Isaac **Pedisich**

SENIOR BACKEND SOFTWARE DEVELOPER

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Current Senior Research Developer at the University of Pennsylvania. Over 6 years of professional experience in data analysis and scientific application development. Passionate about networking, efficiency, and automation. Seeking opportunities to solve hard problems in elegant ways, and to expand my scale of development to reach larger and more diverse audiences.

Technical **Skills**

Expertise in: C++, C, Python (numpy, pandas), MySQL, Java, Linux, Git
Experience with: Javascript (JQuery, Node.js, D3), MongoDB, Neo4J, PHP, Puppet, Spark, TensorFlow, Django

Professional **Experience**

Distributed Systems Lab, University of Pennsylvania   *Philadelphia, PA*

SENIOR SOFTWARE DEVELOPER   *2017 - PRESENT*

- Headed the development of *DeDOS*, a ~20,000-line framework for partitioning software across nodes to defend against DOS
- Developed dataplanes for software-defined network devices, and utilized *mininet* to build testable network simulations
- Designed *mysql* database schema for rapid insertion, viewing, and analysis of performance-monitoring statistics
- Utilized *travis* and *check* to set up continuous integration which automatically unit-tests publicly pushed commits
- Automated techniques to rapidly and easily benchmark remote software for performance and functionality
- Contributed to open-source behavioral model of SDN language (P4) to add periodically executed external functions
- Built tool utilizing injectable code snippets for in-flight detection of anomalous traffic patterns on Node.JS and Apache
- Performed analysis of logs and network traces in python to determine performance and discover opportunities for optimization
- Produced easily-digestible visualizations of varied data-sets, enabling complex bug detection and providing succinct demonstrations of results
- Administered and configured 10-node Linux cluster used for development and analysis of latency-critical applications
- Managed and mentored five undergraduate and master's student employees

Computational Memory Lab, University of Pennsylvania   *Philadelphia, PA*

SCIENTIFIC SOFTWARE DEVELOPER   *2012-2017*

- Overhauled code in Python, C++, and MATLAB for real-time neural analysis and stimulation through human intracranial EEG
- Re-architected lab's data storage, creating quality controlled repository of searchable and analyzable neural and behavioral data
- Automated behavioral and neural data upload, analysis, and report generation workflow
- Designed software and interface using PyQT to locate electrode in 3-D brain scans
- Created system for medical personnel at eight remote sites to easily run and update experiments
- Orchestrated 30-participant experiment testing the effects of repetition on memory

High Energy Physics, University of Pennsylvania   *Phialdelphia, PA*

SOFTWARE DEVLELOPER   *2009-2013*

- Studied design of high-energy sensors to testing low-level components, troubleshooting both analog and digital circuitry
- Designed user interface to automate physical testing and data analysis of circuit components
- Utilized hardware-descriptor language to automate readout of analog-to-digital converters in prototype proton- therapy device

Formal **Education**

Master of Science in Engineering: Computer & Information Science   *Philadelphia, PA*

UNIVERSITY OF PENNSYLVANIA | GPA: 3.9   *2017-2019*

Thesis   *Socket Launcher*: a framework for lossless, transparent, and rapid migration of TCP connections between servers

Coursework   Software Systems, Networked Systems, Introduction to Machine Learning, Big Data Analytics, Analysis of Algorithms, Database and Information Systems, PhD Seminar on Network Research

Bachelor of Arts: Biological Basis of Behavior (Magna Cum Laude)   *Philadelphia, PA*

UNIVERSITY OF PENNSYLVANIA | GPA: 3.67   *2012-2015*

Awards   LPS Award for Academic Achievement in the Natural Science

Coursework   Operating Systems, Software Engineering and Development, Mathematical Foundations of Computer Science

Public **Projects**

DeDOS: Declarative Dispersion-Oriented Software
https://github.com/dedos-project/DeDOS

DeDOS aims to be a new software architecture which enables software to be run in a distributed manner across multiple servers. When a program is written in DeDOS's framework, communication between nodes is automatically handled, allowing the developer to program a series of function calls which are then dispersed among the resources in a data-center. With fine-grained software splitting, DeDOS can more fully utilize all available resources.

