Kacper Kania

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Education

Started: Oct 2020 — **PhD Candidate**
University: Warsaw University of Technology
Research topic: Low Shot Realistic Human Rendering from Partial Information (with the support of Microsoft Research)

Oct 2019 – Oct 2020 — **PhD Candidate (discontinued)**
University: Wrocław University of Science and Technology
Research topic: Implicit Representations for 3D Objects Reconstruction

Feb 2018 - Jul 2019 — **Master's degree with honors in Computer Science and Data Science**
University: Wrocław University of Science and Technology
Thesis: Analysis of properties of contextual neural networks in CUDA
GPA: 5.08 / 5.50

Oct 2014 - Jan 2018 — **Bachelor's degree with honors in Computer Science**
University: Wrocław University of Science and Technology
Thesis: An implementation of an inference module in the sign language recognition system
GPA: 4.79 / 5.50

Selected Research

(Accepted to CVPR 2023) BlendFields: Few-Shot Example-Driven Facial Modeling
Kania, Kacper, Stephan J. Garbin, Andrea Tagliasacchi, Virginia Estellers, Kwang Moo Yi, Julien Valentin, Tomasz Trzciński, and Marek Kowalski. "BlendFields: Few-Shot Example-Driven Facial Modeling." In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp. 404-415. 2023. Project page: https://blendfields.github.io/

(Accepted to CVPR 2022) CoNeRF: Controllable Neural Radiance Fields
Kania, Kacper, Kwang Moo Yi, Marek Kowalski, Tomasz Trzciński, and Andrea Tagliasacchi. "CoNeRF: Controllable Neural Radiance Fields." In Proceedings of the IEEE/CVF Conference on Computer Vision and Pattern Recognition, pp. 18623-18632. 2022. Project page: https://conerf.github.io/

TrajeVAE – Controllable Human Motion Generation from Trajectories
Kania, Kacper and Kowalski, Marek and Trzcinski, Tomasz. "TrajeVAE - Controllable Human Motion Generation from Trajectories" arXiv preprint arXiv:2104.00351 (2021).

(Accepted to NeurIPS 2020) UCSG-Net - Unsupervised Discovering of Constructive Solid Geometry Tree
Kania, Kacper and Zieba, Maciej and Kajdanowicz, Tomasz. "UCSG-Net - Unsupervised Discovering of Constructive Solid Geometry Tree." arXiv preprint arXiv:2006.09102 (2020).

Representing Point Clouds with Generative Conditional Invertible Flow Networks
Stypulkowski, Michal and Kania, Kacper and Zamorski, Maciej and Zieba, Maciej and Trzcinski, Tomasz. "Representing Point Clouds with Generative Conditional Invertible Flow Networks" arXiv preprint arXiv:2010.11087 (2020).

Research Collaborations

Jun 2021 – Dec 2021 — **Visiting International Research Students at University of British Columbia under the supervision of prof. Kwang Moo Yi and Andrea Tagliasacchi**
• Learning a controllable image generation with a few annotated data samples for implicit neural networks
• Current results already enable generating high quality human images with different expressions in an interpretable, controllable way
• The collaboration is still on-going

Work Experience

Jul 2024 – Nov 2024 — **Research Internship at Reality Labs, Meta in Toronto**
• I'm working closely with Codec Avatars team. My project involves developing a method for 3D face registration and 3D face reconstruction jointly.

Jul 2022 – Oct 2022 — **Research Internship at Microsoft Research Cambridge**
• Worked closely with the AR/VR team on realistic, real-time head avatars. My proposed method builds on VolTeMorph (link) and fixes its main issue—lack of realistic, expression dependent wrinkles. The project finished with 2 articles: one published at CVPR 2023 (see "Selected

Research"), and one that further improves the results and is under review at TPAMI (link).

Apr 2020 – Oct 2020 **Computer Vision Engineer, outsourced for BZB UAS**
• Working on an automatic detection from an aerial view of canisters near oil transmission pipelines. Such canisters may indicate attempts to direct the stealing of oil. The detection includes custom region proposal generation and filtering classifier that selects potential canisters (~20 proposals for 8000 x 8000 orthophoto map with near 100% recall).

