Alex Velez-Arce

AI FULL-STACK DEVELOPER · SOFTWARE / ML ENGINEER · PRODUCT ENGINEER

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Professional Experience

present **Founder,** Apliko Inc.
- Tinkering and building open-source part-time as part of calculus house (https://www.calculus.house/)
- Mentoring MIT undergrads and leading a team to develop foundation models and tooling in biomedicine

2024-2025 **Research Associate,** Zitnik Lab, Department of Biomedical Informatics, Harvard Medical School
- ICML 2025 publication and Spotlight paper for NeurIPS'24 AIDrugX. Published jointly with MIT CSAIL, HMS, Harvard University, Stanford, MIT Chemistry, and more.
- Scaled Therapeutic Data Commons to 30K peak MAU. 2x previous usage.
- Trained, benchmarked, and deployed single-cell foundation models via Huggingface Transformers and Huggingface Model Hub with 5000+ downloads.
- Built out rag-enabled llm agent for diagnosing pediatrics patient and published tiny paper on ICLR'25 workshop.
- **Machine Learning Engineering**: model inference APIs and server development, model training, model benchmarking, llm agents, fine-tuning, model implementation, development, and architecture, RAG
- **Data Engineering**: data processing pipelines, ingestion, transformations, retrieval APIs
- **Full-stack**: API-first design, microservices, software design patterns
- **Skills**: Python, PyTorch, Huggingface Transformers, OpenAI, MS Azure, Next.js, Typescript

2022-2024 **Entrepreneurship,** Misc
- Built a web application for recruiter and job-seeker matching with hundreds of users.
- Built out API integrations with Phantom and Metamask APIs for login functionality on the app
- Developed UX design for gamified software engineer job interview experience and wrote associated tokenomics one pager.

2021-2022 **Sr. Full-Stack ML Engineer - Infrastructure,** Cruise Automation and Stealth Startup
- Developed frontend improvements and API integrations for data labeling platform.
- Built out Python backend integrations with AthenaDB
- Developed CI/CD automated testing suite for drastic improvements in debugging metric layer configuration.
- Developed uncertainty quantification pipeline for uncertainty-aware computer vision model
- Left for an entrepreneurial pursuit

2018-2021 **Software Engineer II,** Pinterest Inc.
- Built a data quality system in Python consisting of a domain-specific-language and library used internally across the company to process petabytes of data for quality assurance. It helped improve metrics quality investigation resolution time by 50%.
- Redesigned HBase schema and implemented optimizations to Thrift server and coprocessor Java code for our internal time series database and implemented data jobs and workflows to migrate over hundreds of terabytes of data from HBase .94 to 1.2. Improvements led to over 50% reduce in CPU consumption as well as 70% peak latency improvement. My work was published in the Pinterest engineering blog.
- Built out an experimentation tool in Python and Javascript / React with Elasticsearch-based backend and Spark-based data jobs processing petabytes of data which helped identify online A/B experiments most impacting key company metrics. It led to speed up in addressing 80+ IMs per year affecting 10k logins/signups per hour and with each incident taking up 10 engineering hours. We made a 5x improvement in average time to resolution for login incidents.
- Implemented sequential modeling improvements for advertising ranking machine learning model. Developed TensorRT-based ML backend in C++ for optimal Deep Neural Network model inference on GPUs. Setup Docker environments and Jenkins pipelines to enable multiple GPU environments for DNN models. Implemented support for Tensorflow custom ops in C++ for the model serving and inference platform
- **Machine Learning Engineering**: model inference APIs and server development, model training, model validation tooling development, custom operators, ranking models
- **Data Engineering**: data processing pipelines, ingestion, transformations, retrieval APIs
- **Full-stack**: RESTful APIs, ui/ux design and user research
- **Skills**: C++, Python, Tensorflow Serving, PyTorch, CUDA and GPUs, TensorRT, AWS, Spark, HBase, Flask, React.js

Education

Massachusetts Institute of Technology (MIT)   *Cambridge, MA*
BS Computer Science and Engineering   *2013 - 2018*
- Research advisor: Dr. Justin Solomon (MIT CSAIL)
- Secondary: Dr. Moon Duchin