Socket Launcher
https://github.com/isaac-ped/Socket-Launcher

Socket Launcher is a framework for the lossless, transparent, and rapid migration of TCP connections between servers. Consisting of a proxy and a client library, Socket Launcher utilizes the extended Berkeley Packet Filter (eBPF) to perform rapid packet rewriting and retransmission, allowing for sub-millisecond user-space TCP transfer, and requiring no modifications to the linux kernel or TCP stack.

Shremote
https://github.com/isaac-ped/Shremote

Shremote is a benchmarking tool for the timed execution of remote commands over SSH. With a simple and extensible configuration file, Shremote will automatically generate inputs, run commands, verify success, and gather log files, and perform post-processing.

Academic **Publications**

TMC: Pay-as-you-Go Distributed Communication [*link*]

Henri Demoulin, Nikos Vasilakis, John Sonchack, **Isaac Pedisich**, Vincent Liu, Boon Thau Loo, Linh Thi Xuan Phan, et al.
Proceedings of the 3rd Asia-Pacific Workshop on Networking (APNet), 2019

Detecting asymmetric application-layer denial-of-service attacks in-flight with finelame [*link*]

Henri Maxime Demoulin, **Isaac Pedisich**, Nikos Vasilakis, Vincent Liu, Boon Thau Loo, Linh Thi Xuan Phan
USENIX Annual Technical Conference (ATC), 2019

DeDoS: Defusing DoS with Dispersion Oriented Software [*link*]

Henri Maxime Demoulin, Tavish Vaidya, **Isaac Pedisich**, Bob Dimaiolo, Jingyu Qian, Chirag Shah, Yuankai Zhang, et al.
Annual Computer Security Applications Conference (ACSAC), 2018

Automated Detection and Mitigation of Application-level Asymmetric DoS Attacks [*link*]

Henri Maxime Demoulin, **Isaac Pedisich**, Linh Thi Xuan Phan, and Boon Thau Loo.
ACM SIGCOMM Workshop on Self-Driving Networks (SDN), August 2018

Demonstration of the DeDoS Platform for Defusing Asymmetric DDoS Attacks in Data Centers [*link*]

Henri Maxime Demoulin, Tavish Vaidya, **Isaac Pedisich**, Nik Sultana, Jingyu Qian, Bowen Wang, Yuankai Zhang, et al
SIGCOMM demonstration, 2017 *(First prize for the ACM Student Research Competition*

Closed-loop stimulation of temporal cortex rescues functional networks and improves memory [*link*]

Youssef Ezzyat, Paul A. Wanda, Deborah F. Levy, Allison Kadel, Ada Aka, **Isaac Pedisich**, Michael R Sperling et al.
Nature Communications, 2018

Direct Brain Stimulation Modulates Encoding States and Memory Performance in Humans [*link*]

Youssef Ezzyat, James E. Kragel, John F. Burke, Deborah F. Levy, Anastasia Lyalenko, Paul Wanda, Logan O'Sullivan, Katherine B. Hurley, Stanislav Busygin, **Isaac Pedisich**, et al.
Current Biology, 2017

Proximity of Substantia Nigra Microstimulation to Putative GABAergic Neurons Predicts Modulation of Human Reinforcement Learning [*link*]

Ashwin G. Ramayya, **Isaac Pedisich**, Deborah Levy, Anastasia Lyalenko, Paul Wanda, Daniel Rizzuto, Gordon H. Baltuch and Michael J. Kahana
Frontiers in Human Neuroscience, 2017

Expectation Modulates Neural Representations of Valence throughout the Human Brain [*link*]

Ashwin G. Ramayya, **Isaac Pedisich**, Michael J. Kahana
NeuroImage, 2015