Ryan Newkirk

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EDUCATION

NORTHWESTERN UNIVERSITY MCCORMICK SCHOOL OF ENGINEERING Evanston, IL

Master's Degree in Computer Science and Bachelor's Degree in Computer Science Expected Jun 2024

Major in Computer Science; Minor in Data Science & Engineering | Bachelor's GPA: 3.84 | Master's GPA: 4.00

Relevant Coursework: Data Structures & Algorithms, Scalable Software Architecture, Agile Software Development, Computer Networking, Computer Security, Operating Systems, Computer Engineering, Data Analytics, Data Privacy, Data Science Pipeline, Data Visualization, Artificial Intelligence, Machine Learning, Natural Language Processing, Deep Learning

WORK EXPERIENCE

SQUARE (BLOCK, INC.) (Remote) Chicago, IL

Full Stack Software Engineer Intern - *Developers Experience* Jun 2023 – Sep 2023

- Integrated user testing capabilities into the Web Payments SDK reference. Used Svelte, React.js, Optimizely, OneTrust, internal RESTful service API Java microservice, Cypress, GitHub. Created and deployed an A/B test for a frontend feature. Full ownership over the project, independently developed and deployed, authored Design Doc, Experimentation Doc, and Runbook. Led scrum meetings using Jira, Trello. Ran testing party.
- Prototyped an automated phone calling system for Square sellers using LLM (ChatGPT), Square APIs, Twilio, AWS Lex.

SQUARE (BLOCK, INC.) (Remote) Chicago, IL

Full Stack Software Engineer Intern - *Developers Experience* May 2022 – Sep 2022

- Developed a new frontend feature for Square's Web Payment SDK website for users to simulate making payments using an in-browser code editor. Used Svelte, Typescript (HTML/CSS/JS), CodeMirror API, Cypress, GitHub.
- Developed a cross-platform discount and marketing promotion sharing tool for Cash App/Square Seller Dashboard. Used Node.js servers and the Square Payment API, AWS.

ARGONNE NATIONAL LABORATORY (Remote) Chicago, IL

Data Engineer / Software Development Intern - *Energy Systems Division* Jun 2021 – May 2022

- Developed Python scripts and a MySQL database to collect customer outage data from 232 million households for power outage forecasting. Planned AWS integration. Created visualizations and geo-mapping functions for power outage analysis.

FULL STACK DEVELOPMENT PROJECTS

Scalable Software Architecture Project - "PALLETE-INATOR" Mar - Jun 2023

- Created a web service and API endpoint utilizing AWS S3 and RDS (PostgreSQL Database) and a client-side Python application (Matplotlib, Numpy, Requests) to implement photo storage/viewing/analysis.

Northwestern Hackathon Winner - "REMAP.CITY" remap.city Apr 2024

- Created a social media platform to democratize urban design, allowing anyone to design and share city infrastructure plans. Urban Planning Track 1st Place out of 200+ participants. Built with React.js, JS, Vite.js, Google Cloud Firestore (NoSQL).

Northwestern Hackathon - "SWIFTERNSHIPS" swifternships.tech Apr 2023

- Created a platform connecting college students with micro-internships for professional experience, built with AWS Lambda and S3, Twilio, Firebase Realtime Database, Cloudflare, and Sendinblue. 2nd place out of 250+ participants.

Northwestern Hackathon - "GIFT WHISPERER" Apr 2022

- Created a React site utilizing OpenAI GPT-3 (pre-ChatGPT) for personalized gift recommendations. Used Multithreading and Web Scraping to update our site with real product info. 1st place out of 100 participants.

AI in Media - Web Application for LLM Dimensional Analysis of News Article Mar - Jun 2023

- Co-created a full stack web application that extracts online news article text and categorizes the pragmatic dimensions of the article. Backend - Python (Flask, Google APIs, OpenAI GPT). Frontend - JavaScript (React.js, Tailwind CSS).

Global Data Visualization / Interactive Map Tool weff24.github.io/CS333_A3_D3/ Dec 2023

- Co-developed an interactive visualization of data on countries around the world (modifiable scatter plot, global map, bee-swarm plots) with D3.js, JavaScript, HTML, CSS. Iteratively designed with storyboarding for intuitive UI / UX.

Augmented/Virtual Reality Web Apps - CS 327 Social AR/VR Studio Apr 2023

- Built simple AR/VR web apps and experiences utilizing Three.JS, OpenCV, and the A-Frame VR framework.

MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE PROJECTS

IEEE Northwestern Chapter Projects - "REMEDI" and "SUMMRI" Evanston, IL
Project Manager Sep 2021 – Apr 2023

- 2023 Showcase 2nd Place Winning Project out of 14 teams. Managed a team of four students, led the development of a health/medicine management app. Utilized an ensemble ML model to scan prescription bottles and built a GPT-powered assistant. Used React, Firebase API, Python, Google Vision API, spaCy, ChatGPT, PyTorch, Tailwind CSS, and Mantine.
- 2022 Showcase 1st Place Winning Project. Built a program that detects brain tumors in MRI scans using an image segmentation model using Python ML Framework Keras, as part of a team project to create an assistive tool for radiologists.