Harvard Medical School   *Boston, MA*
Research Fellow   *2024-2025*
- Supervisor: Dr. Marinka Zitnik (HMS)
- Secondary: Dr. Manolis Kellis (MIT CSAIL)

Publications

Published

Velez-Arce, Alejandro and Zitnik, Marinka. PyTDC: A multimodal machine learning training, evaluation, and inference platform for biomedical foundation models. Forty-second International Conference on Machine Learning (ICML 2025)

Velez-Arce, Alejandro, Xiang Lin, Michelle M. Li, Kexin Huang, Wenhao Gao, Tianfan Fu, Bradley L. Pentelute, Manolis Kellis, Marinka Zitnik. 2024. Signals in the Cells: Multimodal and Contextualized Machine Learning Foundations for Therapeutics. AI for New Drug Modalities at NeurIPS 2024.

Velez-Arce, Alejandro and Anaya, J. C. Extending a Clinical Pediatric Growth Chart App Using a Large Language Model. In AI for Children: Healthcare, Psychology, Education.

In Review

Shen, Wanxiang, Chao Cui, Xiaorui Su, Zaixi Zhang, Alejandro Velez-Arce, Jianming Wang, Xiang Cheng Shi, Yan Bing Zhang, Jie Wu, Yu Zong Chen, Marinka Zitnik. 2024. Activity Cliff-Informed Contrastive Learning for Molecular Property Prediction. ChemRxiv.

Acknowledged in

Gao, Shanghua, Ada Fang, Yepeng Huang, Valentina Giunchiglia, Ayush Noori, Jonathan Richard Schwarz, Yasha Ektefaie, Jovana Kondic, Marinka Zitnik. 2024. Empowering biomedical discovery with AI agents. Cell. Volume 187, Issue 22, p6125-6151.

Duchin, Moon, Bridget Eileen Tenner. 2024. Discrete geometry for electoral geography. Political Geography, 2024 - Elsevier.

Industry Literature

Velez-Arce, Alejandro, and Parag Kesar. "PinalyticsDB: A Time Series Database on Top of HBase." Pinterest Engineering Blog, 26 Sept. 2019, https://medium.com/pinterest-engineering/pinalyticsdb-a-time-series-database-on-top-of-hbase-946f236bb29a.

Presentations

Invited Talks

Western Bioinformatics Research Seminar Series November 2024. *Signals in the Cells: Multimodal and Contextualized Machine Learning Foundations for Therapeutics*. Seminar talk at Western University's Schulich School of Medicine and Dentistry: Western Bioinformatics Research Seminar Series, Schulich School of Medicine & Dentistry, Western University, London, Ontario, Canada.

Poster Presentations

(Spotlight) MoML 2024. June 2024. Spotlight Poster Presentation at Molecular Machine Learning Conference. MoML2024 Spotlight Poster: Mila - Institut québécois d'IA, Montreal, Quebec, Canada.

(Spotlight) AI for New Drug Modalities at NeurIPS 2024. December 2024. *Signals in the Cells: Multimodal and Contextualized Machine Learning Foundations for Therapeutics*. Poster presentation for the AI for New Drug Modalities Workshop at NeurIPS 2024. AIDrugX at NeurIPS Spotlight Paper: NeurIPS Conference, Vancouver, BC, Canada.

Teaching Experience

Spring 2018	**6.009 - Fundamentals of Programming**, Lab Assistant	*MIT*
Fall 2017	**6.009 - Fundamentals of Programming**, Lab Assistant	*MIT*
Spring 2015	**6.042 - Math for Computer Science**, Grader	*MIT*
2014	**8.01L - Physics I: Mechanics**, Grader	*MIT*

Extracurriculars

Leadership Positions

2014-2017	**Phi Delta Theta Fraternity**, Social Chair, Secretary, New Member Educator
2013-2017	**Association of Puerto Rican Students**, Athletics Chair, Intramural Soccer team captain, Founding Newsletter Chair, Social Chair
2013-2014	**MIT Baker House Leadership**, Vice President of External Relations