

Petrenko SASHA

Aerospace Engineer | AI Researcher

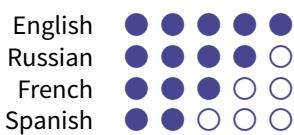
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Born June 20th, 1994 (27 years old) in Columbia, MO, U.S.A.



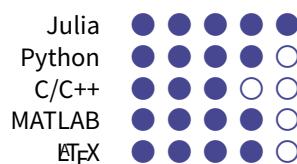
Currently a Ph.D. candidate of Computer Engineering and a machine learning researcher, I have a background in aerospace engineering research and work in lifelong machine learning research and applications with DARPA and ARL's Night Vision and Electronic Sensors Directorate (NVESD).

My research specialties are in Adaptive Resonance Theory (ART) neural network algorithms, deep learning, clustering, and multi-modal lifelong machine learning.

LANGUAGES



</> PROGRAMMING



SKILLS

Research	Machine Learning, Optimal Estimation, Astrodynamics
Programming	Julia, Python, C/C++, C#, MATLAB/Simulink, \LaTeX
Frameworks	GNU/Linux, Windows
Tools	Docker, Unity, GNU toolchain (coreutils, compiler collection, make)
Development	Visual Studio Code, Visual Studio, IntelliJ PyCharm, Atom
Others	FL Studio, Ableton

EDUCATION

December 2021	Ph.S. Computer Engineering - Missouri University of Science and Technology
December 2019	M.S. Aerospace Engineering - Missouri University of Science and Technology - GPA : 3.83
December 2016	B.S. Aerospace Engineering, Minor in Mathematics, Summa Cum Laude - Missouri University of Science and Technology - GPA : 3.82
May 2011	International Baccalaureate Diploma

PUBLICATIONS

- 2021 Petrenko, S., Wunsch, D. (2021). Fast Gaussian Mixture Model Mode Finding. Forthcoming
- 2021 Petrenko, S., Brna, A., Wunsch, D. (2021). Whole-Scene Context Recognition in a Custom AirSim Environment. Forthcoming
- 2021 Petrenko, S., Wunsch, D. (2021). Deep Clustering on Infrared Imagery with ART. Forthcoming
- 2021 Petrenko, S. (2021). AdaptiveResonanceTheory.jl : A Julia implementation of Adaptive Resonance Theory (ART) algorithms, The Journal of Open Source Software. 2021 June 1. Available from <http://joss.theoj.org/papers/10.21105/joss.00500>
- 2021 Petrenko, S. (2021). ClusterValidityIndices.jl : Batch and Incremental Metrics for Unsupervised Learning, The Journal of Open Source Software. 2021 June 1. Available from <http://joss.theoj.org/papers/10.21105/joss.00500>
- 2016 Yamilov, A., Petrenko, S., Sarma, R., & Cao, H. (2016). Shape dependence of transmission, reflection, and absorption eigenvalue densities in disordered waveguides with dissipation. Physical Review B, 93(10)
- 2016 Petrenko, S., (2016) Closing Presentation on Custom FPGA-Deployable Data-Flow Controller Algorithm, Oral, Ball Aerospace and Sandia Laboratories, Albuquerque, NM

PRESENTATIONS

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- 2021 **Petrenko, S.**, (2021) Design and Performance of a Multi-Modal Lifelong Machine Learning Algorithm in Air-Sim Simulations, Oral, DARPA L2M Month 15 PI Review, Virtual
- 2021 **Petrenko, S.**, (2021) Deep Clustering with Adaptive Resonance Theory for Lifelong Machine Learning, Oral, DARPA L2M Month 12 PI Review, Virtual
- 2020 **Petrenko, S.**, (2020) Distributed Dual-Vigilance Fuzzy Adaptive Resonance Theory (DDVFA) and Incremental Cluster Validity Indices (ICVI) for Robust Multimodal Learning, Oral, DARPA L2M Month Phase 2 PI Review, Virtual
- 2019 **Petrenko, S.**, (2019) Robust Multitarget Tracking with Gaussian Mixture Probability Hypothesis Density Filters, Night Vision and Electronic Sensors Directorate, Ft. Belvoir, VA
- 2017 **Petrenko, S.**, (2017) Survey of Modern Machine Learning Techniques and Applications, Oral, Missouri S&T AREUS Laboratory, Rolla, MO
- 2016 **Petrenko, S.**, (2016) Closing Presentation on Custom FPGA-Deployable Data-Flow Controller Algorithm, Oral, Ball Aerospace and Sandia Laboratories, Albuquerque, NM