NLP Research Project "Residual Activation Steering in GPT" Jun 2024

- Co-led a project using open-source LLM "Qwen" to disable LLM generation on select topics while maintaining high performance. Performed rigorous experimental design and analysis. Leveraged GPT-4, MMLU benchmark, and BLEU/ROGUE scores as quantitative evaluation metrics (Python, PyTorch, Jupyter, Numpy, Transformers)

NLP Research Paper "Probing for Emergent Positional Embeddings in GPT" x-ry.github.io/LING.pdf Mar 2024

- Co-authored a paper on mechanistic interpretability (reverse-engineering LLM transformers), investigating emergent positional embedding of words in GPT-2. Performed data extraction, cleaning, and analysis; Conducted training with linear probing on a model with natural sentence data with Python (PyTorch, spaCy, Jupyter Notebook, Conda, TransformerLens), and created visualizations of results (matplotlib, colorama).

NLP Research Paper "Cross-Domain Summarization w/ Incremental Fine-Tuning" x-ry.github.io/CRAFT.pdf Jun 2023

- Created and authored a research paper on a NLP model for cross-domain abstractive text summarization using incremental fine tuning on pre-trained models, demonstrating superior performance over baseline PEGASUS on CNN/DailyMail. Used Python, PyTorch, SBERT, HuggingFace Transformers.

Computer Vision License Plate Privacy Project - "CLOAK" Dec 2023

- ML program for real-time license plate obfuscation. Implemented Computer Vision model YOLO, gaussian blurring, and evaluation metrics to optimize image utility while guaranteeing privacy of drivers. Used Python, PyTesseract, CV2, PyTorch.

DATA ENGINEERING PROJECTS

ML Ops Data Pipeline Development Project Mar 2024 - Jun 2024

- Developed a ML Ops Data Pipeline using AWS, Apache Airflow, and PySpark for a heart disease dataset. Conducted EDA, ETL, feature engineering, missing value imputation, followed by implementing and evaluating logistic regression and SVM models via PySpark and scikit-learn. Utilized Python, Boto3 for data loading, CloudWatch, S3 buckets, and RDS database.

CDC Data Analysis Report Sep - Dec 2022

- Performed data wrangling, validation, cleaning on CDC heart disease survey data. Performed EDA with machine learning (feature engineering, Pearson/Spearman correlation, ensemble models) using Python, pandas, scikit-learn, matplotlib.

Global Data Visualization / Interactive Map Tool weff24.github.io/CS333_A3_D3/ Dec 2023

- Co-developed an interactive visualization of data on countries around the world (modifiable scatter plot, global map, bee-swarm plots) with D3.js, JavaScript, HTML, CSS. Iteratively designed with storyboarding for intuitive UI / UX.

Exploratory Data Analysis Report of Khan Academy Videos Nov 2023

- Conducted EDA on Khan Academy educational content. Utilized Python and Microsoft Excel for data cleaning and analysis of YouTube metadata datasets, used Tableau for data visualization.

NETWORKING AND SYSTEMS PROJECTS

Network Exploration and Security Auditing Tool Mar 2024

- Built a comprehensive Python tool for probing domains, assessing security protocols, and analyzing network characteristics (HTTP Server Identification, DNS Records, Redirects, TLS Versions).

UDP Streaming Protocol Project Feb 2024

- Created a reliable, portable streaming transport protocol resembling TCP, implementing networking protocol features (chunking, out-of-order delivery and packet loss handling, stop-and-wait ACK, checksums, pipelining) in Python.

ACTIVITIES

Google Competitive Programming Competitions - Kick Start & Code Jam 2019 - 2023

- Competed in an international programming competition, solving a set of data structures and algorithm problems in a fixed amount of time. Qualified for Round 1, scored in the top 4% worldwide.

Google Computer Science Summer Institute Jun 2020 - Sep 2020

- Learned to build web applications using the p5 Library, APIs, Node.js, and ExpressJS.

CERTIFICATES

Google Cloud: Machine Learning Certifications 2023

- 8 Certificates - Production ML Systems, ML Operations, ML in the Enterprise, TensorFlow on Google Cloud, Launching into ML, Google Cloud Big Data and ML Fundamentals, How Google does ML, Feature Engineering

TECHNICAL SKILLS

Fullstack - Javascript (Typescript, React.js, Svelte, Vue.js, Node.js, ExpressJS, p5.js), HTML, CSS (Tailwind), AWS (S3, Lambda, RDS, Lex), Google Cloud Services, Python (Flask), Java, APIs, OneTrust, Containerization (Docker)
Data Engineering - Python (NumPy, pandas, scikit-learn, matplotlib, Firebase REST API), AWS (S3, Postgres SQL), MySQL Database, BigQuery, EDA, JavaScript (D3.js, Three.js), Tableau, R
AI/ML/NLP - Python environments and libraries (TensorFlow, PyTorch, spaCy, Keras, Conda, kernels, HuggingFace), OpenCV, Large Language Models (ChatGPT)
Systems - Computer Networking (TCP/IP, C, C++, Linux), Operating Systems, Computer Engineering
Other - DevOps, Git (Version Control), GitHub (Code Review), Agile Workflow (Leading Scrum Meetings, Design Docs, Jira, Notion), Unit and E2E Testing (Cypress)