Karl Hiner

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EDUCATION

Georgia Institute of Technology   Atlanta, Georgia
Master of Science, Computational Science and Engineering | GPA: 3.90   Sep 2022 − Apr 2024

Portland State University   Portland, Oregon
Bachelor of Science, Computer Science | GPA: 3.82   2010 − 2013

EXPERIENCE

Axiom Data Science   Portland, Oregon
Lead Software Engineer   Feb 2020 − Jul 2022

Lead developer on the next generation of the Research Workspace, a web application for collaboratively managing data for scientific projects.

- Developed an extensive admin application and near-complete rewrite of the Research Workspace, dramatically simplifying application architecture while expanding capabilities, using TypeScript, GraphQL, and Postgres.
- Implemented a user authentication and authorization service and UI library to replace several existing services across applications, integrating with Google auth and supporting flexible roles and feature access controls. Amazon Cognito, Express.js, and Postgres for the backend, and TypeScript/React for the client package and UI.
- Developed extensible internal React packages to modularize and modernize UI components, including charts and time pickers, including Storybook UI component tests and documentation, and replaced legacy data portal components and systems in a piecemeal migration from Backbone to React.
- Implemented full-stack data portal features, including a cross-portal feature called *Map Views*, enabling users to create, edit, share, and publish multiple portal map instances.
- Built a remote browser service and UI for internal QA to quickly discover regressions across data portals.

Cozy   Portland, Oregon
Senior Software Engineer   Oct 2018 − Jan 2020

- Led the transition of major components and services to be presented and consumed by Apartments.com after Cozy's acquisition by CoStar Group using Ruby and Javascript.
- Updated customer card creation flow to use Stripe Elements, including detailed error handling and user-facing notifications, improving the user experience and reducing support volume.
- Integrated Stripe Radar risk evaluations into the fraud detection pipeline, improving accuracy.
- Automated a manual process for determining landlord tax requirements by aggregating data from multiple sources, reducing the time to determine tax requirements from hours to seconds.
- Implemented a model to predict and flag accounts that are likely to fail their next payment, preventing ACH payment failures and reducing support volume.
- Mentored junior engineers and led development efforts on major projects, led sprint planning, planned and organized team efforts, and presented team progress.

Self   Portland, Oregon
Independent Study   Dec 2017 − Oct 2018

Dedicated time to advancing my expertise in machine learning, audio signal processing, and software development. This was the beginning of a professional development journey that eventually led me to pursue my Master's degree at Georgia Tech.

- Released BeatBot, a sample-based music production app for Android with a C-based audio/effects backend and a custom OpenGL 2D UI designed to minimize draw call submissions for optimal performance on low-end devices.
- Studied digital audio signal processing, machine learning, C++, and Python, and produced in-depth Jupyter notebooks for each chapter of eight technical books on these topics.
- Using C++ and the JUCE framework, developed a node-based digital audio workstation that automatically determines default connections based on a grid layout, supporting VST plugins and audio/MIDI input/output, integrating with the Push 2 MIDI controller and LCD display.
- Completed deep learning and statistics online courses.
- Implemented a declarative static site generator in React and used it to build my portfolio website.

New Relic   Portland, Oregon

Senior Software Engineer - Applied Intelligence Services Team   Oct 2016 − Dec 2017
- Researched, architected, built, and shipped products using Java, React, and Ruby, including dynamic baselines, error profiles, and host outlier detection.
- Leveraged statistical techniques on data from multiple monitoring sources to extract actionable insights, enabling users to understand and fix complex software problems quickly.
- Prototyped novel time-series algorithms and data visualizations using Python, Jupyter, D3.js, and Three.js, including a T-SNE-based particle visualization for host clustering and outlier detection that was demoed at the main New Relic conference, FutureStack.

Software Engineer / Senior Software Engineer - Mobile Product Team   Apr 2014 − Oct 2016
- Acted as the technical lead on significant features, including activity tracing and version trends.
- Migrated the crash reporting database and API from Postgres to Cassandra, dramatically reducing write and query times while increasing data retention.
- Implemented major features for crash reporting, network reporting, and real user monitoring using Java, React, and Ruby.

Junior Software Engineer - Mobile Team   May 2013 − Apr 2014
- Co-produced the frontend for the Mobile product Ruby on Rails application.
- Developed features for the data collection and aggregation service backend and the Android application monitoring agent, receiving billions of data harvest posts per day.

PROJECTS

MeshEditor | C++/Vulkan/ImGui   Nov 2023 − Apr 2024

Real-time mesh viewer and editor with rigid body audio modeling, and interactive RealImpact dataset explorer supporting comparison of audio models with real-world impact recordings.

Mesh2Audio | C++/OpenGL/ImGui   Jan 2023 − May 2023

Real-time modal audio synthesis from 3D meshes, with interactive vertex excitation.

Processing Ray Tracer | Java/Processing   2024

Ray tracing, implicit surface generation, and mesh manipulation projects, written in the Processing (Java) language.

Drum classification | Python/PyTorch   Dec 2023

A drum instrument classification model and preprocessing pipeline for the Expanded Groove MIDI Dataset dataset.

GeoLDMViz | C++/Python/OpenGL/ImGui   Nov 2023

3D visualizer app for inspecting chains of 3D molecules generated with Geometric Latent Diffusion Models.

FlowGrid | C++/ImGui   Mar 2022 − Present

Immediate-mode editor for Faust (functional audio language) programs, backed by a persistent store supporting constant-time navigation to any point in project history. Includes a from-scratch syntax-aware embedded text editor and language-complete Faust tree-sitter grammar for editing LLVM JIT-compiled Faust, a configurable and monitorable audio graph editor and matrix mixer, complete ImGui frontend for the Faust DSP UI spec, and extensive audio device config.

Jupyter notebooks | Python   Jan 2018 − Jan 2020

Python Jupyter notebooks covering each chapter of several books, including Gareth Loy's Musimathics Vol 1./Vol 2. and Julius O. Smith's Mathematics of the DFT, Intro to Digital Filters, and Physical Audio Signal Processing.

JAXdsp | Python/JAX/TypeScript/React   Dec 2020 − Feb 2022

Parameterize audio graphs in real-time to model an incoming/outgoing audio stream pair with differentiable DSP components, with data and audio over WebRTC.

Generating Music with WaveNet and SampleRNN | Python   Aug 2019

Exploring musical raw audio generation using these popular models.

BeatBot | Java/C/OpenGL   2012 − 2018

A sample-based music production app for Android, with an OpenSL audio/effects backend implemented in C, and a custom OpenGL-based 2D UI designed to minimize draw call submissions for optimal performance on low-end devices.

RELEVANT COURSEWORK

GA Tech: Modeling and Simulation, Computational Physics, Computational Data Analysis, Computer Graphics, Computer Animation, Numerical Linear Algebra, High Performance Computing, Machine Learning with Graphs

PSU: Machine Learning, AI and Game Design, Parallel Programming

Coursera: Machine Learning, Deep Learning, Probabilistic Graphical Models, Audio Signal Processing