EXPERIENCE

Today May 2019	<p>Research Assistant, MISSOURI S&T ACIL LABORATORY, Rolla, MO</p> <ul style="list-style-type: none">➢ (Applied Computational Intelligence Laboratory)➢ Create technology demo of multi-target tracking and identification capabilities, combining GMPHD multi-target state estimation with machine-learning methods for friend-or-foe identification.➢ Present grant solicitation of technology demo to high-ranking military personnel.➢ Develop applications and conduct research in robust infrared image classification with deep clustering techniques for the Night Vision Electronic Sensors Directorate (NVESD).➢ Conduct research in lifelong machine learning with adaptive resonance theory algorithms and deep clustering techniques in collaboration with Teledyne Industries under the DARPA L2M project across its full 18-month duration. <p>Machine Learning Adaptive Resonance Theory Clustering</p>
Today August 2019	<p>AI Consultant, GUISE AI, Rolla, MO</p> <ul style="list-style-type: none">➢ Collaborate in the design and operation of a technology startup, soliciting customers and tailoring machine-learning solutions.➢ Develop novel algorithms for the creation of synthetic data to augment the training of deep neural network classifiers to increase robustness with sparse training data and decrease vulnerability to adversarial examples. <p>Machine Learning Deep Learning Startup</p>
May 2019 January 2017	<p>Research Assistant, MISSOURI S&T AREUS LABORATORY, Rolla, MO</p> <ul style="list-style-type: none">➢ (Applied Research for the Estimation of Uncertain Systems)➢ Researched applications of estimation and machine learning algorithms as applied to navigation.➢ Studied automatic maneuver detection in orbital tracking algorithms.➢ Developed sandbox for Monte Carlo simulation of dynamic combinations of estimation algorithms.➢ Conducted presentations to staff demonstrating results of applications of machine learning and estimation.➢ Created hardware demonstration of multi-sensor multi-target tracking of dynamic objects.➢ Represented Aerospace Engineering department in graduate outreach. <p>Optimal Estimation Machine Learning Embedded Electronics</p>
August 2016 May 2016	<p>Engineering Aide, BALL AEROSPACE, Albuquerque, NM</p> <ul style="list-style-type: none">➢ Supported Sandia National Laboratories clients in future work projects.➢ Tested HDL IP cores performance and characteristics on FPGA development boards (Zynq).➢ Designed and developed MATLAB/Simulink data-flow controller algorithm for HDL compilation via System Generator.➢ Wrote specialized CRC software for HDL compilation. <p>C VHDL Simulink FPGA Embedded Electronics</p>
May 2016 January 2016	<p>Technical Engineering Intern, SANDIA NATIONAL LABORATORIES, Albuquerque, NM</p> <ul style="list-style-type: none">➢ Developed and tested Simulink software for model-based design and deployment of algorithms via VHDL onto FPGA's for satellite applications.➢ Developed Simulink model for FPGA application of GPS receiver command, control, and log functionality.➢ Wrote, tested, and integrated sensor data acquisition and parsing algorithms for atmospheric embedded application <p>C VHDL Simulink FPGA Embedded Electronics</p>

