

Alexander Baumgartner

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Education

University of Chicago

Sep 2022 - Jun 2026

BS in Computer Science Spec. ML; BS in Data Science (GPA: 3.8 / 4)

Chicago, IL

- **Previous Coursework:** Intro to CS(I-II), Intro to DS(I-II), Systems Programming (I-II), Discrete Math, Theory of Algorithms, Mathematical Foundations of ML, Math for DS(I-III), SSI: Spatial Analysis(I-III), Data Vis. and Comm., Intro to Neural Networks, ML for computer systems, Models in Data Science, Quantum Computation

Experience

Scout

Jun 2024 - Dec 2024

Software Engineer

Chicago, IL

- Architected and implemented a patent-pending configurable clustering algorithm for dataset consolidation and model optimization, generating industry-based composite data products. Enhanced usability with runtime-configurable parameters and a fine-tuned neural network for cluster naming and searching. Visualized clusters in 3d post PCA. (pandas, NumPy, scikit-learn, PyTorch, BERT, UMAP, HDBSCAN, gensim, nltk, LDA, plotly)
- Implemented symmetric encryption and deterministic tokenization solutions, significantly enhancing data security, privacy, and regulatory compliance of any data passed through. (Python, PyCryptodome, MongoDB, Firebase, AWS)
- Presented product vision and technical architecture to C-level executives, highlighting the value of Scout's data security and commercialization strategies to drive business development and compliance.

University of Chicago

Jan 2024 - Present

Student Grader for Data 118/119/120/227

Chicago, IL

- Collaborated with professors and TAs to optimize course content and teaching, leveraging insights gained from grading to address student weaknesses and improve overall learning outcomes across multiple data science courses.
- Efficiently evaluate and provide constructive feedback on assignments spanning topics from machine learning, data visualization and communication, project design and best-practice programming.

Projects

Network Anomaly Detection with BitNet | Python, PyTorch, scikit-learn

- Developed a hardware-efficient IDS, leveraging BitNet's quantization to minimize matrix multiplications.
- Built and trained a custom regression model on large-scale packet traces to detect intrusion attempts.
- Implemented performance tracking (psutil, pyRAPL) to measure CPU usage and energy consumption, comparing matrix-free vs. standard neural models.

Gerrymandering-Safe Redistricting with Machine Learning | Python, MCMC, Graph Theory, Geospatial Data

- Developed a Markov chain Monte Carlo (MCMC) algorithm for redistricting that balances fairness metrics including Voting Rights Act compliance, compactness, community preservation, and population parity.
- Leveraged a graph-based approach (via `networkx`) and geospatial operations (`shapely`) to ensure district contiguity, modeling boundaries as "graph cuts" for efficient exploration of redistricting plans.
- Integrated incremental scoring updates and a multi-phase descent strategy, reducing iteration times from 10 seconds to under 1 second on standard hardware.

Customer Churn Prediction Pipeline | Python, Airflow, dbt, PostgreSQL, PyTorch

- Designed and implemented an end-to-end data pipeline for customer churn prediction, automating daily data ingestion and processing, quality checks, and error handling using Apache Airflow.
- Leveraged dbt for modular and version-controlled data transformations, engineering ML and data modeling features using SQL to enhance model performance and derive actionable insights from raw customer data.
- Developed a sophisticated machine learning pipeline using PyTorch, including cross-validation, model training, and automated retraining. Implemented advanced neural network architectures to improve prediction accuracy.

Technical Skills

Languages: Python, C, SQL, R, HTML, CSS, JavaScript

Technologies: pandas, NumPy, scikit-learn, matplotlib, Altair, GeoDa, Tableau, PyTorch, Django, Docker, Git, React.js, Airbyte, dbt, Airflow, UMAP, NLTK, gensim, spaCy, tqdm, HDBSCAN, BERT, LDA, AWS, MongoDB, PostgreSQL

Concepts: Virtual & Cache Memory, Encryption/Decryption, Tokenization, Artificial Intelligence, Machine Learning, Neural Networks, Natural Language Processing, REST/GraphQL API, Agile, Data Engineering, Cloud Computing, Concurrency