

# ALEKSEI PETRENKO

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

## OBJECTIVE

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Summer 2019    Ph.D. internship in machine learning, AI, robotics

## PERSONAL INFORMATION

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Website: <https://alex-petrenko.github.io>  
Date of birth: April 19, 1991

## EDUCATION & RESEARCH

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

2012-2014    M. Sc. in Computer Science at Nizhny Novgorod State Technical University

2008-2012    B. Sc. in Computer Science at Nizhny Novgorod State Technical University

Research interests: deep reinforcement learning, autonomous exploration and intrinsic motivation, RL with sparse rewards, using predictive models for decision making

Current projects:

- Autonomous exploration based on topological landmark-based environment maps
- Imagination-augmented agents (I2A) for stochastic environments

## EMPLOYMENT HISTORY

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2015-2018    **Tech Lead at [itSeez3D](#)**  
Nizhny Novgorod    Lead algorithms and systems developer in the computer vision startup. My main project  
Russia    with itSeez3D was the AI-based 3D human digitization engine called [Avatar SDK](#).

- Development of 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 (3D, 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 demos for major conferences and exhibitions: SIGGRAPH, GDC, VRX.

My avatar automatically created from a single photo by the Avatar SDK deep learning pipeline: <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 **Senior Software Engineer at itSeez**  
Nizhny Novgorod  
Russia
- 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
  - Implemented 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 by itSeez3D software: <https://skfb.ly/CzyX>
- Technologies: C++, OpenCV, C# & Xamarin, Python+numpy, Django, AWS, Docker, iOS, macOS, Linux, Android
- 2010-2013 **Software Engineer at Tecom**  
Nizhny Novgorod  
Russia
- Developed a big real-time (frame perfect) massively multithreaded 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

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### Programming languages:

- C++ (highly advanced). C++ is my favorite language for it’s speed, portability, and weird elegance. C++11/14, STL, Qt, CMake
- Python (advanced). My language of choice for research, prototyping or automation
- C#, Java, Javascript (proficient)

### Other skills:

- Software development and architecture. Created multiple successful software projects from ground up (mobile, desktop, server, VR, plugins). Multithreading, data binding, patterns, loose coupling, APIs, UI, etc.
- Deep learning, deep reinforcement learning. Supervised and unsupervised setting, CNNs, RNNs, ResNets, UNets, GANs, VAEs, etc. Implemented multiple RL methods from scratch: DQN, Vanilla Policy Gradient, A2C, PPO.
- Algorithms. Solid background from industry and programming competitions. Graph algorithms, computational complexity, data structures, etc.
- Computer vision & OpenCV, mostly in the context of 3D scanning
- Cloud, scalable services (AWS API, Docker)
- 3D rendering (OpenGL, Unity3D) and VR (Oculus)

## OPEN-SOURCE PROJECTS & REPOSITORIES

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- 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

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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

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- 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