MONICA SPISAR, PhD

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EDUCATION + RESEARCH TRAINING

University of Michigan - PhD, Biomedical Engineering (Medical Imaging)

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. Strict sensitivity and resolution goals; initially, SOTA sensitivity was underpowered by ~8x. Work focused on subnanometer control of effective optical path length across a synthetic array detector. Built the optical system and tuning electronics. Wrote custom signal capture, processing, and image reconstruction software. 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.

Publications: Google Scholar: Monica Spisar

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.*

University of Toronto - BSc, Physics

Physics specialist program: 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.

PROFESSIONAL EXPERIENCE: TECHNICAL INDIVIDUAL CONTRIBUTOR

Recurse Center Software craftsmanship & upskilling 2021.09 - 2021.12 & 2024.05 - 2024.08

Dramatically improved my software engineering skills in both batches at `*the writing residency for programmers*`.
2024: Foundations for machine learning, AI safety (mechanistic interpretability), memory-safe languages (Rust).
Designing neural networks: zero to micrograd, Rust: Notes on memory management. GitHub: micrograd-python, ruray.
2021: Computer science fundamentals. Focused on backend engineering (mainly in Python, Go) and code craftsmanship.
Naive ray tracer implementation in Python. GitHub: raytracer (Python).

Lantern Software Engineer, Censorship circumvention systems 2022.03 - 2024.05

Rebuilt a data pipeline and migrated a data warehouse, reducing data storage and processing costs by 50%. Created dashboards (client metrics, ops, dev) crucial for securing O($MM) funding and reducing service outage durations O(10x). Member of technical team managing distributed cloud infrastructure for service delivery to O(MM) users, around centralized blocking efforts. Participated in hiring/interviewing processes; helped onboard new team members. Monitored internal adherence to data privacy commitment, supporting technical and design teams on related work.
Go, Python, Rust, GCP, Docker, Terraform, Open Telemetry, Superset, Big Query, Honeycomb, Datadog, Tailscale.

Kardium Research Engineer (Employee #16), Medical devices 2008.11 - 2011.01

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

Sorbonne Université / Université Pierre et Marie Curie Paris VI Research Scientist (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.

PROFESSIONAL EXPERIENCE: EXECUTIVE MANAGEMENT + ENTREPRENEURSHIP

University of Oxford Portfolio Lead / Scientific Liaison 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. Details: monicaspisar.com/posts/hedging-bets-longevity

Mineral Deposit Research Unit COO 2013.10 - 2015.10

Led operations, finance (budget 0($MM)). With the Director, co-led strategies for new research initiatives, sponsorships, fundraising. Board liaison. Planned and executed a unit reorganization. Designed training programs in collaboration with MDRU members and faculty. Routinely resolved friction points between industry expectations and institutional inertia. Redesigned MDRU's information systems to lower the barrier for team members to leverage prior MDRU research and to coordinate resources. Automated operations with transparent, intuitive systems designed to support a distributed team.

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

Delivered a translational training program. Coincidentally contributed to the founding of a 3D tissue printing startup, now a thriving company - Aspect Biosystems. Negotiated and managed 200+ industry-academia agreements annually.

Little Stars Founder/CEO 2010.11 - 2014.09

Founded a progressive early childhood education center. Reached capacity enrollment in under 3 months. Established a licensed facility. Trained qualified ECEs to deliver a progressive program adored by our extended family of families.

Panne Rizo CEO 2004.10 - 2011.01

Acquired a micro-managed business and transformed it into a local retail/wholesale enterprise. Earned coveted Whole Foods supplier slot. Built operational infrastructure and implemented systems to support operational transparency.

Xoran Technologies Early stage startup team member 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.

SOFTWARE SKILLS

Python, Go, Rust. NumPy, sklearn, PyTorch. MATLAB. SQL, PostgreSQL. Open Telemetry, Honeycomb, Datadog. Grafana, Prometheus. BigQuery. Rockset. Docker. Terraform. Tailscale. GCP, AWS. Git. Bash. Wireguard. Javascript, HTML, CSS.

SOFTWARE PROJECTS (select, see https://github.com/msyvr)

micrograd-python, ray tracers (Rust, Python), agentrix, multisource downloader

NON-ACADEMIC WRITING (select, see https://monicaspisar.com)

Designing neural networks: zero to micrograd, Tour de micrograd, Rust: Notes on memory management, Building a longevity bioscience portfolio, Mainstreaming longevity: Scaling biohacking, Picture perfect: AI + medical imaging