

MONICA SPISAR, PhD

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machine learning & software engineer | physicist

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EDUCATION + RESEARCH TRAINING

PhD, Biomedical Engineering: Medical Imaging, University of Michigan

Thesis: [Optoacoustic detector arrays for medical imaging applications](#).

2003.08

Thesis research: Designed, built, tested a laser-based ultrasound imaging system with novel detection technology. Targeted clinical requirements for front-end miniaturization (catheter delivery) and image quality: stringent sensitivity and resolution specs. Built the optical system and tuning electronics. Wrote custom signal capture, processing, and image reconstruction software. Work focused on subnanometer control of effective optical path length across a synthetic array detector, and final designs achieved a 10x sensitivity increase. Mentored an undergraduate assistant. As a member of the Biomedical Ultrasound Lab, participated in weekly research meetings and supported fellow BULLies' research on, e.g., laser-generated microbubbles and histotripsy.

Pre-thesis research: Small scintillation (gamma) camera for breast imaging. Used statistical image reconstruction methods to identify optimal detector configuration. Customized Monte Carlo photon transport simulation software (in C) to include parallel processing. Built and evaluated a prototype gamma camera.

Graduate level courses (select): MAT: linear algebra, statistics; EECS: digital signal processing and analysis; NERS: physics of medical imaging (nuclear imaging); BME: medical imaging systems (radiography/CT, ultrasound, MRI/fMRI), medical imaging lab*; Neurosci: neurophysiology.

**BME510 Medical Imaging Lab: I was part of the inaugural cohort for this course, and we collaboratively fine tuned lab exercises to prepare the course for official, permanent delivery. I subsequently served as TA.*

BSc, Physics, University of Toronto

Physics specialist courses: classical mechanics, electricity & magnetism, thermal physics, quantum physics, electromagnetic theory, statistical mechanics, condensed matter physics, optics, laser physics, relativistic electrodynamics, nuclear and particle physics, high energy physics; calculus, multivariable calculus, linear algebra, analysis, ordinary differential equations, partial differential equations, complex analysis, statistics; medical imaging.

TECHNICAL INDIVIDUAL CONTRIBUTOR

Software engineer: upskilling & craftsmanship @ Recurse Center

2021.09 - 2021.12 & 2024.05 - 2024.08

Dramatically improved my software engineering skills in both batches at `the writing residency for programmers`.

2024: Machine learning (deep learning models), AI safety (mechanistic interpretability), memory-safe languages (Rust).

[Designing neural networks](#), [Rust: Notes on memory management](#). GitHub: [micrograd-python](#), [ruray](#).

2021: Computer science fundamentals. Backend engineering focus, mainly in Python, Go. Code craftsmanship.

[Naive ray tracer implementation in Python](#). GitHub: [raytracer \(Python\)](#).

Software engineer: censorship circumvention systems @ Lantern

2022.03 - 2024.05

Member of a technical team managing distributed cloud infrastructure delivering services to millions of users.

Designed and rebuilt a streaming data pipeline, and migrated a data warehouse. Reduced data storage and processing costs by 50%. Built monitoring to help reduce service outage durations up to 10x. Designed custom metrics to support product development, business, and customer service teams. Participated in hiring processes (résumé screens, interviews) and onboarding of new team members. Monitored internal adherence to data privacy commitments, supporting all teams on related work. Go, Python, Rust, GCP, Docker, Terraform, Open Telemetry, Rockset, Superset, Big Query, Honeycomb, Datadog, Grafana, Prometheus, Tailscale.

Research engineer: medical devices @ Kardium (Employee #16)

2008.11 - 2011.01

Led deployment imaging for a class III medical device for transcatheter mitral valve repair. Led device performance characterization (computer simulations, lab), preclinical trial design, initial clinical evaluation for a class II device for sternal closure. Product research: observed coronary artery bypass surgeries and cath lab procedures, worked closely with expert clinicians to define specs (performance and UX). Participated in hiring processes, onboarding. Kardium grew to 30 people during my tenure, and we worked on a highly effective consensus model for all R&D and hiring. Patents: [8888791](#), [9700363](#): Surgical instrument and method for tensioning and securing a flexible suture

Research scientist: biomedical imaging lab @ Sorbonne University (Postdoc) 2003.09 - 2004.09

Led research on high resolution ultrasound imaging of angiogenesis. Computer simulations of small particle dynamics in microscopic blood vessels. Engineered a microfluidics-based vascular model for high resolution ultrasound imaging. Mentored doctoral students.

