Ivan Puhachov

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PhD graduate working on geometry and machine learning
with applications to modern 2D and 3D graphics pipelines.
4 publication at SIGGRAPH (top-tier conference on graphics)

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PUBLICATIONS

▷ **Generative 2D Animation for 3D Graphics Pipelines** — under review
Ivan Puhachov, Noam Aigerman, Thibault Groueix, Mikhail Bessmeltsev
  – Use Stable Diffusion to generate graphical assets (skeleton-driven animation). GenAI
    text-to-image, Score Distillation Sampling (SDS) with SDXL, attention manipulation,
    Textual Inversion, DreamBooth finetuning, LoRA personalization, ControlNet.

▷ **Neural Implicit Reduced Fluid Simulation** — SIGGRAPH Asia 2024 · project page | acm
Yuanyuan Tao, Ivan Puhachov, Derek Nowrouzezahrai, Paul Kry
  – Fluid simulation using latent space of implicit geometric model (deepSDF).

▷ **Reconstruction of Machine-Made Shapes from Bitmap Sketches** — SIGGRAPH Asia 2023 · project page | acm
Ivan Puhachov, Cedric Martens, Paul G. Kry, Mikhail Bessmeltsev
  – 3D shape reconstruction from natural sketch by patch-based optimization.
    Extracting geometric primitives with ML then aligning them to the drawing.

▷ **Stability-Aware Simplification of Curve Networks** — SIGGRAPH 2022 · project page | acm
William Neveu, Ivan Puhachov, Bernard Thomaszewski, Mikhail Bessmeltsev
  – Design a curve network on a shape by worst-case stability criterion.
    Simplified mixed-integer semi-definite programming to an efficient greedy algorithm.

▷ **Keypoint-Driven Line Drawing Vectorization via PolyVector Flow** — SIGGRAPH Asia 2021 · project page | acm
Ivan Puhachov, William Neveu, Edward Chien, Mikhail Bessmeltsev
  – Novel PolyVector flow aligns curve to a smooth cross-field over bitmap image.
    ML keypoint detection, graph processing, then flow optimization to extract vector curves.

▷ Demo Projects — personal webpage
  – Trained GAN to generate vector images using differentiable rasterizer — link
  – RNN with attention to draw and complete doodles, trained on Quick Draw data — link

EXPERIENCE

▷ **Research Engineering Intern** at Huawei Research, Canada — Montreal, Canada · Oct 2021 – Feb 2024
  – Research demo for Digital Avatars (NeRF, GAN, Diffusion)
  – Developed product demos for mesh deformation, skinning and rigging, machine learning
    for shape deformation in C++, Python, with Blender and internal software.
  – SA 2023 paper: first-author publication, full R&D cycle from idea generation to paper
    submission, data generation in Blender, computer vision model training and finetuning,
    optimization pipeline, user studies, quantitative metrics.
  – SA 2024 paper: assisted in project design, setting up experiments infrastructure on
    remote machine with git, ssh, logging.

▷ **Machine Learning Research Intern** at MobiDev — Kharkiv, Ukraine · Feb 2019 – Aug 2019
  – MobiDev connects business with consultants and teams to deliver and support apps.
  – I worked on Computer Vision user verification; monitoring and analytics; deployment
    with Docker and AWS; improved verification success rate by 20%

SKILLS SUMMARY

Programming Languages: Python, C++, bash, JavaScript
Frameworks: PyTorch, JAX, NumPy, OpenGL, CGAL, libigl, Eigen, pyomo, Ipopt, huggingface
Tools: git, docker, Blender, Adobe Illustrator scripting
Geometry and Graphics: differential geometry; shape analysis; mesh optimization; deformation and animation;
vector fields; optimization algorithms; graph processing, graph optimization
Machine Learning: data processing; clustering; computer vision – detection, classification, segmentation; feature
extraction and fine-tuning; generative models – GAN, VAE, diffusion; neural implicit models – deepSDF, NeRF;

EDUCATION

▷ Université de Montréal — Montreal, Canada
  PhD student in Computer Science, DIRO, LIGUM — Sept 2019 – June 2025
  Research supervisor: Mikhail Bessmeltsev

▷ University of L'Aquila & Kharkiv National University — Ukraine, Italy
  MSc (cum laude) in Mathematical Engineering; **BSc** in Mathematics — Sept 2013 – June 2019
  Joint MSc Programme Intermaths **Thesis:** "Catacaustics of surfaces" (advisor: Alexander L. Yampolsky)