Moazin Khatti

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Education

Simon Fraser University
Master of Applied Science (MASc)
CGPA: 4.33 | Sept 2021 - Present
- Researcher under Dr. Zhenman Fang
- Lead TA for ENSC 251: Software Design and Analysis for Engineers

Pakistan Institute of Engineering and Applied Sciences
Bachelor's in Electrical Engineering
CGPA: 3.66 | Sept 2016 - July 2020
- Specialized in Embedded Systems

Publications

[1] **M. Khatti**, X. Tian, Y. Chi, L. Guo, J. Cong, Z. Fang. "PASTA: Programming and Automation Support for Scalable Task-Parallel HLS Programs on Modern Multi-Die FPGAs". FCCM 2023 (accepted)

[2] L Guo, Y Chi, J Lau, L Song, X Tian, **M Khatti** et al., "TAPA: ...". TRETS 2022. (under submission)

Skills

Compiler Development:
LLVM Compiler Infrastructure • LLVM IR Passes • Clang (for S2S) • PyVerilog (for RTL transformations)

Heterogeneous Computing:
Vitis HLS • Vivado • Verilog • OpenCL • OpenMP • CUDA

Machine Learning & Data Analysis:
PyTorch • NumPy • SciPy • Pandas • Jupyter Notebooks

Programming Languages and Tools:
Python (Proficient) • C/C++ (Proficient) • Assembly • Git • CMake • Java • Javascript • Rust

System Design:
Django • Flask • REST APIs • ReactJS • HTML / CSS • Gunicorn • Nginx • Docker • AWS • Google Cloud • Android Studio • GDK • Linux

Relevant Coursework:
Compiler Optimizations • Programming for Heterogeneous Systems • Design & Analysis of Algorithms • FPGA Design • Deep Learning Systems • Real-Time Embedded Systems

Links

• github.com/moazin
• linkedin.com/in/moazin/

Experience

Graduate Researcher - Simon Fraser University
BURNABY, BC, CANADA
HiAccel Lab
SEP.2021 - CURRENT
- Extended the HLS compilation framework [TAPA] to automatically improve the frequency of task-parallel accelerators that use double-buffer based communication channels on Xilinx FPGAs. (Clang, PyVerilog)
- Explored Xilinx's next generation Versal ACAP devices for application acceleration
- Automated off-chip memory access burst-length selection in HLS programs by using an LLVM Transformation Pass on top of Vitis HLS Frontend using techniques like Scalar Evolution and Alias Analysis (LLVM, Vitis HLS Frontend)

Adobe
REMOTE
Software Developer - Contract (Link: SVG-Native-Viewer)
MAR.2021 - SEPT.2021
- Extended Adobe's SVG rendering engine with bounding box calculation features to enable color font support in next-gen Adobe web products. Developed a regression testing framework to ensure functional correctness across different graphic rendering ports like Skia, Cairo, WinGDI, CoreGraphics. (C/C++, CMake, gdb, Boost, GNU build system)

Google Summer of Code
REMOTE
Inkscape (Link: Path Library Improvement; PR Link:Code)
JUN.2020 - AUG.2020
- Reverse engineered and documented legacy code implementations of computational geometry algorithms for core features such as Path Simplification, Boolean Operations, Path Tweaking, and Flowing Text to enable developers to improve code quality, maintain and add/modify functionalities in the codebase which was otherwise a black-box. (C/C++, Boost, gdb, GNU build tools)

GNU FreeType (Link: OT-SVG in FreeType; Report: Code)
JUN.2019 - AUG.2019
- Added OpenType SVG support to the font rendering engine enabling color font support on approx. 1 billion devices that use FreeType. Designed an interface to ensure flexible integration with arbitrary backend SVG rendering libraries like librsvg and resvg. (ANCI C, C++, gdb, GNU build tools)

Projects

Handwriting Synthesis (Link: Report)
SPRING 2022
Worked on an LSTM and gaussian mixture-density based sequential model in PyTorch to synthesize differently styled handwriting from input text. Performed multiple ablation studies and optimized the network to reduce the number of neural parameters down by 24% and the mixture density components by 75% while retaining the quality of results.

Accelerating Matrix Multiplication
JUN.2021 - AUG.2021
Accelerated general matrix multiplication run-time on CPUs, FPGAs and GPUs by 16x, 55x and 1666x respectively by exploring different loop transformations, memory and cache optimizations, resource consumption and multiprocessing on each platform. (OpenMP, Vitis HLS, CUDA)

Hospital Management System
SEP.2019 - PRESENT
Designed, implemented, tested and productionized a hospital management system that has been managing records of 32,000 patients, their visits, hospital admissions, diagnostic reports and hospital finances. (Django, Python, Docker, Gunicorn, Nginx)

Misc. Projects
LAST DECADE
I've worked on a variety of projects spanning web and mobile applications, embedded systems and data scrapping systems that have given me a holistic understanding of end-to-end system design and modern-day tech stacks.