

DAVID SMERKOUS

AI PhD Student - Oregon State University

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SUMMARY

Research: Hypernetworks, Uncertainty Estimation, Computer Vision, Kidney Morphology, Medical Imaging

Personal: Robotics, Automation, FIRST, Automated Agriculture, 3D printing.

SKILLS

Languages: (C)Python, C, C++, Java, Matlab, SQL, JS, HTML, Appian LC.

Technologies: Torch, Docker, Slurm, Flask/Django, Git, OpenCV, Keras (tf), CUDA, Unix Dev, Phoenix, Android, Arduino/UDOO, AWS.

EDUCATION

9/2022 - 2027 **PhD. Artificial Intelligence** **Oregon State University - Corvallis**
GPA: 3.82/4.0. Advisor: Fuxin Li. Coursework: Convex Optimization, Topology, Machine Learning, Matrix Analysis, AI Ethics, Algorithms

9/2018 - 8/2022 **B.S. Applied Computational Math Sciences (Numerical Algorithms Track)** **University of Washington - Seattle**
GPA: 3.7/4.0 - Dean's List. Coursework: Linear Algebra, Real Analysis, Data Structures, Optimization/Linear Programs (LPs), Synthetic Biology, Neural Computing, Mathematical Reasoning, Scientific Computing

RESEARCH EXPERIENCE

9/2022 - Present **HyperMHE: Fast and Diverse Implicit Neural Sampling** **Oregon State University**

- Developing a hypernetwork based Bayesian neural sampler of MLPs and CNNs.
- Constructing a novel kernel hyperspherical energy loss to quickly estimate the diversity of sampled networks.
- Introducing the first scalable CNN hypernetwork with diverse feature representations.

10/2018 - 5/2022 **Automated Foot Process Width Estimation in Kidney Diseases [1]** **Najafian Lab - UW Medicine**

- Led and mentored a team of five students in developing a cloud-based tool for kidney biopsy electron microscopy image analysis [1].
- Reduced the time to estimate key disease parameters from 8 hours to 5 minutes while maintaining high certainty.
- Curated and labeled a segmentation dataset of over 1,000 electron microscopy images.
- Developed ForkNET a U-Net variant image segmentation network for kidney morphology estimation.
- Developed DPs and vision algorithms for estimating glomerular membrane width, foot process width, and other key morphological parameters associated with kidney pathogenesis.
- Designed a multi-layer segmentation utility in wxPython, available at <https://pathology.smerkous.com>

PUBLICATIONS

[1] David Smerkous et al. "Development of an automated estimation of foot process width using deep learning in kidney biopsies from patients with Fabry, minimal change, and diabetic kidney diseases". In: *Kidney International* (Sept. 2023). DOI: 10.1016/j.kint.2023.09.011. URL: <https://doi.org/10.1016/j.kint.2023.09.011>.

SOFTWARE EXPERIENCE

6/2019 - 11/2020 **Team Lead - Software Developer** **Goyadon**

- Developed and managed software for multi-million dollar corporate projects, including Sinclair Oil and Technology Credit Union.
- Worked with and managed multiple teams to deploy and migrate database, front-end, and backend solutions for both projects. Used the following core technologies: Docker, GCloud, AWS, Appian, and SQLServer.
- Planned timelines, participated in SCRUM meetings and led small teams of developers.
- Managed the deployment of historical company data to new solutions with various clients.

5/2017 - 10/2017 **Software Development Intern** **CloudyBoss**

- Contributed to a large team with strict deployment deadlines.
- Implemented a remote text-to-speech (TTS) engine called remsphinx.
- Applied basic NLP (using NLTK) for sentiment analysis and context understanding.

- 3/2015 – 5/2016 **Project Reviewer** **Hackster IO, Inc**
- Published personal and sponsored projects on Hackster IO. Current profile at <https://www.hackster.io/smerkousdavid>.
 - Invited by Hackster IO to be a project reviewer for their site, moderating and reviewing projects for the general public.
 - Invited by Udoo to be an official Udoo Evangelist, involving free access to beta products and sponsorship for Hackathons.
 - Developed open-source GPIO and sensor control libraries for the Udoo.
 - Selected by SeeedStudio to be part of some board testers, creating sample projects and usage examples for their future customers.
- 10/2014 – 6/2018 **Software Team Co-Lead** **FRC Team 5431**
- Co-led software development across three seasons of FIRST robotics for Plano ISD team 5431.
 - Created canvas courses, and taught intro software development and robotics to new students, with homework assignments and quizzes.
 - Developed segmentation and object tracking models to track field objects.
 - Developed MIMIC, which allowed the team to program autonomous driving routines via recordings of teleoperated commands during practice, and draw tasks on a virtual map of the field.

PRESENTATIONS

- 2/2023 **Young Investigator Award** **Orlando, Florida**
- WORLDSymposium**
- Received the Young Investigator Award for contributing to the field through the automation of relevant biomarkers to rare diseases. Invited to present my research on automated Foot Process Width estimation at the WORLDSymposium conference in February 2023, where I engaged with doctors, industry professionals, and fellow researchers. The conference focused on rare Lysosomal storage diseases, exploring related research, drugs, treatments, and clinical studies. Also took part in a Q&A panel, discussing my research and broader applications of artificial intelligence.
- 5/2019 **6th Update on Fabry Disease** **Prague, Czech Republic**
- Presented a poster demonstrating the accuracy and speed of deep learning models on electron microscopy scans for histology. Showed that deep learning segmentation and computer vision approaches correlated better with disease-related parameters than previous unbiased histology methods performed by humans.
- 5/2015 **PTC Liveworx** **Boston, Massachusetts**
- Selected as one of five students to participate in an international PTC IoT (Internet of Things) LiveWorx convention in Boston. Collaborated with PTC engineers to implement an augmented reality solution onto FIRST robots, utilizing Vuforia for augmented reality. Presented demos at a booth to industry professionals, sharing insights about Vuforia augmented reality and its application in robotics.

PROJECTS

- 1/2023 **AgAthon: Apple Picking** github.com/smerkousdavid/agathon-2023
- During the 48-hour hackathon held in the Jan 2023 Agathon competition, we developed a more robust instance segmentation model using deep ensembles and apple uncertainty estimation. Agathon 2023 was a competition held between teams from multiple universities to develop apple-picking AI solutions.
- 8/2021 - 10/2021 **AI Dog Feeder**
- An automated dog feeder utilizes an NVIDIA Jetson Nano equipped with a camera to interpret dog tricks performed by my dog. I have trained the model for basic commands like sit, down, stand, etc., and it vocalizes the command while using a classification model to assess when my dog has completed the task and reward him with a treat or food using an auger and hopper to dispense it into a bowl.
- 4/2016 - 5/2017 **Slumber Sleep Monitor** github.com/Pseudonymous-coders/Slumber
- Developed a sleep tracking band as part of the AT&T hackathon, with a specific focus on aiding patients with sleep apnea in gaining insights into their sleep patterns. The project received recognition as the runner-up for the AT&T design award, leading our team to present it to the AT&T foundry (AT&T's R&D group). The Slumber Hub effectively monitors user sleep by employing a Bluetooth LE band equipped with an accelerometer and heart rate monitor to identify REM sleep.
- 5/2016 **MYVA: MY Voice Activated Home** hackster.io/smerkousdavid/myva-home-voice-controlled-home-automation
- Developed an Android app for a voice-enabled home automation system that controls lights and other functions on networked devices, including inventory control, location with GPS, and more.

LANGUAGES

English - native, **Russian** - fluent