

# T Varatharajan

Graphics Engineer — WebGL, WebGPU, Real-Time 3D Rendering

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## Professional Summary

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Graphics Engineer with 2+ years of experience building high-performance, real-time 3D web applications using WebGL and WebGPU. Specialized in custom rendering engines, GLSL/WGSL shader development, Physically Based Rendering (PBR), and GLTF/GLB asset pipelines. Strong focus on GPU optimization, scalable architecture, and delivering smooth 60 FPS interactive graphics in modern browsers.

## Technical Skills

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**Programming Languages:** JavaScript (ES6+), TypeScript, GLSL, WGSL, HTML5, CSS3

**Graphics APIs:** WebGL, WebGPU

**3D Rendering Concepts:** Real-Time Rendering, Physically Based Rendering (PBR), Lighting Models, Shader Development, HDRI Environment Mapping, Scene Graphs

**Frameworks Libraries:** Three.js

**Asset Pipelines:** GLTF 2.0, GLB, PBR Materials, Texture Optimization

**Tools Build Systems:** Git, GitHub, Webpack, Vite, NPM, VS Code, Chrome DevTools, Jira

## Professional Experience

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**Software Developer (Graphics Engineer – WebGL/WebGPU)**

Dec 2023 – Present

*Hexr Factory Immersive Tech Pvt Ltd* — Chennai, Tamil Nadu, India

- Architected and improved a production-grade custom 3D rendering engine for real-time web graphics using TypeScript, WebGL, and WebGPU.
- Designed modular shader systems in GLSL and WGSL supporting multiple light types, Physically Based Rendering (PBR), and optimized GPU data flow, reducing draw calls by 30%.
- Built a complete GLTF/GLB asset pipeline with PBR material support, reducing scene load time by 40% through asset compression and lazy loading.
- Engineered real-time lighting systems, camera controls, and interactive scene navigation for complex 3D web applications.
- Maintained consistent 60 FPS performance through GPU optimization, efficient buffer management, and render-loop profiling.
- Collaborated with designers, frontend engineers, and product teams to deliver scalable and performance-focused 3D web graphics solutions.

## Key Projects

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**Custom Web-Based 3D Editor**

Personal Project

github.com/Varatharajan1808/3D-Web<sub>Engine</sub> /Live Demo

- Architected and enhanced a unified **web-based 3D rendering engine** from scratch using **JavaScript and TypeScript**, supporting **WebGL**-based rendering pipelines.
- Executed a full **Physically Based Rendering (PBR)** pipeline using the metallic-roughness workflow, including tangent-space normal mapping, emissive materials, and multi-light support (directional, point, and spot).
- Built a complete **GLTF 2.0 asset pipeline** supporting meshes, PBR materials, textures, normal maps, and hierarchical scene structures with parent-child relationships.
- Designed and applied a **hierarchical scene graph system** to manage transforms, cameras, meshes, lights, and materials, incorporating efficient frustum culling and bounding volume calculations.
- Expanded professional-grade **editor tooling**, including scene hierarchy management, multi-axis transform gizmos, real-time material editing, and runtime texture streaming for complex scenes.

## Education

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### **Bachelor of Science in Mathematics**

Jul 2017 – Apr 2020

Kamaraj College, Manonmaniam Sundaranar University — Thoothukudi, Tamil Nadu, India

### **MBA in Human Resource Management (HRM)**

Dec 2021 – May 2023

Alagappa University — Thoothukudi, Tamil Nadu, India

## Certifications

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- **Full Stack Web Development** – QSpiders Institute, Chennai Apr 2023
- **Software Developer Trainee** – Hexr Factory Immersive Tech Pvt Ltd Sep 2023