ALEKSEI PETRENKO

Computer science Ph.D. student with background in deep reinforcement learning, machine learning, algorithms and software development

OBJECTIVE

Summer 2020 — Ph.D. internship in machine learning, AI, robotics

PERSONAL INFORMATION

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Date of birth: April 19, 1991

EDUCATION & RESEARCH

2018-present, Los Angeles, USA — Computer science Ph.D. student at University of Southern California, funded by USC Provost Fellowship (current GPA 4.0/4.0)
Advisor: Prof. Gaurav Sukhatme, USC Robotic Embedded Systems Lab

Research interests: deep reinforcement learning, distributed RL, trust region methods, agent memory architectures, intrinsic motivation & exploration.
Active research projects:

- Distributed RL & self-play for training human-level agents for a pixel-based 3D game (VizDoom)
- Autonomous exploration based on topological landmark-based environment maps

2012-2014 — M. Sc. in Computer Science at Nizhny Novgorod State Technical University (5.0/5.0)
2008-2012, Russia — B. Sc. in Computer Science at Nizhny Novgorod State Technical University (4.95/5.0)

EMPLOYMENT HISTORY

2019, Santa Clara, USA — **PhD Research Intern at Intel Labs**
Advised by Vladlen Koltun, worked on a research project aimed at scaling up model-free reinforcement learning for simulated environments using asynchronous actor-critic algorithms (distributed PPO, IMPALA). Preliminary demos of the agent's performance: single-player and multiplayer. The project is currently being readied for publication.

Technologies: Python, Pytorch, TensorFlow, RLLib, Ray, OpenAI Gym, Slurm

2015-2018, Nizhny Novgorod, Russia — **Tech Lead at itSeez3D**
Lead algorithms and systems developer in the computer vision startup. My main project with itSeez3D was the AI-based human digitization engine called Avatar SDK.

- Developed a deep learning-based method for accurate 3D reconstruction of the human head from a single portrait photo
- R&D for the automatic generator of full-body characters (skeleton animation, rendering, deep learning)
- Optimized deep neural networks for deployment (quantization, compression, etc.)
- Worked on various applications for the avatar engine: mobile, desktop and virtual reality. Developed and deployed interactive demos for major conferences and

exhibitions: SIGGRAPH, GDC, VRX.
My avatar automatically created from a single photo by the Avatar SDK demo app: https://skfb.ly/6FUYY

Key technologies:

- C++11/14 and OpenCV for the algorithms
- TensorFlow and Keras for deep learning
- Python & numpy for ML research and scripting
- OpenGL, Unity & Unreal for 3D rendering, Oculus SDK + Unity for VR

2013-2015
Nizhny Novgorod
Russia

Senior Software Engineer at itSeez

Computer vision startup and for many years a company behind the OpenCV library. At itSeez I was involved in the development of a new product: the first portable consumer 3D scanner.

- 3D scanning algorithms for various depth sensor platforms: Intel RealSense, Google Tango, Apple iPad + Occipital Structure Sensor, etc.
- Developed a cloud backend for the 3D reconstruction pipeline
- Created mobile and desktop 3D scanning applications
- Algorithms for polygonal mesh and point cloud processing, filtering and refinement of noisy 3D data, algorithms that prepare meshes for 3D printing: mesh "hollowisation" (polygon offset), ensuring manifoldness, etc.

My full-body scan made with itSeez3D software: https://skfb.ly/CzyX

Technologies: C++, OpenCV, C# & Xamarin, Python+numpy, Django, AWS, Docker

2010-2013
Nizhny Novgorod
Russia

Software Engineer at Tecom

Developed a big real-time (frame perfect) massively parallel broadcast automation system with many levels of redundancy. Position in Tecom allowed me to acquire expertise in many areas of software engineering, from architecture to low-level optimization.
Technologies: C++ and Qt, C#, Java, Javascript, Python, Linux

SKILLS

Programming languages:

- C++ (highly advanced). C++ is my favorite language for it's speed, portability, and weird elegance. C++11/14/17, STL, Qt, CMake
- Python (advanced). Past experience includes research, prototyping and automation
- C#, Java, Javascript (past experience, proficient with some catching up)

Other skills:

- Software development and architecture. Created multiple successful software projects from ground up (mobile, desktop, server-side, VR, plugins). Multithreading, data binding, patterns, loose coupling, APIs, UI, etc.
- Deep learning: CNNs, RNNs, ResNets, UNets, GANs, VAEs, etc. Deep reinforcement learning. Implemented many RL methods from scratch: Double/dueling DQN, Policy Gradient, A2C, PPO, distributed PPO. Frameworks & tools: Tensorflow, PyTorch, Ray, RLLib, OpenAI Gym, etc.
- Algorithms. Solid background from industry and programming competitions. Graph algorithms, computational complexity, data structures, etc.
- Computer vision, OpenCV, depth sensors & 3D data processing
- Cloud, scalable services, cluster (AWS API, Docker, Slurm)
- 3D rendering (OpenGL, Unity3D) and VR (Oculus)

OPEN-SOURCE PROJECTS & REPOSITORIES

2018 https://github.com/alex-petrenko/curious-rl intrinsic motivation in deep RL, implementation of a method called "Curiosity-driven Exploration by Self-supervised Prediction" for hard exploration tasks in 3D pixel-based environments

2018 https://github.com/alex-petrenko/tf-reinforce Tensorflow implementation of classic policy gradient algorithms for continuous control tasks

2017 https://github.com/alex-petrenko/rl-experiments deep RL algorithms (Double DQN, A2C) in the context of the gridworld environment called MicroTbs

2016 https://github.com/alex-petrenko/4dvideo open-source volumetric video recorder and player for Intel RealSense and Google Tango. It can capture and playback "4D" clips like this in real time with a single mobile device. Features a very fast Delaunay triangulation algorithm based on modified Guibas-Stolfi method.
Visit my personal website to find more code and projects.

ACHIEVEMENTS

2018-2020 Provost PhD Fellowship from University of Southern California

2012 Scholarship of the President of the Russian Federation

2012 Winner of "Osipovsky Cup 2012" programming contest held in Kovrov State Technological Academy

2012 Winner of the Code Game Challenge at ACM ICPC Southern Subregional Contest

2011-2012 Participant of the ACM ICPC, World Semifinals (NEERC)

2010-2012 Prize winner of the ACM ICPC, World Quarterfinals (NEERC Southern Subregional)

OTHER INTERESTS

- Futurology, transhumanism, AGI, singularity. Authors: E. Yudkowsky, G. Egan, R. Kurzweil, K. Eric Drexler, V. Vinge
- Fundamental science: physics, cosmology, evolutionary biology
- Entrepreneurship
- Hobbies: motor racing, karting