# Aliakbar Izadkhah

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## Education

- **Carnegie Mellon University** — Pittsburgh, PA
  *PhD in Process Systems Engineering* — *Aug. 2018 – May. 2023*
- **University of California, Davis** — Davis, CA
  *Master of Science in Mechanical Engineering* — *Aug. 2016 – July. 2018*
- **Sharif University of Technology** — Tehran, Iran
  *Bachelor of Science in Chemical Engineering* — *Sep. 2012 – May. 2016*

## Experience

- **Operations Research, Supply Chain Logistics** — Pittsburgh, PA
  *PhD Student* — *Jan 2018 - Present*
  - **ML-assisted Vehicle Routing Under Uncertainty**: Proposed a black-box routing simulation, derivative-free optimization (DFO) solver, and developing time series forecasting algorithm to generate new data points from historical customer orders data (C++, Python)
  - **A Unified BPC Solver for Periodic Vehicle Routing**: Developed a tailored branch-price-and-cut optimization solver to address several variants of periodic vehicle routing problems (multiple day trips, multiple depots,service choice, time windows, heterogeneous fleets). (C++, CPLEX, Gurobi)
  - **Multi-day Periodic Vehicle Routing**: Proposed a novel exact solution approach for a routing problem called "periodic vehicle routing with multiple day trips", which arises in the Linde PLC supply chain operations, for the first time in the literature. (C++, CPLEX, Gurobi)
  - **Last-mile Delivery Policy Simulator**: Established a last-mile delivery policy simulation framework incorporating existing historical data for Linde PLC to evaluate the performance of new delivery paradigms (C++, CPLEX)

## Coursework Projects

- **PyTorch-like Deep Learning Framework & NeuralODE**: Built a PyTorch-like deep learning framework from ground up, with backend support of CPU/GPU containing standard functionalities such as automatic differentiation, optimizers, data loaders, loss functions, and all required modules to employ parametrized layers (Python, C++, CUDA)
  Designed and implemented a NeuralODE layer (operators and backends, ODE numerical solver, AD) within our Pytorch-like framework and demonstrated its capability of approximating ODE dynamics with NNs. (Python, C++, CUDA)
- **Large Datasets ML Pipelines**: Conducted various analyses such as entity resolution and PCA and built ML pipelines on large datasets such as Million Song Dataset, light-sheet imaging, and Criteo 1TB click logs dataset. (Python, AWS EC2, PySpark)
- **Model Compression**: Implemented multiple model compression techniques from scratch (network slimming, and magnitude-based pruning). (Python, Tensorflow)
- **Quantum Programming**: Implemented a quantum computing MILP solver using D-wave quantum computer for job shop scheduling problem (Python)

## Programming Skills

Python, C++,CPLEX, Gurobi, GAMS, AWS(EC2, S3), CUDA, Tensorflow, PySpark

## Phd Coursework

**Computer Science & Machine Learning**: Advance Data Structure & Algorithms, Introduction to Machine Learning, Machine Learning with Large Datasets, Deep Learning Systems: Algorithms and Implementation, Machine Learning Production
**Operations Research**: Linear/Integer/Quantum Integer/Convex programming,

## Publication & Presentation

**A.Izadkhah**, A. Wang, J. Lainez, J. Pinto, and C. E. Gounaris. Periodic vehicle routing problem with trips spanning multiple days. In Preparation, 2022
**A.Izadkhah**, A. Subramanyam, J. Lainez, J. Pinto, and C. E. Gounaris. Multi-period vehicle routing: Effect of customer flexibility in delivery day windows. Submitted, 2021
**A.Izadkhah**, A. Subramanyam, and C. E. Gounaris. Multi-period vehicle routing: Effect of customer flexibility. INFORMS Transportation Science and Logistics Workshop, 2021
**A.Izadkhah**, A. Wang, and C. E. Gounaris. A unified branch-price-and-cut framework for various classes of periodic vehicle routing problems. INFORMS Annual Meeting, 2020