Abdelrahman ElShafay

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Education

Carleton University Ottawa, ON

B.C.S Honours Computer Science, specializing in AI and ML *Sep. 2022 – June 2027*

- Fourth year standing

Work Experience

Carleton University Ottawa, ON

Undergraduate Teaching Assistant - COMP 2404: Intro to Software Eng. *Jan 2025 – April 2025*

- Leading weekly tutorial sessions designed to reinforce course material, provide in-depth explanations of C++ concepts, and guide students through hands-on problem-solving activities to enhance their understanding and application of programming principles.
- Leading weekly office hours, explaining core C++ concepts such as object-oriented programming, data structures, and debugging, while providing one-on-one assistance with assignments and troubleshooting code.
- Evaluating assignments and exams, providing actionable feedback to foster student learning and academic success.

Technical Skills

Languages: Java, Python, C/C++, SQLite, JavaScript, TypeScript, HTML/CSS, R, Scheme, Prolog
Technologies: Angular, React, Node.js, Rest API, openCV, Cython, TCP/IP, I^2C, Linux Kernel
Developer Tools: Git, Docker, Google Cloud Platform, Kubernetes, VS Code, PyCharm, IntelliJ, Qt Creator, DrRacket

Projects

iTunesfy | *JavaScript, TypeScript, Node.js, AngularJS, SQLite, Rest API* *Sep 2024 – Dec 2024*

- Developed a full-stack web application with Angular for the Front-end and Node.js with SQLite for the Back-end, allowing users to store and manage song and user information seamlessly.
- Implemented robust SQL security features, including authentication, access control, and encryption, to protect sensitive user data.
- Created a platform fostering a vibrant online music community, enabling users to store songs in playlists, create and publish new songs, and explore a library of content.
- Integrated user authentication workflows for secure account creation and management.
- Utilized the iTunes search API via a RESTful interface to dynamically fetch song, album, and artist data.

ASCII Camera | *Python, OpenCV, NumPy, Computer Vision* *May 2025 – May 2025*

- Designed and developed a real-time camera application that transforms live webcam video into ASCII art, processing up to 30 frames per second with less than 50 ms latency per frame.
- Implemented a custom pixel-to-ASCII character mapping algorithm, achieving a 92% improvement in visual clarity compared to traditional fixed-ramp approaches
- Optimized image resizing and terminal rendering, resulting in a 40% reduction in CPU usage while maintaining consistent output quality across diverse hardware setups.

Syntax Interpreter | *C++17, CMake* *Dec 2024 – May 2025*

- Engineered a complete interpreter pipeline for the Lox scripting language—custom lexer, recursive-descent parser, and tree-walking byte-code-free evaluator.
- Implemented first-class functions, closures, and block-level lexical scoping via an environment chain, enabling nested declarations, shadowing, and proper return semantics.
- Optimised the scanner to skip comment blocks in-place, reducing lexical-analysis time and peak memory by 35%.

BMP 280 device driver | *Linux Kernel, C, I^2C, sysfs, Raspberry Pi, BMP280* *June 2025 – July 2025*

- Developed a Linux kernel I^2C driver module for the BMP280 temperature and pressure sensor, including sensor reset, register configuration, and sysfs user interface.
- Implemented calibration logic for BMP280 using datasheet-based compensation formulas to compute accurate temperature and pressure readings.
- Implemented proper handling of device probing, register initialization, and I2C communication using $i2c\_smbus\_*$ APIs.
- Exposed real-time sensor data to userspace via sysfs attributes, following standard Linux driver conventions.