LEADERSHIP + EXECUTIVE MANAGEMENT + ENTREPRENEURSHIP

Portfolio Manager / Scientific Liaison @ University of Oxford 2019.02 - 2021.07

Built \$1.2MM longevity bioscience portfolio: scouted, managed projects. Worked with PIs to develop >50 longevity focused research proposals in under 6 months. Managed a complex mix of advisory board objectives. Drafted original research proposals for sister portfolios under our funding umbrella. Mentored junior team members. Made inroads on biological aging with exceptional partners. Details: monicaspigar.com/posts/hedging-bets-longevity

COO @ Mineral Deposit Research Unit, University of British Columbia 2013.10 - 2015.10

Led operations, finance (budget O(\$MM)), core team. With the Director, co-led strategy for research and training initiatives, sponsorships, fundraising. Upgraded operations with transparent, intuitive systems designed to support a distributed research team. Board liaison. Routinely resolved friction points between industry expectations and institutional inertia. Planned and executed a unit reorganization to increase impact and effectiveness. Designed and delivered training programs in collaboration with MDRU members and faculty. Redesigned MDRU's information systems to lower the barrier for team members to leverage prior MDRU research and to coordinate resources. Safety and emergency planning for remote international fieldwork expeditions.

Program Manager & Industry Grants Officer @ University of British Columbia 2011.04 - 2013.06

Delivered a translational training program for MD/PhDs. Coincidentally contributed to the founding of a 3D tissue printing startup, now a thriving company: [Aspect Biosystems](https://www.aspectbiosystems.com). Negotiated and managed 200+ industry-academia agreements annually, working within the broader UILO team and in close coordination with UBC Legal and Finance.

Founder/CEO @ Little Stars 2010.11 - 2014.09

Founded a progressive early childhood education center. Established a licensed facility. Trained qualified ECEs to deliver a progressive curriculum adored by our extended family of families. Reached capacity enrollment in under 3 months. Self-directed, play-based program prioritizing outdoor activities in local beaches, parks, and forests.

CEO @ Panne Rizo 2004.10 - 2011.01

Acquired a micro-managed business and transformed it into a local retail/wholesale enterprise. Built operational infrastructure and implemented systems to support operational transparency and efficiency. As an acquirer (not a founder), I initially rotated through each role - night baker to delivery and shipping - to understand all aspects of the business. Earned coveted Whole Foods supplier slot. Developed a deep respect and appreciation for engaged clients.

Startup team member @ Xoran Technologies 2000.01 - 2000.11

Startup to commercialize a small footprint CT scanner. On early team, to seed SBIR award (\$250k/\$1.5M). Contributed to initial investor pitches. Led market research to identify a tractable go-to-market strategy. [Still a thriving company.](#)

PEER-REVIEWED PUBLICATIONS

[Google Scholar](#); [ResearchGate](#)

CORE SOFTWARE SKILLS

Languages: Python, Go, Rust. **Data:** SQL, PostgreSQL, BigQuery. Open Telemetry, Honeycomb, Datadog, Grafana, Prometheus. Rocket. **DevOps/Infrastructure:** Docker, Terraform. **Networking:** Tailscale, Wireguard. **Cloud:** GCP, AWS. **Essentials:** Git. Bash. Javascript, HTML, CSS.

Machine learning/data science: PyTorch, NumPy, SciPy, Matplotlib, MATLAB + signal/image processing & FEA toolboxes. Graduate level coursework in probability and statistics and in signal and image processing.

SOFTWARE PROJECTS, samples from <https://github.com/msyvr>
[activation engineering](#), [RAG vs. fine tuning](#), [micrograd-python](#), [ray tracers \(Rust, Python\)](#), [agentrix](#), [async downloader](#)

NON-ACADEMIC WRITING, samples from <https://monicaspigar.com>
[Designing neural networks: zero to micrograd](#) | [Rust: Notes on memory management](#) | [Rags to riches: RAG v fine tuning](#) | [All together now: async v parallel](#) | [Speed of light: physics & compute of ray tracing](#)