Ailun (Allan) Pei

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Education

Arizona State University, Tempe, AZ — Jan 2024 – May 2025
Master of Science in Computer Science — GPA: 3.58

Arizona State University, Tempe, AZ — Aug 2020 – Dec 2023
Bachelor of Science in Computer Science, *magna cum laude* — GPA: 3.61

Technical Skills

Languages: C++, C#, Python, JavaScript, TypeScript, Java, Swift, Kotlin, SQL, Bash, HLSL, GLSL, HTML/CSS
Graphics: Unity, Unreal, OpenGL, WebGL, DirectX, Shader Graph, Three.js, Blender, MonoGame
ML & Data: PyTorch, TensorFlow, CUDA, NumPy, pandas, scikit-learn, matplotlib, D3.js
Web & Tools: React, Vue, Node.js, Flask, FastAPI, RESTful API, Git, AWS, Docker, Visual Studio, Xcode, CI/CD
Certifications: AWS Solutions Architect Associate, AWS ML Specialty (In Progress)

Experience

Software Engineer Intern — Jun 2024 – Aug 2024
Shandong Zhaojin Group Co., Ltd. via Extreme Trading — Shanghai, China

- Built a **screen lock dialog** using **C++/MFC**, integrating **password validation** with session data and improving application security for trading platform users
- Developed a **timeout configuration module** with **INI file I/O** and custom **Windows messages**, enabling dynamic idle-lock settings to enhance system security
- Implemented **GDI double-buffered rendering** with custom **DC**, **bitmap**, and **fonts** for smooth lock screen UI performance
- Optimized user interaction by handling **keyboard/mouse events** in **PreTranslateMessage**, providing clearer feedback and streamlined authentication

Projects

Music & Socioeconomic Data Analysis — Spring 2025

- Investigated correlations between popular music characteristics and U.S. socioeconomic trends by aggregating 67 years of Billboard Hot 100 data with **Spotify API** audio features, **Genius API** lyrics, FBI crime statistics, and OECD economic indicators
- Engineered **ETL pipelines** using **Pandas/NumPy** to perform monthly aggregation of 8 musical features and lyrical sentiment analysis via **VADER**; implemented automated fallback strategies for handling missing data and API limitations
- Developed **Sequential Neural Networks** with **TensorFlow/Keras** and baseline models (**Ridge Regression**, **Random Forest**, **Scikit-learn**), achieving **R^2 = 0.62** for robbery predictions and identifying significant inverse correlation between crime rates and musical loudness

MeshCNN Architecture Analysis for 3D Shape Classification — Fall 2024

- Conducted systematic ablation study on MeshCNN neural network using **PyTorch 1.2.0/CUDA 9.2** on SHREC16 dataset, validating **3 core architectural components** through controlled modifications
- Restructured network architecture by removing **MeshPool layers**, demonstrating **25% accuracy degradation** (75% vs 100%) despite **57% parameter increase** (2.078M vs 1.321M), empirically validating that learned mesh simplification is critical for efficient 3D shape classification
- Optimized training pipeline with **gradient clipping** and modified loss functions, achieving **46% faster convergence** to 100% accuracy (epoch 7 vs 13) while maintaining computational efficiency at 2.1GB GPU memory

Spherical Conformal Parameterization of 3D Meshes — Fall 2024

- Implemented a **folding-free spherical conformal mapping pipeline** for genus-0 surfaces using **Python/NumPy/SciPy** to support geometry processing applications
- Constructed **cotangent Laplace–Beltrami operator** and area-based mass matrix, initialized with eigenvector embeddings, and optimized harmonic energy via orthogonality-constrained updates with line search
- Reduced harmonic energy by approximately **0.4% to stable minimum** within 1000 iterations, producing stable spherical embedding with uniform coverage and no fold-overs

Academic Experience

Research Assistant — Oct 2023 – Dec 2024
Center for Human, Artificial Intelligence, and Robot Teaming (CHART), Arizona State University — Mesa, AZ

- Supported DARPA-sponsored *Artificial Social Intelligence for Successful Teams (ASIST)* program through multi-week participation in **Minecraft-based Bomb Disposal simulation**, performed **data cleaning and preprocessing** of large-scale team communication datasets, and reviewed analysis techniques from collaborating institutions (IHMC, UCF, CMU)
- Developed **research questions and testable hypotheses** on team effectiveness and strategy adaptation; applied **statistical analysis and text mining methods** for dataset exploration, variable identification, and communication pattern analysis

Teaching Assistant (Undergraduate & Graduate) & Grader — Jan 2023 – May 2025

- Supported **250+** students across **5 courses**, including C++ (as grader) and multi-level **C#/MonoGame shader programming** (as teaching assistant); held weekly office hours for 40–60 students per semester
- Delivered guest lectures on advanced shader techniques, graded **200+** assignments with detailed feedback, improving students' shader programming proficiency and maintaining strong class attendance