

# Geraint Luff

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Software engineer and mathematician with a passion for audio and signal processing, cryptography/privacy, web protocols and open standards.

Interested in opportunities to solve crunchy problems and create tools that make people happy.

## Signal Processing Highlights

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### Talks and writing

- *Four Ways To Write A Pitch-Shifter* presented at ADC-22 [youtu.be/fJUmmcGKZMI](https://youtu.be/fJUmmcGKZMI)
- *Let's Write A Reverb* presented at ADC-21 and TAP meetup [youtu.be/6ZK2Goivyotk](https://youtu.be/6ZK2Goivyotk)
- Ongoing audio / DSP blog [signalsmith-audio.co.uk/writing/](https://signalsmith-audio.co.uk/writing/)

### Audio effects

- Open-source C++ pitch/time stretching library [signalsmith-audio.co.uk/code/stretch/](https://signalsmith-audio.co.uk/code/stretch/)
- VST3 effects (Signalsmith Audio), and command-line (C++) effects and analysis tools
- Create/maintain a popular set of JSFX (REAPER) effects [geraintluff.github.io/jsfx/](https://geraintluff.github.io/jsfx/) including reverbs, synths (various algorithms), harmoniser, spectral analysis/matching, modulation/FM, pitch/formant shifting, time-alignment, and some tutorial videos

## Employment

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Mar 2020 - current	<b>Signalsmith Audio Ltd. - founder / developer</b> <a href="https://signalsmith-audio.co.uk">signalsmith-audio.co.uk</a> As well as ongoing consulting and code-licensing for algorithmic design/implementation (audio/radio), I'm developing commercial VST3 audio effects (solo and collaborative, currently in alpha), and submitted an entry to the 2021 KVR Developer Challenge.
Sep 2021 - Dec 2022	<b>Voisey / Snap Inc. - Audio Software Engineer</b> I created a C++ audio-processing framework with configurable effect-chains, to replace the (iOS-only) AudioKit implementations, plus a range of effects including reverb, chorus/flanger/phaser, compressor/limiter, vocoder and adaptive noise-reduction.
Feb 2017 - Mar 2020	<b>Amazon Lab126 / Evi Technologies / Ring</b> <b>Research Scientist (audio focus) / Software Development Engineer</b> I worked in the platform team of Lab126's Computer Vision dept. (now part of Ring). <ul style="list-style-type: none"><li>• Designed/implemented automated audio analysis tools, used to tune filters/AGC</li><li>• Contributed to audio pipeline and other platform-level features (Linux kernel and Android-based OS) for Amazon Cloud Cam and Ring Stick-Up Cam</li><li>• Worked with third-party vendor, identifying and trouble-shooting audio issues (software and acoustic) in their components for the Ring Stick-Up Cam</li><li>• Wrote security review for Amazon Cloud Cam</li></ul>
Nov 2014 - June 2016	<b>ARM Ltd - IoT Web Applications Engineer</b> I worked in the Internet of Things (IoT) R&D group and business unit. <ul style="list-style-type: none"><li>• Designed and analysed IoT cryptographic authentication and privacy protocols</li><li>• Designed a dynamic information schema for configuring headless BLE/IoT devices using adaptive UIs, and contributed to iOS reference implementation</li><li>• Contributed to an Objective-C runtime for low power wearable IoT devices</li><li>• 14 granted patents, mainly for cryptography/privacy (10 UK, 11 US, 4 China)</li></ul>
May 2012 - Nov 2014	<b>ACTIV Financial - Web Tools Developer</b> I maintained and developed internal web-based tools for the company, including a RESTful JSON/AJAX site, automating SVN/CVS and emails (IMAP) from PHP.
Aug 2009 - April 2012	<b>Airsource Ltd - Mobile Software Developer (Android/iOS)</b> I developed smartphone software, both in-house and contracted. Projects included Android/iOS app development, and modifying the Android OS for a customised phone
Summers 2006 – 2008	<b>Meridian Audio - sponsored student</b> Culminated in research on the performance limits of dithering in fixed point FFT

## Open Source

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SignalSmith DSP libraries  
C++ signal-processing library [signal-smith-audio.co.uk/code/dsp/](http://signal-smith-audio.co.uk/code/dsp/)  
High-quality C++ pitch/time stretching library [signal-smith-audio.co.uk/code/stretch/](http://signal-smith-audio.co.uk/code/stretch/)  
A 600-line header-only FFT, with good performance for its size [bit.ly/ssa-fft](http://bit.ly/ssa-fft)  
tv4 (*4+ million downloads/month*) [npmjs.com/package/tv4](http://npmjs.com/package/tv4)  
JSON Schema validator for JavaScript (Node.js/browser)  
uri-templates (*500k+ downloads/month*) [npmjs.com/package/uri-templates](http://npmjs.com/package/uri-templates)  
construct and deconstruct URLs based on RFC 6570, for JavaScript (Node.js/browser)  
JSON Schema [json-schema.org](http://json-schema.org)  
I was spec draft editor & contributor for v4 of this JSON description/validation spec  
Contributed to UglifyJS  
patch added support for explicit sourcemap URLs for each input

## Ask me about my other projects/interests

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Git repo parsing/manipulation  
HTML+JS for static-site repo previews ([bit.ly/static-git](http://bit.ly/static-git)), Git-mine ([bit.ly/git-mine](http://bit.ly/git-mine))  
Cryptography  
ECC/RSA/D-H/AES, Socialist millionaire, Lamport/Merkle signature family  
Plotting and equations  
Plotting (C++ and JavaScript) and equation libraries (JavaScript) for my own writeups  
UI frameworks  
REAPER JSFX UI library ([bit.ly/jsfx-ui](http://bit.ly/jsfx-ui)), schema-driven UI generation  
Web protocols  
OAuth2 webhook extension for HTTP POST, SMTP client & server, URI Templates, CBOR debugger ([bit.ly/cbor-debug](http://bit.ly/cbor-debug)), JSON Patch / Merge, JSON Schema  
Small JavaScript  
1.4kb Promises polyfill, 1.3kb HTML sanitiser, 849-byte SHA-256, 849 byte SHA-256 (presented as lightning talk at Chaos Community Congress)  
Code generation  
JSFX preprocessor, URI Template to JavaScript, JSON Schema to JavaScript  
Fun with images  
Monte-Carlo raytracer ([bit.ly/js-ray](http://bit.ly/js-ray)), pencil-sketch simulation  
Statistics & optimisation problems  
Bayesian inference, Markov models / HMM / Viterbi, neural networks

## Languages and Tools

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- Completed projects in:
  - C/C++ (VST3, command-line, Linux kernel, Node.js native modules)
  - JavaScript (Node.js, ES6), HTML/CSS
  - Java (Android) and Objective-C (iOS)
  - JSFX (REAPER's effect language)
  - Python, MATLAB, Shell (bash), PHP
- Familiar with version control (Git - [see my HTML+JS client](#), SVN) and Agile SCRUM

## Education

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2006-2009 **Queens' College, University of Cambridge**  
**BA Mathematics (2:2)**  
Favourites include: Complex Analysis, Galois Theory, Markov Chains, Statistics, Coding and Cryptography, Number Theory, Set Theory and Logic

## Music

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[geraintluff.bandcamp.com](http://geraintluff.bandcamp.com)  
I compose/record/perform my own music (piano/voice/synthesiser), and have self-released three albums, including running a successful Kickstarter. I enjoy collaborating with other musicians, and I've often been a member of musical groups (including touring with Queens' College choir, the county youth choir & orchestra, and leading Amazon's Cambridge office choir).