

Vedran Hrabar

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Education

MSc, Computer Science, FER, University of Zagreb

2026 – 2028 (expected)

BSc, Computer Science, FER, University of Zagreb

2023 – 2026

Thesis: *Memory efficiency of self-attention mechanisms in vision transformer architectures*. A modular ViT test bed with standard, linear (ELU+1, Katharopoulos et al.) and FlashAttention-2/3-style attention, each implemented as a custom CUDA kernel. Swin-style windowed attention and my own token pruning run on top of any of them. The pruning scores patches with classical image cues (Laplacian and Sobel gradients, colour intensity and saturation), learns the cue weights with the model, and selects patches through a differentiable perturbed top- k . Memory, speed and accuracy benchmarked across input resolutions.

Research and ML projects

Lesion segmentation with learnable morphology PyTorch

Mar 2026 – present

- Led a team of five; wrote the morphological layers, boundary-aware loss, preprocessing and evaluation.
- A stripped-down FCN with these changes reaches a Dice of 0.9070 on ISIC2018-T1, above the original challenge submissions and several larger U-Net and Transformer models.

serron CUDA · C++ · PyTorch

Jun 2026 – present

github.com/vhrabar/serron · PyPI

- Differentiable mathematical morphology for PyTorch, with learnable morphological layers.
- Separable van Herk–Gil–Werman CUDA kernels: $O(1)$ per pixel at any window size, forward and backward.
- Erodes an $8 \times 3 \times 512 \times 512$ batch with a 127×127 window in 0.25 ms on an H100 (PyTorch 81 ms, CuPy 2.0 ms).

Morphottention CUDA · C++ · PyTorch

Jun 2026 – present

github.com/vhrabar/Morphottention · PyPI

- Attention with the dot product replaced by a morphological operation.
- Flash-attention-style forward and backward CUDA kernels; the full attention matrix is never stored. Works with autograd and fits a standard ViT unchanged.

Competitions

Kaggle: Biohub Cell Tracking During Development Silver medal

Jun – Sep 2026

59th of 3,947 teams (top 1.5%) · [solution](#)

- Ensemble of three small 3D U-Nets with a transformer linker for tracking zebrafish cells in 3D over time.
- Main gain from handling sparse labels: only about 1 in 28 cells is annotated.

Open source

SecureEye Python · C++ · PAM · ONNX

Mar 2026 – present

github.com/vhrabar/SecureEye

- Modernised, more secure fork of Howdy (face login for Linux): PAM library and a separate authentication daemon over a socket, plus an ONNX liveness check.

kx-plot Python · matplotlib

Oct 2026 – present

One-line matplotlib plots from a short spec string; runs offline in Kaggle notebooks. [GitHub](#) · PyPI

IssueHub Kotlin · IntelliJ Platform

Jul 2026 – present

JetBrains IDE plugin for GitHub and GitLab issues. [JetBrains Marketplace](#)

Skills

Languages Python, C++, CUDA, Rust, Kotlin

ML & vision PyTorch (custom CUDA ops), Triton, OpenCV

Systems Linux, CMake, Meson, Docker; packaging for AUR, Fedora Copr, Launchpad

Spoken Croatian (native), English (full professional proficiency)