Marcus Loo Vergara

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SUMMARY OF QUALIFICATIONS

7 years of experience working on real-time and performance-critical systems, in particular computer graphics, system architecture, and cross-platform development. M.Sc. in Computer Science from the Norwegian University of Science and Technology, with a focus on deep learning and computer vision. Self-motivated and curious, with a collaborative approach to technical problem-solving.

- C/C++
- Low-level optimization
- Vulkan, D3D11/12, & WebGPU
- Python
- API design
- Performance analysis
- Deep learning
- Software architecture
- Multi-platform development

EDUCATION

Norwegian University of Science and Technology, Trondheim, Norway — Aug 2013 – Jun 2019
Master of Science in Computer Science.
- Studied computer vision, computer graphics, and deep learning.

University of California, San Diego, San Diego, USA — Oct 2017 – Jun 2018
Additional Studies, Computer Science.
- Studied at UC San Diego as part of the degree.

WORK EXPERIENCE

Senior Software Developer at Hexagon, Oslo, Norway — Aug 2024 – Present
Software Developer — Nov 2022 – Aug 2024
R&D role developing a cross-platform visualization SDK, focusing on large-scale CAD, rendering optimization, API design, and developer tooling.
- Driving a single-source-of-truth API redesign, leveraging C for cross-language interoperability.
- Developing cross-platform debugging and profiling tools, including remote API capture & replay.
- Extending the internal rendering abstraction with modern rendering features:
  - Compute shaders, storage buffers, uniform buffers, descriptor sets, samplers.
  - Implemented on DirectX 11, DirectX 12, Vulkan, OpenGL, WebGL, WebGPU, Metal.
- Optimizing rendering of parametric geometry, achieving up to 30% improvement on some devices.
- Developing functionality to convert and visualize common CAD-file formats.

Drone Software Engineer at Nordic Unmanned, Oslo, Norway — Feb 2021 – Nov 2022
Embedded software development and integration for custom industrial drones, working on microcontroller firmware and a modular onboard Linux software stack.
- Designed and implemented the onboard Linux software architecture, including peripheral integration, IPC, ground-control communication, and service management.
- Developed drivers for the STM32 Cortex-M7 microcontroller to acquire data from IMUs.
- Designed a video streaming architecture with prioritized ground-station traffic and remote relays.
- Improved and extended the in-house simulator, including hardware-in-the-loop testing.

Junior Graphics Programmer at Funcom, Oslo, Norway — Oct 2019 – Feb 2021
Graphics programming in Unreal Engine, primarily working on *Dune: Awakening*.
- Researched rendering techniques and extended Unreal Engine's material system with bindless texture support for PC (DirectX 12), Xbox One (DirectX 12), and PS4 (libGNM).
- Optimized development workflows for artists and other users.
- Provided internal support for rendering issues and troubleshooting.

Graphics Software Engineering Intern at Sony Interactive Ent., San Mateo, USA Jul 2018 – Sep 2018
Internship at SIEA's Global Developer Technology Group.
- Implemented a physically based rendering and HDR demo for PlayStation 4 (libGNM and PSSL).
- Investigated tools for automatically extracting and analyzing GPU performance data.

Software Developer at Grabster, Trondheim, Norway Jul 2017 – Aug 2017
Summer job assisting a start-up with app development.
- Grabster was a food-selling marketplace app for iOS and Android.
- Implemented screen navigation and backend functionality for the Android app (*React Native*).

Teaching Assistant at the Norwegian University of Science and Technology Aug 2015 – May 2019
On-campus part-time job assisting students.
- Assisted students with theoretical and practical questions.
- Subjects:
  - Jan 2019 – May 2019: Computer vision and deep learning
  - Jan 2016 – May 2017: Procedural and object-oriented programming (C++)
  - Aug 2015 – Dec 2015: Computers and digital design (Assembly programming)

RELEVANT PROJECTS

Fractala Sandbox, Game project 2019 – Present
Co-owner and one of two developers of *Fractala Sandbox*, a large-scale GPU-driven physics sandbox written from scratch in C++.
- Position-based dynamics simulating 100,000+ particles at 600 Hz, rendering at 240 FPS on desktop.
- Designed and implemented a cross-platform C++ engine with Vulkan and DirectX 11 backends.
- Created a sandboxed WebAssembly modding API for safe extensibility.
- Implemented threaded rendering and detailed GPU/CPU performance instrumentation.
- See it in action: *https://youtu.be/AKEU9soBSvE*

Reinforcement Learning for Autonomous Vehicles, Thesis Sep 2018 – Jun 2019
Research in deep reinforcement learning, implementing methods to teach a simulated car to drive in the open-source driving simulator *CARLA*.
- Implemented a custom version of the *Proximal Policy Optimization* reinforcement learning method with *Python* and *TensorFlow*.
- Created an *OpenAI Gym*-like environment for CARLA to make RL research easier.
- Reduced training time through experimentation with reward functions, environment designs, and improvements to the PPO algorithm by scaling the output mean to respective limits.

MISCELLANEOUS

Seismic Map Illustration for European Standard, Commissioned Work Apr 2021
Used official seismic data from EFEHR along with geographical boundaries of municipalities in Norway to programmatically create a seismic map, printed in the official standard: *NS-EN 1998-1:2004+A1:2013+NA:2021*.

Teaching Assistant Training, Norwegian University of Science and Technology May 2019
Certificate awarded for attending a pedagogical training course for teaching assistants.

Abakus GameDev, Norwegian University of Science and Technology Aug 2014 – Jun 2019
Co-founder and leader of Abakus GameDev, a student organization for those interested in game development and game design.
- Responsible for creating a socket-based framework that was used for AI competitions.
- Participated in meetings, discussing workshop ideas and advertising.
- Held a presentation on deep reinforcement learning for games.