TARAS KHAKHULIN

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I'm interested in generative models, 3D vision and motion synthesis. I worked on PhD in Machine Learning under the supervision of Victor Lempitsky and results were published at conferences like CVPR, ECCV, and ACMM. My work in image synthesis, fast novel view generation, and realistic human avatars has been integrated into practical applications and devices, demonstrating real-world impact. Currently, I am a Research Engineer at Synthesia, where I develop foundational models for video and human avatars. I excel in rapidly prototyping and advancing innovative technologies that push the boundaries of visual computing systems. Global talent visa holder.

PROFESSIONAL EXPERIENCE

Synthesia Dec 2022 - present
Research Engineer *Edinburgh, UK*

Novel-view synthesis. Human motion capturing. Motion & video synthesis. SIGGRAPH'23 – HumanRF.

- Developed novel method for efficient 3D reconstruction for humans in motion. The core contributor in the project for a high-resolution articulated 3D avatar with focus on geometry and motion.
- Driving a project for controllable video diffusion with a focus on human videos. Trained and designed large video generative models. Preview results available here: MIT review.

Research Scientist Intern *London, UK*

Human motion and non-rigid registration without priors. Aug 2022 - Dec 2022

Samsung AI Center Apr 2019 - Aug 2022
Research Engineer *Moscow, Russia*

Worked on Image Synthesis and Neural Rendering. Led and contributed into several research projects:

- Proposed one-shot 3D reconstruction for head avatars with neural rendering, and worked with the enhancement based on self-supervised methods for megapixel quality. Both works presented at ACMM'22, ECCV'22 - code.
- Improved real-time novel views synthesis with scene as a set of semi-transparent meshes. Presented at CVPR'22 and modernized solution at WACV'23. Lead and publish library for novel view synthesis MLI and viewer.
- Developed generative models without spatial convolutions with the same quality code. CVPR'21
- Improved style transfer for high-resolution photo-realistic landscapes — CVPR'20 **oral talk** GitHub code.

Laboratory of Neural Systems and Deep Learning, MIPT, Feb 2018 – Sep 2018
Research Intern *Moscow, Russia*

Worked on the initial version of DeepPavlov - an open-source conversational framework. Investigated contextualized word embeddings for real texts. Developed PPO for machine translation to optimize BLEU.

NetCracker Technology Mar 2017 – Sep 2017
Junior Software Engineer *Moscow, Russia*

Built a client-server communication component with JavaEE. Accelerate SQL queries more than 2 times.

EDUCATION

Ph.D. student in Computer Science, Skolkovo Institute of Science and Technology 2020 - 2023
Advisor: Victor Lempitsky *Moscow, Russia*

New representations for image synthesis and 3D scenes

Master of Computer Science, Skolkovo Institute of Science and Technology Sep 2018 - Jun 2020
Advisor: Ivan Oseledets *Moscow, Russia*

GPA 5.0 out of 5.0, diploma with honours

Bachelor in Applied Math and Physics, Moscow Institute of Physics and Technology Sep 2014 - Jun 2018
GPA 4.74 out of 5.0 *Moscow, Russia*

PUBLICATIONS

* denotes joint first co-authorship

[1] P. Solovev*, T. Khakhulin*, and D. Korzhenkov*, "Self-improving multiplane-to-layer images for novel view synthesis," in *WACV*, 2023.

[2] M. Işık, M. Rünz, M. Georgopoulos, **T. Khakhulin**, J. Starck, L. Agapito, and M. Nießner, "Humanrf: High-fidelity neural radiance fields for humans in motion," in *ACM Trans. Graph.*, 2023.

[3] **T. Khakhulin**, V. Skliarova, V. Lempitsky, and E. Zakharov, "Realistic one-shot mesh-based head avatars," in *European Conference of Computer vision (ECCV)*, Oct. 2022.

[4] N. Drobyshev, J. Chelishev, **T. Khakhulin**, A. Ivakhnenko, V. Lempitsky, and E. Zakharov, "Megaportraits: One-shot megapixel neural head avatars," in *ACM International Conference on Multimedia*, Sep. 2022.

[5] **T. Khakhulin**, D. Korzhenkov, P. Solovev, G. Sterkin, T. Ardelean, and V. Lempitsky, "Stereo magnification with multi-layer images," in *CVPR*, Jun. 2022.

[6] I. Anokhin, K. Demochkin, **T. Khakhulin**, G. Sterkin, V. Lempitsky, and D. Korzhenkov, "Image generators with conditionally-independent pixel synthesis," in *CVPR*, Jun. 2021.

[7] R. Schutski, D. Kolmakov, **T. Khakhulin**, and I. Oseledets, "Simple heuristics for efficient parallel tensor contraction and quantum circuit simulation," *Phys. Rev. A*, vol. 102, p. 062 614, 6 Dec. 2020.

[8] **T. Khakhulin**, R. Schutski, and I. Oseledets, "Learning elimination ordering for tree decomposition problem," in *Proceedings of NeurIPS Workshop Learning Meets Combinatorial Algorithms*, Nov. 2020.

[9] I. Anokhin*, P. Solovev*, D. Korzhenkov*, A. Kharlamov*, **T. Khakhulin**, A. Silvestrov, S. Nikolenko, V. Lempitsky, and G. Sterkin, "High-resolution daytime translation without domain labels," in *CVPR*, Jun. 2020.

[10] M. Burtsev, A. Seliverstov, R. Airapetyan, M. Arkhipov, D. Baymurzina, N. Bushkov, O. Gureenkova, **T. Khakhulin**, and et. al., "Deeppavlov: Open-source library for dialogue systems," in *Proceedings of ACL 2018, System Demonstrations*, 2018.

[11] V. Malykh, V. Logacheva, and **T. Khakhulin**, "Robust word vectors: Context-informed embeddings for noisy texts," in *EMNLP: The 4th Workshop on Noisy User-generated Text*, 2018.

US PATENTS

- "Plausible dayscale timelapse generation method and computing device", US 17741959, 2022
- "Image generators with conditionally-independent pixel synthesis", US 17697436, 2022
- "Method and apparatus for three-dimensional reconstruction of a human head for rendering a human image", US 17987586, 2022
- "Method of generating multi-layer representation of scene and computing device implementing the same", US 18083354, 2023

TEACHING & PROGRAM COMMITTEE

Reviewer: ICCV 2021, CVPR 2022, ECCV 2022, WACV 2023, CVPR 2023, ICCV 2023, ICML 2024, ECCV 2024.

Teaching Assistant, Deep Computer Vision and Graphics, May, Spring, 2022 (80 participants).

Teaching Assistant, Deep Learning, Spring, 2021 (100+ participants).

Lecturer and manager of the deep learning school. Co-found practical courses for 500+ active students.

AWARDS

- "The Ilya Segalovich" Yandex award for young scientists, *highly selective*, 2022
- Huawei scholarship for master students at MIPT, 2019