Mitsuba3 inverse rendering pipeline to support gaussian volume primitive training for arbitrary heterogeneous volume, leveraging its underlying JIT compiler backend (Dr.JIT) to optimize dynamic inverse rendering pipeline.

Autonomous Vehicle Research Group, Bandung Institute of Technology - Robotics Engineer (Indonesia) **Sept 2016 – Nov 2019**

- Led and advised an 8-member mechanical team in CAD design, simulation, manufacturing and assembly to develop 9 autonomous mobile soccer robots for RoboCup MSL (Middle Sized League) and a telepresence robot.
- Developed a custom omnidirectional camera system using a catadioptric mirror, ray-tracing simulation for wide-angle visual perception, and CNC manufacturing. It enables scene segmentation over an entire field with only a fraction of the original device price (2%). This includes an image processing pipeline to detect ball and segment playing fields, achieving real-time performance ~30FPS and suitable for remote sensor calibration and parameter tuning through ROS1.

- Conducted bachelor's thesis on the design and control of a high-speed (~6 m/s) ball-handling mechanism, meeting RoboCup Middle-Sized League requirements and delivering a generalizable control algorithm with STM32 microcontroller.
- Managed research schedules and manufacturing pipelines in coordination with other divisions (electronics and software), including hardware development lifecycle (CAD design, simulation, manufacturing vendors, final assembly, and testing).
- Achieved various awards over the span of 3 years for both regional and national levels.

Education

M.Sc., Visual Computing, Mathematics & Computer Science Dept., Universität des Saarlandes, Germany Apr 2023 – Sept 2025
- Thesis: Neural-precomputed scattering for real-time rendering of heterogeneous volumes.
- Core coursework: Computer Graphics, 3D Computer Vision, High Level Computer Vision, Image Processing and Computer Vision, Image Compression, System Architecture, Reinforcement Learning, and Digital Signal Processing.

B.Sc., Mechanical Engineering (Mechatronics minor), Bandung Institute of Technology, Indonesia Aug 2015 – Oct 2019
- Thesis: Design and control system of ball handling mechanism for mobile soccer robots.

Selected Projects

3D Gaussian Splatting for Lightweight Autonomous Driving Simulation [Vulkan, CUDA, TensorRT, ROS2] – Personal project **(2026)**
- Engineered a lightweight real-time 3D simulation engine utilizing 3D Gaussian Splatting integrated with Vulkan, CUDA, and TensorRT for high-fidelity visual perception.
- Optimized memory allocation via Multi-Anchor Gaussian Splatting, restricting GPU VRAM consumption to 650MB while achieving 215 FPS (480p) and 90 FPS (1080p) for large-scale spatial environments.
- Designed a zero-copy data transfer architecture utilizing Vulkan-CUDA interoperation, eliminating host-to-device memory overhead to enable synchronous DeepLabv3+ inference and simulation rendering at 60FPS.
- Compiled deep learning perception pipelines into ONNX and optimized via TensorRT execution (FP16 precision) to output real-time 2D semantic costmaps for spatial navigation.

Real-Time LiDAR Simulation Engine [C++, CUDA, VDBFusion, OptiX] – Ongoing Project **(2026)**
- Engineering a lightweight and high-performance 3D LiDAR simulation engine for robotics simulation from LiDAR-derived surface mesh representation of KITTI LiDAR point clouds.
- Implementing custom spatial optimization utilizing hardware ray traversal (NVIDIA OptiX) and advanced 3D spatial partitioning to optimize GPU memory bandwidth.

Physically Based Software Path Tracer [Modern C++, Multithreading] – Study Project (2024)
- Engineered a native, multi-threaded C++ software path tracer from scratch implementing modular BVH acceleration structures, advanced material models (Disney BSDFs), light sampling, and custom pixel samplers.
- Implemented advanced rendering algorithms including volumetric fog, thin-lens depth of field, bloom, normal mapping, alpha masking, line tracing, and Intel Open Image Denoise (OIDN) integration to produce high-fidelity visual outputs.
- Designed a unique non-photorealistic artistic rendering pipeline, earning the highest score in the university rendering competition for visual presentation.

