Jacob Fuehne

jacobfuehne@yahoo.com | 1-618-420-7980 | www.linkedin.com/in/jacobfuehne/ | www.github.com/Fuehnix

EDUCATION

University of Illinois at Urbana-Champaign May 2024 - May 2026
Master of Computer Science GPA: 4.0/4.0

- Coursework: Cloud Computing Applications, Database Systems, Deep Learning for Healthcare, Foundations of Data Curation, Theory and Practice of Data Cleaning, Internet of Things, Natural Language Processing, Scientific Visualization

University of Illinois at Urbana-Champaign August 2018 - May 2021
Bachelor of Science in Computer Science and Linguistics GPA: 3.8/4.0

- 1st place in 2019 ACM Reflections MechMania AI hackathon
- Coursework: Algorithms, Artificial Intelligence, Applied Machine Learning, Audio Computing Lab, Computational Linguistics, Computer Architecture, Computer Systems, Corpus Linguistics, Data Structures, Statistics, Programming Languages and Compilers

RESEARCH

Jacob Fuehne, et al. "*Recite, Reconstruct, Recollect: Memorization in LMs as a Multifaceted Phenomenon*" ICLR 2025 [PDF]

Jacob Fuehne *"A Review of the Unified Corpus and a Methodology for Improvement on Generalizable Emotion Detection"* Preprint December 2020 [PDF]

Jacob Fuehne, Vivek Nair *"Systems Enabling the Use of Natural Language Processing Methods for Software-Based Leak Detection, Prevention, and Mitigation"* White Paper February 2020 [PDF]

EXPERIENCE

Generative AI Engineer @ Other World Computing (OWC) February 2024 – Present

- Created a new in-house search engine API, MongoDB product database, internal logging, search admin console UI, and continuous improvement through Learn to Rank (LTR) for improved customer experience while reducing operational cost to $0
- Built a custom UI in JavaScript for the new in-house search engine's scoring method with tiers of complexity for everyone from marketing team to engineers needing to sanity check the equations combining BM25 text search, vector search, and the miscellaneous weights and boosts applied
- Deployed a customer support and sales assistant RAG chatbot with a hybrid locally hosted MongoDB text/vector search backend, custom LangChain implementation, Chainlit and FastAPI managing event streaming to React JS frontend, LangSmith tracing for observability and collecting user feedback, and integrated with Salesforce Live Agents API for offloading to the human support team as desired
- Optimized locally deployed backend code for production customer loads using multi-threaded asynchronous conversation code and a python multiprocessing worker pool for assigning loads dynamically across all available CPU cores for 2000+/tokens streamed per second
- Generated synthetic data summarized from messy product manuals and knowledgebase with agentic AI into structured JSON for chatbot
- Developed a Text2NoSQL pipeline POC using the Microsoft Guidance framework to automatically generate MongoDB match queries identifying suggested products based on scenarios given by users based on over 300 category filters and 6000+ unique SKUs
- Responsible for testing and coordinating enterprise AI products with partner companies and developing internal agentic AI workflows

Artificial Intelligence Engineer @ Albemarle Corporation April 2023 – February 2024

- Provided NLP expertise to Albemarle in decision making and developing an enterprise chatbot using Microsoft Bot Framework SDK and Azure
- Integrated chatbot with REST APIs to query SAP S/4 HANA, Ariba, Workday, Salesforce, Azure, and ServiceNow for user requests
- Designed chatbot architecture and project delivery model in accordance with leadership's goals and resource availability, as well as identifying areas of improvement
- Designed NLP and ML features for custom in-house data analytics for IT ticketing and chatbot usage using topic modelling

Software Engineer @ Cognizant June 2021 – March 2023

- Transitioned **Gilead Sciences** to automated Java Selenium test scripts for their Identity Management app and maintained SQL user database
- Collaborated with backend and frontend teams as lead to resolve defects and manage SQA resources to meet project timelines
- Responsible for writing test plans, reports, cost savings metrics, and ensuring test requirement coverage during execution

NLP Research Intern @ Solid Security October 2019 – April 2020

- Developed a program in Java to generate and index idiomatic permutations of a document through a custom Spintax ruleset, then identify the source of a leaker via semantic distance algorithms, syntactic differences, statistical analysis, and repeated exposure
- Researched and tested effectiveness between various algorithms in literature survey such as Hamming Distance, Levenshtein Detailed Distance, word2vec skip-gram, character n-grams, and more
- Wrote preprint papers and reviewed current literature on paraphrase detection and generation for text (code is public on my GitHub)

