

# Stanislav Pidhorskyi | Curriculum Vitae

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I'm passionate about Computer Vision and Machine Learning. I am a quick learner and system builder with broad knowledge and experience in fields ranging from interactive computer graphics to computer vision. My current research focus is on generative models and novelty/anomaly detection.

## Education

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- **Ph.D. in Computer Science**, *West Virginia University, Morgantown WV* *Aug. 2015 – present*  
Lane Department of Computer Science and Electrical Engineering. Working on Computer Vision problems with the focus on open set classification and novelty detection.
- **M.S. in Dynamics and Strength of Machines**, *National Aerospace University, Kharkiv, Ukraine* *Sept. 2012 – Feb. 2014*  
Department of Mechanical Engineering. Thesis: "Calculation Method of Structural Durability of Aviation Construction Elements"
- **B.S. with Honours in Applied Mechanics**, *National Aerospace University, Kharkiv, Ukraine* *Sept. 2008 – Jun. 2012*  
Department of Mechanical Engineering. Thesis: "Calculation of Wing and Chassis Strength of a Heavy Cargo Aircraft AN-124"

## Professional Experience

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- **West Virginia University, Morgantown WV**, *Graduate Research Assistant* *January 2016 – present*  
Performed Computer Vision and Machine Learning research. Used Deep Learning to design methods for image retrieval, novelty/anomaly detection, and attention learning. See the list of research projects below for details.
- **IstoVisio, Inc., Morgantown WV**, *Research Intern* *January 2018 – May 2018*  
Built data conversion pipeline of large-scale volumetric microscopy images that originate from heterogeneous sources into internal multi-resolution octree representation. Implemented real-time multiplier for connecting several clients in one Virtual Reality space.
- **IstoVisio, Inc., Morgantown WV**, *Research Intern* *June 2017 – August 2017*  
Designed algorithm and implemented semi-automatic tracing tool that increased the speed of manual segmentation of neurons in light-sheet microscopy images. Added colormaps to direct volume rendering system. Added FFmpeg-based screen recording. Added SPIR-V support to the rendering engine.
- **Gameloft, Kharkiv, Ukraine**, *Senior C++ Developer* *August 2014 – July 2015*  
Implemented shadow-mapping utilizing LiSPSM "Light Space Perspective" SIBGRAPH 2007 and PCF "Percentage-closer soft shadows" SIGGRAPH 2005 in a production environment. Graphics programmer at the project: "Gangstar Vegas IV: City of sin" (iOS). Responsible for many graphic improvements were made during project evolution. Implemented support of Thai language.
- **Gameloft, Kharkiv, Ukraine**, *C++ Developer* *June 2013 – August 2014*  
Gameplay programmer at "Candy Block Breaker for Tango" (iOS). Worked with text rendering at UNO and friends for Line (iOS). Was porting Asphalt 8 Airborne to a new platform – PS Vita. Gameplay and graphics programmer at Gangstar Vegas IV: City of sin (iOS).
- **National Aerospace University, Kharkiv, Ukraine**, *Research Assistant* *June 2009–May 2013*  
Developed a data collecting system for the fatigue test facility. Designed electrical circuit with AVR microcontroller, an array of ADC, and USB controller and produced a prototype of the device. Developed software for the device and for the PC, that is a part of the data collecting system.

## Research Projects

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- **Probabilistic Novelty Detection with Adversarial Autoencoders**  
Developed a new probabilistic framework for novelty and anomaly detection which led to a NeurIPS publication [1]. Introduced novel architecture that combines adversarial autoencoder with GAN. The implementation uses Pytorch and publicly available on [github](https://github.com). An extensive set of results show that the approach improves state-of-the-art results on several benchmark datasets. Resulted. Extension of the approach applied for open-set recognition resulted into WiML workshop publication.
- **Attribute Based Scalable Face Image Retrieval using Hashing**  
Build a system to perform quick face image retrieval. For queries, built an interactive application using morphable face model that can produce realistic face images. Face model can be modified real-time to adjusted the search results enabling easy database browsing. Developed a deep-learning based algorithm for hashing face image and model parameters so that similar faces and face models produce similar hashes. Designed novel deep hashing method which resulted into an ACCV publication [2]. The implementation uses Tensorflow and for the rotation optimization implemented a python module in C++ using pybind11 that does random search optimization and can utilize multiple cores of CPU.

## ○ Quick, Draw! Doodle Recognition Challenge

Built a classifier for Google Quick Draw challenge with a training set of 50M drawings. Implemented fast rasterizer to convert vector drawings to raster images on GPU. The rasterizer is a python module developed with pybind11 and CUDA and allows to significantly speed up training time by doing rasterization on the fly. Rasterization was fast enough to achieve nearly 100% utilization of 4 Titan Xp while adding negligible overhead on one of GPUs. Got into [top 14%](#) with simple ResNet-18 and without using ensembling.

