Abhinav **Gyawali**

Compiler Engineer

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As a prospective PhD student, my research interests currently span **programming languages, compilers** and **databases**.
In databases, I am particularly intrigued by Incremental View Maintenance and the structured testing of database systems through query synthesis. In programming languages, while I am still exploring the specific problems I want to focus on, I deeply enjoy the field and have a strong appreciation for languages like Rust. I admire the functional flavor it brings, along with its robust build system, which I believe significantly enhances developer productivity. Beyond these areas, I am also open to exploring research opportunities in Operating Systems and Networking, as I find these fields offer compelling challenges and significant potential for impactful contributions.

Education

Oct 2019 – Aug 2024	**Bachelor of Science**, *Deerwalk Institute of Technology* (DWIT), Kathmandu Computer Science & Information Technology
May 2017 – June 2019	**Cambridge International A Levels**, *St. Xavier's College* (SXC), Kathmandu **Courses** : Computer Science, Physics, Chemistry, Mathematics

Publications

- Mihai Budiu, Leonid Ryzhyk, Gerd Zellweger, Ben Pfaff, Lalith Suresh, Simon Kassing, **Abhinav Gyawali**, Matei Budiu, Tej Chajed, Frank McSherry, Val Tannen, **"DBSP : Automatic Incremental View Maintenance for Rich Query Language,"** accepted for publication in **The VLDB Journal**.
  In this paper, we redefine Incremental View Maintenance and propose a solution using DBSP. DBSP is a simple but expressive language for describing computations over data streams. We give an algorithm for converting a DBSP program into an incremental program. Finally we demonstrate how to build upon DBSP to support rich query languages like SQL. A practical implementation of this lies in github.com/feldera/feldera/tree/main/sql-to-dbsp-compiler
- **Abhinav Gyawali**, **"SocketDB : DBMS with Data Streaming via WebSockets,"** accepted for publication in **Deerwalk Journal of Computer Science and Information Technology, 2025**.
  In this paper, I describe my final year project, SocketDB, a lightweight SQL database that allows clients to subscribe to real-time updates through WebSockets. This paper argues that, in certain cases, this approach would reduce the load on the application server from constant requerying of the data by the client.

Professional Experience

Present
December 2023

Compiler Engineer, Feldera, Silicon Valley, USA (Remote)

- Enhanced the **SQL Compiler** by implementing support for JSON and ARRAY data types with DBSP, implementing SQL library functions, optimizing and testing data type casting mechanisms, and enhancing overall query performance.
- Implemented Feldera support for **sqlancer**, a sophisticated automated testing framework that generates and evaluates Feldera SQL queries, uncovering **31 previously undetected bugs**.
- Developed and maintained the **Feldera Python SDK**, a critical tool for bridging Feldera's core functionalities with Python-based data analysis workflows.
- Authored comprehensive technical documentation for SQL library functions and the Python SDK.
- Designed and deployed end-to-end performance monitoring frameworks, enabling the collection and analysis of critical metrics for Feldera Pipelines.
- Collaborated with external stakeholders to design custom demos and integration projects, showcasing Feldera's capabilities effectively.

Rust | Java | Python | Compiler Design | Apache Calcite | Incremental View Maintenance

November 2023
May 2022

Software Developer, Invisid (Previously DeepSign GmbH), Saarbrucken, Germany (Remote)

- Engineered the MacOS version of the Invisid Client, collecting raw user input metrics for continuous behavioral 2FA, based on the latest research on behavioral 2FA.
- Redesigned and optimized the architecture of the REST and gRPC server, achieving a 25% improvement in processing times and enhancing scalability for research deployment scenarios.
- Conducted in-depth feature extraction from raw OS input data, advancing machine learning model accuracy for behavioral authentication.
- Developed **trackpad-rs**, a specialized library to extract precise trackpad and magic mouse data from Apple's *MultitouchSupport* framework, supporting research on fine-grained user interactions.
- Engineered internal libraries for seamless FFI integration with C/Swift APIs, facilitating efficient data collection from MacOS.