Software Engineer Intern @ AbbVie Inc. April 2019 – August 2019

- Worked with an Agile team of interns and a mentor to automate document processing for clinical drug trials, allowing pharmaceutical researchers to reallocate more than $200,000 in salary hours towards doing research rather than reviewing documents
- Implemented image recognition, machine learning, and statistical techniques in Python utilizing OpenCV, Matplotlib, NumPy, and other libraries to recognize and parse handwritten text in different formats
- Tested accuracies of various methodologies to differentiate between intentional marks and bad scans, eventually deciding on SciPy stats to compare against a blank document copy and employing a histogram to determine statistical significance

PROJECT HIGHLIGHTS

Clinical Drug Trial Synthetic SDTM Dataset Generator for Keiji AI / UIUC Sun Lab Python

- Advised by Professor Jimeng Sun, currently working on a publication to use agentic AI to take any clinical drug trial's protocol PDF, constraints for ADaM variables, and demographic data as input to create synthetic data that represents the clinical drug trial
- Provides synthetic SDTM data to biostatistician researchers to build statistical workflows and validate analysis programming on realistic data before a drug trial begins to reduce bottlenecks
- Using Google Gemini API and Chain of Thought approach to read tables from PDFs, reason, and populate thousands of rows in up to 64 SQL tables commonly seen in the SDTM clinical trial data format.

AI IoT Smart Nutrition Tracking System Python

- An IoT system to improve the UX experience of dieting with apps by having a dedicated smart screen connected to a raspberry pi, a Bluetooth kitchen scale, barcode scanner, and a camera for scanning foods, thus removing the commitment issues associated with a dieting user pulling out their phone, opening the app, and scanning in ingredients one at a time
- Identifies food using USDA FoodData API for retrieving nutrition info from products and a computer vision API for classifying produce
- To supplement the insufficient quantity of open-source image training data, OpenAI API is used for new foods and image data is logged for reference as future training data

Self-Driving Raspberry Pi Car Python

- Built a small-scale raspberry pi car with ultrasonic distance sensors, a camera connect by picamera, Bluetooth, and Wi-Fi capabilities from a parts kit and implemented self-driving abilities from scratch in Python
- Using ultrasonic distance sensors, maps out obstacles along a course, avoids collisions with static and moving objects, and solves the course with A* search algorithm without prior knowledge other than its relative position to the destination
- Recognizes miniature traffic lights and stop signs using OpenCV and TensorFlow Lite locally on the raspberry pi
- Accounted for many challenges in unreliable sensors, latency, servo calibration for turning, motor speed, and power control, which over time would cause the car to get "lost" or run into walls when analog reality falls out of sync with the data of the virtual representation if not handled
- Expanded to have the pi car map out Wi-Fi signal strength around the apartment, like a Wi-Fi troubleshooting Roomba

AI Dungeons and Dragons Twitch Bot Python

- Built a Twitch Chatbot and widget for a hackathon using ReactJS, Python, the Twitch API, and OpenAI to act as a multiplayer turn-based text adventure game for viewers in a content creator's Twitch stream.

SharePoint Chatbot using Microsoft Bot Framework SDK C#

- Implemented bot in both C# and Microsoft Power Virtual Agents, connecting bot to other services through Azure Bot Service

Healthcare Review Analysis through Topic Modelling Python

- Performed Latent Dirichlet Allocation (LDA) Topic Modelling on Healthcare review corpus to analyze feedback for hypothetical business
- Wrote analysis of performance increases by cleaning and fine tuning the corpus with stop words removal, lemmatization, and stemming

SKILLS

Languages:	Python, Java, SQL, MQL (MongoDB), JavaScript, C++, Bash, Cypher (Neo4j), C#, HTML, CSS
Software/Frameworks:	NumPy, Chainlit, LangChain, LangSmith, PyTorch, OpenCV, Pandas, ElasticSearch, Matplotlib, REST API, ReactJS, Flask, Selenium, Git, Linux
Skills/Concepts:	Audio Computing, Asynchronous, AWS, Azure, Convolutional Neural Network (CNN), Computer Vision, Finite State Machines, GPT, AI for IVR, Linux, Machine Learning, Microservices, Multi-processing, Multi-threading, Nginx, Optimization, Recurrent Neural Network (RNN), Regex, Robotic Process Automation (RPA), Text Analytics, Topic Modelling, Transformers