# Jim Leonard

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## Summary

Programmer with 25 years of professional experience programming client/server, network and systems software seeking a software development position in the Pittsburgh area. Solid experience working primarily in Python and C/C++ on Linux as a lead/senior developer in a small group environment.

## Skills

Current languages: Python, Cython, C, C++, Javascript, OpenSCAD

## Experience

### Critical Care Medicine at University of Pittsburgh 2024 – Present

**Research Programmer**

Work on a project at the same lab as the TRACIR project in the following position (under NDA).

### Auton Lab at Carnegie Mellon University 2019 – 2024

**Research Programmer**

Primarily worked on several data acquisition and conversion projects for the Auton Lab machine learning group. The projects were mostly written in Python or Cython. Two of the major projects include:

TRACIR Project ("Trauma Care In a Rucksack," a project to work towards a man-portable field medic, supported by the U.S. Army Medical Research and Materiel Command):
Wrote and updated software to instrument a University of Pittsburgh animal surgical laboratory to test automated resuscitation algorithms. This is the first time that these protocols have ever been implemented in a fully automated fashion.

- This software records data from dozens of instruments and monitors, each with their own interfaces (mostly serial protocols and shared library APIs).
- Has a web interface that displays and allows control of medical and experiment information.
- Allows plug-in modules/drivers for different instruments and experiment systems.
- Once the subject is hooked up to the necessary monitors and pumps, the system can work in a completely hands off mode, initially starting with baseline monitoring, then inflicting trauma, and then resuscitation by giving blood, fluids, and drugs as needed.
- The main software is a multiprocess Python application and the web interface was written in Javascript using the Webix framework. In addition, I built several small electronics/microcontroller projects to interface with some of the devices. The firmware on these devices was written in C and C++.

MLADI data conversion project:
Wrote and maintained a conversion tool for taking deidentified patient data recorded at UPMC hospitals and converting it to a format that could be better used by other researchers.

- This software was used to convert thousands of patient records, each comprising up to dozens of gigabytes of unsorted CSV data with binary/hexadecimal encoded fields and various forms of indirection.
- The conversion tool was written in Python and Cython using NumPy, Pandas, and Bcolz tools.

**Pittsburgh Supercomputing Center, Pittsburgh PA** **2015 – 2019**
**University of Pittsburgh, Pittsburgh PA** **2011 – 2015**
**Research Programmer**

Worked in small groups of programmers and public health domain experts to write software models in the public health experts' areas of research. The cores of most of the projects were written in Python often using major frameworks and libraries including NumPy, Bottle, Django, SQLAlchemy, and Pandas. At least 30 articles were published in peer-reviewed journals (and I am a coauthor on several) based on software that I was a core developer on. Two of the major projects include:

HERMES vaccine supply chain modeling tool

- This software was used by the Pitt/PSC/Johns Hopkins team of analysts to model the vaccine supply chains of at least 10 developing countries and it is now used by outside groups to model supply chains independently. It has been used by several countries in decisions to make changes in policies for their supply chains.
- The simulation is written in Python with an HTML/Javascript/JQuery web interface front end connecting to a Python/Bottle server with SQAlchemy managing the database store.

PyRHEA regional healthcare system model to simulate spread of hospital acquired infectious disease

- Models of the Orange County and Chicago area healthcare systems (including hospitals, nursing homes, and long-term acute care facilities) have been created to model interventions into the spread of MRSA and CRE.
- The simulation is written in Python with outputs written using bcolz and processed in Pandas.

**HighRes Biosolutions Inc, Woburn MA** **2008 – 2010**
**Firmware Engineer**

Wrote and integrated embedded systems to control and provide interfaces for laboratory automation devices. Each device included a device specific network server, written in C, to provide the primary automated interface to the device along with a web interface and utilities, written in C, C++, Java, Javascript, and HTML, to support users and integrators.