Indoor Navigation System [Android studio, OpenGL ES] – Work project **(2022)**
- Built a mobile 3D indoor navigation app combining multi-modal sensor fusion (ARCore Visual Odometry, WiFi fingerprinting, GNSS) for real-time spatial positioning on resource-constrained devices.
- Developed custom OpenGL ES / WebGL graphics subroutines for smooth, real-time 3D directional overlay rendering with minimal CPU utilization.

Bundle Adjustment & 3D Visual SLAM Engine [Python, OpenCV, SciPy, ThreeJS/WebGL] – Study project **(2024)**
- Created a multi-view 3D reconstruction pipeline using Gauss-Newton least-squares optimization, estimating sparse 3D point clouds and camera trajectories across 20+ sequential views.
- Built interactive web visualization components using ThreeJS/WebGL to inspect reconstructed 3D point clouds and SE(3) camera poses directly within the browser.
- Earned top grade in 3D Computer Vision coursework for achieving the highest reconstruction accuracy in camera trajectory estimation.

Top 5 Achievements

- **5th Place & Highest Accuracy Award - National Road Damage Detection AI Competition (2023)**
  Awarded by the Ministry of Public Works & Housing (Indonesia) for engineering the top-performing AI model and web dashboard for real-time road defect detection and surface quality inspection.
- **Talent Recognition Award (Top 10%) - CAD-IT Consultants (Asia) Pte Ltd (2022)**
  Recognized for exceptional engineering contributions, successfully delivering 14 computer vision/AR client solutions, and cross-functional team leadership.
- **2nd Place - Accenture Case Challenge at HackaTUM (2021)**
  Awarded by Technische Universität München (TUM) for engineering an Azure cloud-based custom computer vision pipeline for automated defect inspection in LCD manufacturing during its annual hackathon.
- **1st Place & Best Strategy Award - Autonomous Robotics Competition (2018 & 2019)**
  Awarded by the Ministry of Research, Tech., and Higher Education (Indonesia) for engineering autonomous soccer robots that won national competitions under RoboCup MSL standards, featuring the first fully autonomous visual perception and positioning system using catadioptric vision.

- **3rd Place - National Game Development Competition (2018)**,
  Awarded by Sepuluh Nopember Institute of Technology (Indonesia) for developing and optimizing an Android-based game engine architecture featuring custom toon-shading, stencil shaders, and stealth AI gameplay mechanics.

Top Publications

- **Neural-Precomputation for Real-Time Rendering of Heterogeneous Volumes**
  Master Thesis, Faculty of Mathematics and Computer Science, Universität des Saarlandes 2025
- **Mechanical Design and Control System of Ball Handling Mechanism in Mobile Soccer Robot**
  Bachelor Thesis, Faculty of Mechanical and Aerospace Engineering, Institut Teknologi Bandung (ITB) 2019
- **Development of the Wheeled Soccer Robot Dagozilla Version 2.1 for the Middle Size League (MSL) Competition.**
  The Indonesian Symposium on Robotic Systems and Control (ISRSC) 2019
- **Development of Dagozilla's Version 2 Wheeled Soccer Robot for the Middle Size League (MSL) Competition.**
  The Indonesian Symposium on Robotic Systems and Control (ISRSC) 2018
- **Hand Sign Translating Apparatus (HASTA)**
  Physics Contribution Seminar (SKF) 2018

SKILLS

- **Machine Learning & Computer Vision:**
  PyTorch, TensorRT, ONNX, OpenCV, Dr.JIT, TinyCUDA-nn, TensorFlow, scikit-learn, TensorBoard, MLflow, Weights & Biases (Wandb).
- **3D Graphics & Spatial Computing:**
  Vulkan, OpenGL, OpenGL ES, CUDA, NVIDIA OptiX, WebGL, ThreeJS, NVIDIA Nsight Compute, 3D Point Clouds (PCL, VDBFusion).
- **Languages & Core Frameworks:**
  Python, C++ (Modern C++17/20), C#, C, Java, JavaScript, GLSL.
- **Web & Microservices Architecture:**
  REST APIs, gRPC, WebSocket, Docker, Microservices Architecture, CI/CD, Git, CMake.
- **Systems & Embedded Hardware:**
  ROS1, ROS2, Visual SLAM, STM32, Microcontroller Systems, Arduino, PLC, Baremetal Deployment.
- **3D Modeling & Engine Development:**
  Blender3D, SolidWorks, Autodesk Inventor, Mitsuba3, Unity3D.