Shalev Lifshitz

AI Researcher, Engineer, & Entrepreneur

19 years old, Canadian, and striving to develop the future of technology. My goal is to spark the next wave of human innovation and help humanity reach a new evolutionary step.

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SKILLS

- Leadership
- Entrepreneurship
- Deep Learning, Computer Vision, Supervised Learning, Reinforcement Learning
- Python, Java, C#, C++
- PyTorch, Tensorflow, OpenCV, NumPy, Matplotlib, Pandas, SciPy, Scikit-Learn
- Git, Docker, PostgreSQL, Java Spring, Linux, ONNX, NVIDIA Apex, Mixed-Precision Training
- CLEAN Architecture, SOLID Principles, Regression Testing
- 3D Rendering
- Communication and Public Speaking
- Critical Thinking and Problem Solving
- Creativity
- Writing

EDUCATION

Specializing in Computer Science, Minoring in Math and Psychology

Undergraduate at the University of Toronto

09/2020 - Present

WORK/RESEARCH EXPERIENCE

Researcher

University of Toronto, Prof. Sheila McIlraith's Group

09/2021 - Present — *Toronto, Ontario*

Conducting deep reinforcement learning research with Prof. Sheila McIlraith at the University of Toronto and Vector Institute for Artificial Intelligence.

ML Engineer - building algorithms to automatically understand CT scans

Claronav

01/2020 - Present — *Toronto, Ontario*

Creating Machine Learning algorithms to improve surgical navigation at Claronav, an industry leader in surgical navigation which developed the first FDA-cleared image-guided surgical navigation system. Instead of a human having to locate and annotate various structures in CT scans, I teach machines to figure out the location of these structures on their own. The algorithms I created are now being used in surgical navigation systems around the world to understand patient CT scans in less than half a second.

Achievements

- Built the entire Machine Learning infrastructure from the ground up and created multiple Deep Learning models (both 2D & 3D input) to automate surgical navigation planning.
- Combined classic CNNs and Fully Convolutional Networks with classical computer vision methods.
- Created methods to analyze the results of training and used the ONNX library to prepare models for deployment in hundreds of surgical navigation systems.

Researcher - histopathology image search for cancer diagnosis

University of Waterloo, Kimia Lab

06/2019 - 01/2021 — *Waterloo, Ontario*

Created a new histopathology image search technique to speed up and improve the diagnosis of cancer and other diseases. I performed this research at the University of Waterloo KIMIA Lab (a global leader in histopathology image search). Paper (first-authored) is available at https://arxiv.org/abs/2111.15519.

Researcher - creating neural networks to behave more like the brain

University of Waterloo, Kimia Lab

09/2018 - 09/2019 — *Waterloo, Ontario*

Worked directly with Prof. Hamid Tizhoosh to design a new type of neural network that aims to rethink the basic perceptron structure used in Deep Learning and move away from a feed-forward approach. We aimed to develop networks that can be easily embedded in larger graphs (inspired by the structure of biological neural networks). I implemented and developed our novel neural architecture from scratch, without the use of existing Deep Learning libraries (since they were not able to perform our unique experiments). I spent over 400 hours implementing the network while maintaining academic excellence (95+ GPA). Paper is available at https://arxiv.org/abs/1909.12933.

Researcher - computer vision for faster and better diagnosis

The Hospital for Sick Children

06/2018 - 09/2018 — *Toronto, Ontario*

Researched ML & Computer Vision techniques to diagnose genetic disorders from cell images.

INTERESTS

AI | Neuroscience | Neurosymbolism | Multi-Agent RL | Cellular Automata | Physics, Sound, and Light Transport Simulations | Graphics & 3D | Game Development | General Relativity | Mathematical Proofs | LOTR | Piano | Causality | Latin | Ancient Greek and Roman Civilization | Ensuring a Positive Future for Humanity

TECHNICAL PROJECTS

Rendering engine with physics and sound simulations (12/2021 - Present)

Leading a team to build a rasterization rendering engine that uses physics and sound simulations to create a dynamic world. The rendering, physics, and sound engines/simulations are all created from scratch using C++.

AutoDirect.tech (09/2021 - 12/2021)

Worked in a team of 4 to develop AutoDirect.tech, a web application that enables buyers to easily view an assortment of cars with pre-approved financing, customized for their individual financial profiles. The project was performed in collaboration with Senso.AI, a Toronto startup (they provided the API which was used to determine loan offer pre-approvals for each buyer). I was responsible for most of the backend architecture and development, which used a Java Spring server and a PostgreSQL database server. I also implemented a regression testing infrastructure for the backend codebase using GitHub actions. The live website is available at https://autodirect.tech/ *and the backend code is available at* https://github.com/TLI-Group-1/Backend.

RESEARCH PAPERS

Subtractive Perceptrons for Learning Images: A Preliminary Report (09/2019)

We define the subtractive Perceptron (s-Perceptron), a graph-based neural network that delivers a more compact topology to learn one specific task. In this preliminary study, we test the s-Perceptron with the MNIST dataset, a commonly used image archive for digit recognition. The proposed network achieves excellent results compared to the benchmark networks that rely on more complex topologies. https://arxiv.org/abs/1909.12933

Gram Barcodes for Histopathology Tissue Texture Retrieval (12/2021)

We propose Gram barcodes, a new metric of tissue similarity for Histopathology Image Retrieval (HIR) systems. Unlike most feature generation schemes, Gram barcodes are based on high-order statistics that describe tissue texture by summarizing the correlations between different feature maps in layers of convolutional neural networks. We run HIR experiments on three public datasets using a pre-trained VGG19 network for Gram barcode generation and showcase highly competitive results. https://arxiv.org/abs/2111.15519

SPEAKING ENGAGEMENTS

Some of my speaking engagements:

- Talk at IFA (Berlin, Germany)
- Talk at Future Port Prague (Prague, Czech Republic)
- Talk at meConvention (Frankfurt, Germany)
- Panel at FiRe: Future in Review (San Diego, United States)
- Talk at ReWork Responsible AI Summit (Montreal, Canada)
- Talk at SXSW: South by Southwest (Austin, Texas)
- Talk at KPMG Executive Look (Toronto, Canada)

Please visit my website at shalev.ca for more videos of my speaking engagements and my portfolio.

AWARDS & ACHIEVEMENTS

C. David Naylor Scholarship from the University of Toronto ($20 000)

University of Toronto Scholar (2021)

University of Toronto, Trinity Collage Award (2021)

Winning Pitch at the McMaster University Fall 2018 Innovation Sprint

Best Startup Award at SAGE Canada