## ○ Interactive Exploration of Multidimensional Images Using Virtual Reality

Lead a group of undergrad and grad students. Supervised, developed and maintained all aspects of the project and the rendering engine in particular. The project led to a product [syGlass](#) owned by IstoVisio, Inc.. Implemented real-time Direct Volume Rendering system to visualize large-scale volumetric microscopy and CT/MRI images in Virtual Reality. Direct Volume Rendering system implements different optical models and transfer-functions. Rendering system utilizes GPU by using compute shaders in OpenGL. Implemented interactive Virtual Reality exploration of the data. Incorporated abstraction layer over different VR APIs, that allowed easily add support for different Virtual Reality headsets, such as Oculus, Vive, and Microsoft VR. Implemented multi-resolution, octree based system for interactive visualization of volumes up to 16TB. Implemented a multi-level caching system to amortize disk access.

## ○ Guided Imagery Mobile Health Application

Developed an iOS application for medical research purposes, which is available at [iTunes](#). The application includes various surveys and audio cards that are unlocked according to the program. Mobile iOS application communicates with a web server to send all tracking information and get updated audio cards. Implemented tracking system, to collect all user activity and send it back to the server once the internet is available. To develop the iOS application I've used C++ and Objective C. To develop server application I've used Amazon Web Services, Python, and Django framework.

## Technical Skills

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### ○ Programming Languages: Proficient in: C, C++, Python, GLSL

Have experience with: C#, Java, Objective C, x86 Assembly, AVR Assembly, SSE2/3 Intrinsics.

### ○ Tools & Technologies: PyTorch, Tensorflow, NumPy, Scikit-Learn, cython, CUDA, GPGPU, OpenGL, OpenCL, Oculus VR, Vive VR, Unity, GCC, clang, MSVC, Emscripten, CMake.

### ○ Experience developing for: Linux (Ubuntu, Gentoo), OS X, iOS, Windows, AVR

## Honors

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First Class Diploma for first place at the Ukrainian Olympiad on Strength of Materials. May 2010

## Professional Service

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Reviewed papers for CVPR, ECCV, BMVC, ICIP, ICIAR, and WiML. IEEE student member.

## References

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| Prof. Dr. Gianfranco Doretto<br>Lane Department of Computer Science and Electrical Engineering,<br>West Virginia University, Morgantown WV<br>26506-6109<br>+1(304)-293-9133<br>gianfranco.doretto@mail.wvu.edu | Prof. Dr. Donald A. Adjeroh<br>Lane Department of Computer Science and Electrical Engineering,<br>West Virginia University, Morgantown WV<br>26506-6109<br>+1(304)-293-9681<br>donald.adjeroh@mail.wvu.edu | Victor Bernot<br>Lead developer at OhBibi.<br>Former Principal Programmer at Gameloft<br>OhBibi, 44, rue des Petites Ecuries, 75010<br>Paris, France<br>+33683539166<br>vbernot@ohbibib.com |
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## Publications

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- [1] Stanislav Pidhorskyi, Ranya Almohsen, Donald Adjeroh, and Gianfranco Doretto. "Generative Probabilistic Novelty Detection with Adversarial Autoencoders". In: *Advances in Neural Information Processing Systems (NeurIPS)*. 2018, pp. 6821–6832.
- [2] Stanislav Pidhorskyi, Quinn Jones, Saeid Motiian, Donald Adjeroh, and Gianfranco Doretto. "Deep Supervised Hashing with Spherical Embedding". In: *Asian Conference on Computer Vision (ACCV)*. 2018.
- [3] Stanislav Pidhorskyi, Michael Morehead, Quinn Jones, George Spirou, and Gianfranco Doretto. "syGlass: Interactive Exploration of Multidimensional Images Using Virtual Reality Head-mounted Displays". In: *arXiv preprint arXiv:1804.08197* (2018).
- [4] Ranya Almohsen, Stanislav Pidhorskyi, and Gianfranco Doretto. "Open-set Recognition with Adversarial Autoencoders". In: *WiML Workshop*. 2018.
- [5] Peter Giacobbi, Treah Haggerty, Stanislav Pidhorskyi, Danielle Symons-Downs, Leann Long, Dana Volker, Melanie Clemmer, Melissa Olfert, Shari Steinmann, Neel Rao, Hannah Staggs, Kelsey Kinnamon, Thomas Hulsey, and Donald Adjeroh. "Feasibility and Use of a Guided Imagery Mobile Health (mHealth) Application for Pregnant Women". In: *Annals of Behavioral Medicine* (2019).
- [6] O.P. Kyslytsyn, Stanislav Pidhorskyi, and A.O. Taran. "Temperature Distribution Along the Active Layer of the Oxide Cathode Under the Continuous and Pulse Current Take-offs". In: *Aerospace Engineering and Technology* 3 (2012), pp. 47–55.