Rust | gRPC | REST | Axum | ML

April 2022
July 2021

Backend Developer, TextABA, Kathmandu, Nepal

- Designed and implemented the backend architecture for a fully functional dating and chat application.
- Built a real-time chat system leveraging WebSockets and integrated Google Firebase for instant notifications.
- Deployed the application on AWS Free Tier, supporting 100 concurrent users with an average session duration of 90 minutes.

`Rust` `WebSockets` `Firebase` `AWS`

June 2021
May 2020

Infrastructure Security Engineer, Flow Webinar, Remote

- Executed comprehensive security assessments of the Flow Cloud Network and web applications, identifying and mitigating critical vulnerabilities.
- Strengthened the Flow Cloud Network's security posture through robust hardening strategies.
- Streamlined AWS resource utilization, achieving a 32% reduction in server costs.
- Configured and managed WireGuard VPN, enabling secure access to internal networks.
- Deployed an efficient logging and monitoring system utilizing Elasticsearch, AWS Lambda, and Kibana, enhancing incident response times by 30%.
- Drafted and implemented GDPR compliance policies to meet regulatory standards.

`Security` `Vulnerability Assessments` `Cloud` `WireGuard` `VPN` `Logging` `GDPR`

April 2020
August 2018

Junior System Administrator, NixBin LLC, Remote

- Deployed and managed virtualization environments using Proxmox, ensuring robust and scalable infrastructure.
- Configured NGINX reverse proxies with TLS termination to enhance security and traffic management.
- Deployed and maintained websites utilizing virtual hosts on both NGINX and Apache servers.

`Linux` `NGINX` `Apache HTTP Server` `Docker` `Proxmox`

July 2018
Feb 2018

Software Developer Intern, NixBin LLC, Remote

- Designed and implemented RESTful backend APIs using **PHP/Laravel**, ensuring seamless data integration and performance.

`PHP` `Laravel` `REST` `API`

Projects

DBSP

Present

github.com/feldera/feldera/tree/main/crates/dbsp

DBSP is a computational engine for continuous analysis of changing data. With DBSP, a programmer writes code in terms of computations on a complete data set, but DBSP implements it incrementally, meaning that changes to the data set run in time proportional to the size of the change rather than the size of the data set. This is a major advantage for applications that work with large data sets that change frequently in small ways.

`Incremental View Maintenance` `Rust`

SocketDB

2024

github.com/abhizer/socketdb

SocketDB is a lightweight SQL database that enables real-time updates through WebSockets. Clients can subscribe to query results and receive updates whenever the underlying data changes. This project allowed me to explore the intersection of database design and real-time communication, providing valuable insights into building efficient and responsive systems.

`Rust` `Databases` `WebSockets`

Nyx-lang

2023

github.com/abhizer/nyx-lang

Nyx-lang is a statically typed, tree-walking interpreted language with a type-checking mechanism to ensure safety and correctness. Working on this project deepened my understanding of compiler design and type systems, while encouraging me to approach language implementation from a structured and reliable perspective.

`Rust` `Compiler` `Interpreter` `Type Checker`

Loogle-rs

2023

github.com/abhizer/loogle-rs

Loogle is a ”Local Google” like search engine based on Term Frequency - Inverse Document Frequency (TF-IDF). Users can search for text in their search space and Loogle returns a sorted list of the files based on the page rank.

`Rust` `Search Engine` `TF-IDF`

Monkey-rs

2022

github.com/abhizer/monkey-rs

Monkey-rs is my take on the concepts from the Writing an Interpreter in Go book. This project was a pivotal learning experience, helping me become more comfortable with Rust and introducing me to the challenges and rewards of interpreter development. It marked an important step in my growth as a developer.

Rust Interpreter

Awards & Certifications

2021	**DWIT Merit Based Scholarship** : Class of 2023, DWIT, Nepal
2020	**DWIT Merit Based Scholarship** : Class of 2023, DWIT, Nepal
2020	**AWS Educate Student Ambassador**
2019	**TEDxMaitighar** : Organizer
2017	**Red Hat Certified Engineer** : (170-197-891)
2017	**Red Hat Certified System Administrator** : (170-197-891)

Others

Programming Languages	**Rust**, **Python**, **Java**
HackTheBox	22 root owns
Chess	FIDE Classical : 1785

References

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