Aug 2019 – Oct 2020 **Research Assistant at Wrocław University of Science and Technology**
• Research on incorporating the CSG framework for occupancy representation in neural networks for a direct mesh reconstruction
• Research on processing point clouds using continuous normalizing flows
• Research on processing shapes in the SDF representation using continuous normalizing flows for a direct mesh reconstruction
• Developing an algorithm that predicts whether a bank transaction will be overdue

Nov 2016 - Feb 2019 **Researcher and Developer at Identt, Wrocław**
• OCR system for personal documents under arbitrary lighting conditions
• OCR annotation tool for personal documents
• Personal document image generator using BRDF model
• Face identification using a single person's image
• Leading seminaries about Deep Learning algorithms and listener during seminaries about various algorithms related to Machine Learning field (that includes Monte Carlo simulation, VboW approach for image search engine)

Feb 2018 - May 2018 **Researcher and Developer at CancerCenter, Wrocław**
• Application for histopathology images management
• Prostate segmentation on 3D MRI imagery

Jun 2017 - Sep 2017 **Research Internship at Wrocław University of Science and Technology**
• Analysis of proteins' data as cloud of points where each point was an atom of a molecule
• Creating a deep algorithm for 3D pocket segmentation in a patch-wise manner

Jul 2016 - Oct 2016 **Summer Trainee at Nokia, Wrocław**
• PlantUML diagrams for SCT/PIT Tests generator
• Web application for computer components monitor in Django
• Automatic boost to c++11 syntax converter
• Real time plotting utility of daily cluster nodes usage

Own Projects

Automatic traffic sign detection and recognition
A real-time system using deep learning detector and classifier using Tensorflow framework. The solution performs with high accuracy at 15 FPS on GTX 740m. Repository: ***github.com/vanitas-vanitatum/traffic-sign-recognition***

Audio Deep Dream
An implementation of a deep dream algorithm proposed initially by Google. The solution implements the same method that works on spectrograms. I applied a few modifications to make the results more diverse. A dreaming model was trained on gender classification dataset. Repository: ***github.com/kacperkan/speaker-gender-classification-and-deepdream***

METAVIR scale value prediciton
A project including a deep learning model for a prediction of one of METAVIR scale values from USG liver images. The best model is a pretrained DenseNet working on an image preprocessed with the NL means algorithm. The project required extracting ROIs where all the ground truth data (such as ROI coordinates and USG machine's parameters) was encoded in pixels of images. Repository: ***github.com/kacperkan/liver-usg-kaggle***

Hashtag recommendation system
An application recommending appropriate hashtag for a particular content of tweet using content embeddings and hashtag popularity measured by PageRank algorithm. Repository: ***github.com/data-boars/hashtag-recommendation-project***

Awards

November 2020 **1st place at SkyHack Hackathon in Poland**
My team and I proposed a web application that allows to upload a video clip, predicts in a multilabel classification fashion what elements are present and extracts keywords from audio file of a narrator from the associated audio. Both predictions are performed with customized deep learning models. Repository: ***gitlab.com/deep4hack/deep4hack***

2018, 2019 **Rector Awards for distinguished MSc student**

May 2018 **3rd place at BankItUp Hackathon in Wrocław**
We proposed a solution for a potential credit recipient recommendation. It was a web application which ranked companies according to their capital, starting date of the economic activity and other information available at government websites.

2018 **Dean Award for distinguished BSc student**

2015, 2016, 2017, 2018 **Rector Awards for distinguished BSc student**

Teaching & Additional Activities

Mar 2021 - **Teaching Assistant**
• Computer Vision project for PhD students. Responsibilities: planning the lecture, organizing project proposals, and organizing the work of PhD students

Feb 2020 – Jun 2020 **Teaching Assistant**
• Probabilistic Machine Learning laboratory for Master students with Data Science specialization. Responsibilities: preparing tasks as Jupyter Notebooks (on Gaussian Processes, Bayesian Neural Networks and Latent Dirichlet Allocation); organizing research projects for students
• Linux Administration for Bachelor students at Computer Science faculty. My responsibilities included: planning and creating presentations, tasks, and the final tests each week for students (from basic bash commands to bash scripting and complex network administration)

Nov 2016 – Oct 2020 **Active member of medical.ml scientific students' group**
• Projects: EMG data analysis in search of common characteristics for pseudomiotonic signal and METAVIR scale prediction from USG liver images
• Internal courses: statistics and a theory behind Machine Learning algorithms, their various applications
• Seminaries: mainly about novelties in machine learning and Deep Learning

Nov 2017 – Oct 2019 **Open lectures and workshops**
• Lectures on introduction to Machine Learning, Artificial Neural Networks and Deep Learning
• Workshops on how libraries such as Tensorflow, Keras and PyTorch are constructed and how to use them on toy examples

Additional information

Research interests:	Inverse computer graphics, neural rendering, representation learning, generative modelling
Fields of expertise:	Deep learning, manifold learning, 3d computer graphics, computer vision, data analysis, explainable machine learning, linear algebra
Programming:	Python (advanced), C++ (basic), Rust (basic)
Frameworks:	PyTorch, Tensorflow, OpenCV, Keras, Pandas, CUDA, Docker
Languages:	English (C1), Polish (native)