May 2016 January 2016	GNC/CDH/SI Engineer, MISSOURI S&T SATELLITE RESEARCH TEAM, Rolla, MO <ul style="list-style-type: none"> ➢ A research team that works with AFRL/NASA to design, construct, and launch small satellites. ➢ Generating and implementing command and data handling software interface between flight computer and peripherals. ➢ Implementing and testing guidance, navigation, and control flight software using Raspberry Pi – MATLAB – Simulink interface utilizing model-based design. ➢ Writing stereoscopic imaging algorithm and software for camera image capture and control. <div style="display: flex; justify-content: space-around; font-size: 0.8em; margin-top: 5px;"> C MATLAB Simulink Embedded Electronics Linux Circuit Design </div>
May 2016 May 2015	Undergraduate Research Assistant, MISSOURI S&T PHYSICS UNDERGRADUATE RESEARCH, Rolla, MO <ul style="list-style-type: none"> ➢ Collaborating one-on-one with physics professor to explore wave propagation in random ordered media. ➢ Utilizing Python, Python libraries, and GPU-accelerated functions to create quantum transport models for iterative simulation. ➢ Published in peer-reviewed journal. <div style="display: flex; justify-content: space-around; font-size: 0.8em; margin-top: 5px;"> Python Quantum Physics </div>
January 2015 May 2015	Electronics Engineering Co-op, PARKER HANNIFIN - SPORLAN DIVISION, Washington, MO <ul style="list-style-type: none"> ➢ Successfully lead a high-profile project through design, testing, and launch. ➢ Collaborated with multi-disciplinary division teams and external vendors. ➢ Developed test plans and lab test requests, collaborating with technicians. ➢ Developed 3D models and rapid printed prototypes for numerous projects. ➢ Developed and implemented an advanced mathematical temperature profile model. ➢ Tested and evaluated new iOS application. <div style="display: flex; justify-content: space-around; font-size: 0.8em; margin-top: 5px;"> C MATLAB Simulink Embedded Electronics Linux Circuit Design </div>
May 2015 May 2013	Composites Team Leader, MISSOURI S&T FORMULA ELECTRIC TEAM, Rolla, MO <ul style="list-style-type: none"> ➢ Lead design of aerodynamic surfaces of the vehicle and performed extensive CFD analysis. ➢ Fabricated of carbon-fiber and fiberglass shroud to implement aerodynamic design. ➢ Prepared and delivered proposal presentations to prospective sponsors such as university alumni. ➢ Represented the Missouri S&T Formula electric team at alumni, sponsor, and recruitment events. ➢ Designed chassis and internal framework parts of an Electric-Class Formula SAE style vehicle. <div style="display: flex; justify-content: space-around; font-size: 0.8em; margin-top: 5px;"> C MATLAB Simulink Embedded Electronics Linux Circuit Design </div>
August 2012 May 2011	Materials Science and Engineering Research Internship, AUBURN UNIVERSITY, Auburn, AL <ul style="list-style-type: none"> ➢ Conducted solid-oxide fuel cell, solid-oxide thermoelectric, and magnetostrictive solutions research. ➢ Prepared samples using : ceramics processing, ball milling, sintering, and sputtering. ➢ Performed sample measurement and analysis using certifications in scanning electron microscopy, transmission electron microscopy, and x-ray diffraction. ➢ Prepared and delivered presentations and activities for prospective department students. <div style="display: flex; justify-content: space-around; font-size: 0.8em; margin-top: 5px;"> Materials SEM TEM XRD </div>

💻 PROJECTS

ADAPTIVERESONANCE.JL

2020-2021

🔗 JuliaHub 🔗 github.com/AP6YC/AdaptiveResonance.jl ↗ Documentation

An open-source Julia package for Adaptive Resonance Theory (ART) algorithms, officially registered with JuliaHub and submitted with JOSS.

Julia ART Clustering

CLUSTERVALIDITYINDICES.JL

2020-2021

🔗 JuliaHub 🔗 github.com/AP6YC/ClusterValidityIndices.jl ↗ Documentation

An open-source Julia package for Cluster Validity Indices (CVI) algorithms, officially registered with JuliaHub and submitted with JOSS.

Julia CVI Clustering

METALCVI.JL

2021

🔗 github.com/AP6YC/MetalCVI.jl ↗ Documentation

An open-source Julia implementation of the MetalCVI method for assessing clustering quality as a metric in unsupervised learning modes.

Julia CVI MetalCVI Clustering

GRANT AGENCIES AND PROGRAMS

DARPA L2M PROGRAM

2019 - 2021

 <https://www.darpa.mil/program/lifelong-learning-machines>

The DARPA Lifelong Learning Machines (L2M) program aims to create a new paradigm in machine learning whereby learners, of all learning modalities, continue to learn new and shifting distributions without brute force retraining. Missouri S&T participated in Phase 1 of the DARPA L2M program as a seedling organization and continues in Phase 2 as a subcontractor under the Teledyne System Group.

[Julia](#) [Python](#) [Tensorflow](#) [ART](#) [CVI](#) [Clustering](#)

NIGHT VISION ELECTRONIC SENSORS DIRECTORATE (NVESD)

2019 - 2021

 https://c5isr.ccdc.army.mil/inside_c5isr_center/nvesd/

The NVESD conducts research in night vision applications for the U.S. Army. Missouri S&T collaborates with the NVESD in both consultation and in the research of achieving robust lifelong learning in the infrared domain for various ARL and U.S. Army applications.

[Julia](#) [Python](#) [Tensorflow](#) [ART](#) [CVI](#) [L^AT_EX](#)

REFERENCES

Dr. Donald C. Wunsch II

Mary K. Finley Missouri Distinguished Professor of Computer Engineering, MISSOURI UNIVERSITY OF SCIENCE AND TECHNOLOGY

 dwunsch@mst.edu

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