**ITA Software, Cambridge MA** **2005 – 2008**
**Software Engineer**

Programmer maintaining ITA's Global Distribution System (GDS). This software was written primarily in Common Lisp with other modules/servers written in C++, Perl, and Python on Linux with a backing Oracle database.

**Starbak Communications, Waltham MA** **2000 – 2004**
**Senior Software Engineer**

Programmer responsible for developing Starbak's video streaming servers. These were implemented in C on Linux systems.

**H&R Block / Compuserve, Columbus OH** **1997 – 2000**
**Software Engineer**

Programmer for group responsible for maintaining H&R Block's back end electronic filing servers, which handled receiving returns from field offices, processing them, and sending them to the IRS and state departments of revenue. These systems were written in C on VMS.

## Selected Coauthored Publications:

TRACIR

Evaluation of a Physiologic-Driven Closed-Loop Resuscitation Algorithm in an Animal Model of Hemorrhagic Shock. *Critical Care Medicine* 52(12): pp. 1947-1957, 1 December 2024. https://doi.org/10.1097/CCM.0000000000006297

Autonomous precision resuscitation during ground and air transport of an animal hemorrhagic shock model. *Intensive Care Medicine Experimental* 12(44), 24 May 2024. https://doi.org/10.1186/s40635-024-00628-5

PyRHEA

How Long-Term Acute Care Hospitals Can Play an Important Role in Controlling Carbapenem-Resistant Enterobacteriaceae in a Region: A Simulation Modeling Study. *American Journal of Epidemiology* 190(3): pp. 448-458, March 2021. https://doi.org/10.1093/aje/kwaa247

How to Choose Target Facilities in a Region to Implement Carbapenem-resistant Enterobacteriaceae Control Measures. *Clinical Infectious Diseases* 72(3): pp. 438-447, 1 February 2021. https://doi.org/10.1093/cid/ciaa072

How Introducing a Registry With Automated Alerts for Carbapenem-resistant Enterobacteriaceae (CRE) May Help Control CRE Spread in a Region. *Clinical Infectious Diseases* 70(5): pp. 843-849, 1 March 2020. https://doi.org/10.1093/cid/ciz300

SIGMA

Economic value of vaccinating geographically hard-to-reach populations with measles vaccine: A modeling application in Kenya. *Vaccine* 37(17): pp. 2377-2386, 17 April 2019. https://doi.org/10.1016/j.vaccine.2019.03.007

HERMES

Modeling the economic impact of different vial-opening thresholds for measles-containing vaccines. *Vaccine* 37(17): pp. 2356-2368, 17 April 2019. https://doi.org/10.1016/j.vaccine.2019.03.017

The value of tailoring vial sizes to populations and locations. *Vaccine* 37(4): pp. 637-644, 21 January 2019. https://doi.org/10.1016/j.vaccine.2018.12.010

The potential effects of introducing microneedle patch vaccines into routine vaccine supply chains. *Vaccine* 37(4): pp. 645-651, 21 January 2019. https://doi.org/10.1016/j.vaccine.2018.12.008

Dual-chamber injection device for measles-rubella vaccine: The potential impact of introducing varying sizes of the devices in 3 countries. *Vaccine* 36(39): pp. 5879-5885, 18 September 2018. https://doi.org/10.1016/j.vaccine.2018.08.026

Landscaping the structures of GAVI country vaccine supply chains and testing the effects of radical redesign. *Vaccine* 33(36): pp. 4451-4458, 26 August 2015. https://doi.org/10.1016/j.vaccine.2015.07.033

Only Adding Stationary Storage to Vaccine Supply Chains May Create and Worsen Transport Bottlenecks. *Journal of Public Health Management and Practice* 19: pp. S65-S67, September/October 2013. https://doi.org/10.1097/PHH.0b013e31828a83fe

Augmenting Transport versus Increasing Cold Storage to Improve Vaccine Supply Chains. *PLOS One* 8(5). 22 May 2013. https://doi.org/10.1371/journal.pone.0064303