Sasha Lopoukhine

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Education

University of Cambridge — Cambridge, UK
PhD in Computer Science supervised by Tobias Grosser — *Jan 2023 — Present*

Researching the use of MLIR and multi-level compilation to effectively target AI accelerators.

- Led the development of a novel MLIR-based linear algebra micro-kernel backend that targets ETH's Snitch Core, yielding 95% FPU utilization and 94% of theoretical maximum throughput for our chosen kernels. Whole neural networks compiled via this micro-kernel outperform the state of the art by >22x.
- Developed a novel MLIR-based extensible interpreter, which I presented at the 2023 MLIR developer meeting.

Publications:

- Sidekick compilation with xDSL

University of Cambridge — Cambridge, UK
BA in Computer Science - II.i — *2012 — 2015*

Received Bob Diamond prize for Computer Science.

Employment History

Co-Founder & Chief Engineering Officer — September 2021 — January 2022
Cub3 — *Los Angeles, CA*

Led development of a platform that enabled third parties to employ Web3 tools, NFTs, and other blockchain technology to encourage positive behavior in online fan communities.

- Spearheaded the engineering team, developing a minimal viable product, identifying key features and coordinating efforts.

Software Engineer — March 2018 — September 2021
Apple — *Cupertino, CA*

Curated Library – a novel iOS 13 feature providing user photos in a curated perspective free of memes, screenshots, and duplicate images, deployed to **over a billion devices**.

- Responsible for efficient calculation of the unique Years/Months/Days display on the Curated Library page, leveraging date, time, and other metadata to provide a beautiful, clutter-free, display of the user's photo library.
- Carried out extensive performance and unit testing, building new profiling infrastructure in the process.

Patent: US20200356227A1 – **Curated Media Library**

On-disk graph – a novel infrastructure component of Photos Memories. Enabled numerous features, such as on-demand availability of all Memories, automatic song selection, and next memory suggestion.

- Implemented a graph database to represent Memories data, accommodating roughly 1,000 times more data than the previous representation.
- Led the migration of existing features to the new database, with minimal regressions, leading to a 9x reduction in testing time—from 1 hour and 30 minutes to 10 minutes.
- Added many new unit tests to ensure the continued high quality of this component of the infrastructure.

Next memory suggestion – a recommendation engine for the Memories interface that suggests new memories to watch

- Developed a novel recommendation engine for Memories, leveraging features of the current Memory, and the user's library.

Integration of Apple Music into Memories – a feature that lets users select any song from the Apple Music library to play in Memories.

- Required handling enormous data sets including over a billion users' photo libraries and Apple Music's 90 million song library.
- Led the feature extraction efforts to provide the recommendation engine with information from the Memories database to suggest appropriate music.
- Provided Swift mentoring to the team and offered guidance on the project's software architecture and design patterns.

iOS Engineer January 2016 — September 2017
Snips *Paris, France*

Keyboard extension – a cutting-edge tool leveraging the Snips Personal Knowledge Graph to suggest phrases from their personal database as they entered text throughout iOS.

- Created a software keyboard that interacted with supporting services (email, calendar, and contact

information) to extract the necessary information as the user was typing.

- Enhanced the functionality of the auto-completion and next-word recommendation.
- Developed a bespoke binary-encoded language model that loaded in milliseconds and outperformed the built-in keyboard in terms of word recommendations, auto-complete, and auto-correction.

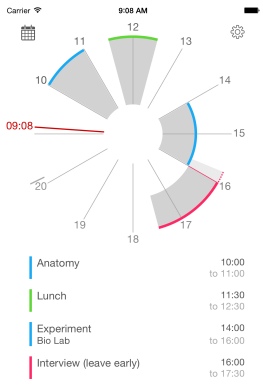
Snips Platform – Labs - prototyped natural language parsers and applications built on top of them.

- Built an interactive voice assistant on iOS, that could handle queries such as "Show me photos from the restaurants I went to last week" using CKY parsing.
- Built an interactive voice assistant engine that would fill in the gaps in user's queries.
- Developed prototypes for voice-activated gadgets such as speakers and coffee machines.

Cofounder & CEO 2014 — 2016
Blue Tatami *Cambridge, UK*

Blue Tatami was a startup developing personal productivity applications on iOS. We developed Dodeka, an iOS program for displaying calendar events on a 12-hour watch face. This program required a unique visualization designed from the ground up to show the current day's calendar events in the clearest way possible.

- Developed the project's concept and wrote app from scratch
- Introduced a unique personal productivity tool
- Created innovative graphics and design features
- Grew to **more than 6,000 users** with no advertising



Projects

Maintainer, xDSL Jan 2023 — Present

xDSL is a pythonic counterpart to MLIR that makes modern compiler development more accessible to researchers and students.

Author, Simple Datagram Protocol | Article 2017

Worked around Apple's requirement for devices to have Made for iPhone certification to access Bluetooth, by using BTLE to transfer configuration data to Raspberry Pis instead.

Author, BioSwift 2015

First open-source framework in Swift to handle gene data.

Presentations

2023 EuroLLVM - Prototyping MLIR in Python

2023 LLVM Dev Mtg - Compiler backend design with MLIR

2024 EuroLLVM - Teaching MLIR concepts to undergraduate students

2024 LLVM Dev Mtg - Quidditch: An End-to-End Deep Learning Compiler for Occamy using IREE & xDSL

Skills and Awards

- **Programming Languages**: Python, Swift, Objective-C, C/C++, JavaScript/TypeScript, Assembly
- **Languages**: Fluent in English, Russian, French