

Alberto Zeni — Curriculum vitæ

☎ (+39) 348 300 7550 • ✉ alberto.zeni@polimi.it • 🌐 albertozeni • in albertozeni

Profile overview

I hold a Ph.D. in Information Technology and a B.Sc. and a M.Sc. in Computer Science and Engineering, all from Politecnico di Milano. Currently, I am an AI/HPC Systems Research Scientist at Meta, working on the design and optimization of AI systems and infrastructure at data-center scale. Previously, I was a Computer Architect at AMD, where I worked on the design and verification of the AMD NPU array architecture and was a founding member of the AMD -omics research group, carrying on the research I started during my PhD on developing HPC genome analysis applications on heterogeneous architectures. I am also a Co-Founder of GenoGra, a startup delivering scalable, hardware-accelerated genomic analysis software.

My research revolves around developing high-performance kernels and applications for FPGAs and GPUs, with a particular focus on genome analysis and, more recently, AI acceleration. Over the past five years, I actively sought collaboration with leading researchers in the field and have had the chance to work and collaborate with many experts in the field of compute acceleration, computer architecture and genomics, such as Steven Hofmeyr, Aydın Buluc, Katherine Yelick (Lawrence Berkeley National Laboratory - LBNL and UC Berkeley), Michaela Blott, David Clarke (AMD), Mehrzad Samadi (NVIDIA), Srinivas Devadas (MIT), Heng Li (Harvard). During my M.Sc. and Ph.D. years, I spent around six months at the LBNL, one year at Xilinx Research Labs in Dublin (plus four months remotely as a visiting scholar), remotely interned for NVIDIA for seven months, and spent five months as a visiting Ph.D. at MIT CSAIL/Dana Farber Cancer Institute in Cambridge (Massachusetts, USA).

Beyond my research pursuits, I have extensive experience in teaching, particularly on computer architecture related subjects. I was the teaching assistant and lecturer for multiple CS Engineering courses at B.Sc. and M.Sc. levels. Furthermore, I was the lecturer of two extracurricular courses on heterogeneous architectures open to B.Sc, M.Sc., and Ph.D. students. Additionally, I have successfully co-supervised several students, including 4 M.Sc. theses on compute acceleration applied at Politecnico di Milano.

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Education

Ph.D. in Information Technology (Computer Science and Engineering), Cum Laude

Politecnico di Milano, Milan (Italy)

Nov 2020 - Jan 2024

The objective Ph.D. is to design a framework for the development of genomic applications exploiting high performance computing with heterogeneous hardware architectures. The final objective of this work is to both provide a customizable fully hardware-accelerated genomic pipeline and help the end user when developing genomic applications.

M.Sc. in Computer Science and Engineering

Politecnico di Milano, Milan (Italy)

Feb 2017 - Dec 2019

The thesis "A methodology for automatic GPU kernel optimization" involved the design of multiple GPU accelerated algorithms and the development of a methodology aimed at automatizing the process of GPU kernel development.

B.Sc. in Computer Science and Engineering

Politecnico di Milano, Milan (Italy)

Oct 2013 - Feb 2017

Third Year Project in Software Engineering: Implementing a digital version of the "Consiglio dei Quattro" board game.

Work/Visiting Periods

Research Scientist at Meta

Oslo, Norway

March 2025 - Now

Working on kernels, runtime, collectives, infrastructure, training/inference model enablement at scale, platform bringup and performance enhancements for the Meta Inference and Training Accelerator (MTIA) platform.

Computer Architect at AMD

Dublin, Ireland

Apr 2024 - March 2025

Worked on the design, testing, and validation of the AMD Neural Processing Unit (NPU) Array Architecture.

Post-Doc Researcher at Politecnico di Milano

Milan, Milan, Italy

Jan 2024 - Apr 2024

I Continued my research on developing HPC genome analysis applications on heterogeneous architectures.

Additionally, I focused on performance optimization for FPGA and GPU kernels, AI for genome analysis, and homomorphic encryption.

Visiting Ph.D. Student at MIT CSAIL - Dana Farber Cancer Institute

Cambridge, MA (USA)

Feb 2023 - June 2023

Under the supervision of Prof. Srini Devadas and Prof. Heng Li, I developed an High-Performance multi-reference based assembler.

High Performance Engineering Intern at NVIDIA

Santa Clara, CA (USA) - Remote

June 2022 - Jan 2023

Under the supervision of Dr. Mehrzad Samadi. During my internship I worked in the Parabricks team on the acceleration of *minimap2*, specifically I was in charge of the acceleration its aligner, named KSW2.

Visiting Scholar at Xilinx Research Labs

Dublin, Ireland - Remote

Sept 2021 - Dec 2021

Under the supervision of Dr. Kenneth O'Brien. My main tasks involve the design, acceleration and benchmark of High Performance Computing applications targeting hardware accelerators such as FPGAs, and co-processors.

Research Intern at Xilinx Research Labs

Dublin, Ireland

Nov 2019 - Oct 2020

Under the supervision of Dr. Michaela Blott. During my internship, I worked on the development of the High Performance Conjugate Gradient Benchmark (HPCG) for FPGA.

Visiting Scholar at Berkeley Lawrence National Laboratory

Berkeley, CA (USA)

Mar 2019 - Aug 2019

Under the supervision of Dr. Steven Hofmeyr, worked on the development of the X-Drop aligner on GPU and its integration within different genome pipelines.

Research Activities

Genome analysis on heterogeneous architectures

This project focuses on accelerating multiple genome analysis pipelines on FPGAs and GPUs.

2020-2024

Methodologies for GPU Kernel Optimization

This project focuses on streamlining the development and optimization of GPU Kernels.

2019-2024

☞ Starlight

GATK GPU-acceleration

This project focuses on a GPU implementation of GATK (Genome Analysis ToolKit).

2022-2024

WFA hardware-acceleration

This project focuses on accelerating of the WFA aligner on FPGA and GPU.

2022-2023

☞ FPGA-Implementation, ☞ GPU-Implementation

KSW2 hardware-acceleration

This project focuses on different hardware implementations of the popular KSW2 aligner.

2021-2023

☞ FPGA-Implementation

FPGA HPCG distributed implementation

This project leverages multiple FPGAs to implement the popular HPCG Benchmark

2020-2021

X-drop hardware acceleration

This project focuses on different hardware implementations of the X-drop algorithm.

2019-2021

☞ FPGA-Implementation, ☞ GPU-Implementation

Teaching Activities

Teaching Assistantship at Politecnico di Milano.....

GPUs and Heterogeneous Systems (Programming models and architectures), M.Sc.

March 2022 - March 2024

held by Prof. Antonio Miele. Course Evaluation: 3.3/4

"Fondamenti d'Informatica" (CS 101), B.Sc.

September 2022 - June 2023

held by Prof. Antonio Miele. Course Evaluation: 3.4/4

"Fondamenti d'Informatica" (CS 101), B.Sc.

September 2021 - June 2022

held by Prof. Antonio Miele. Course Evaluation: 3.2/4

"Fondamenti d'Informatica" (CS 101), B.Sc.

September 2020 - June 2021

held by Prof. Antonio Miele. Course Evaluation: 3.3/4

Elective Teaching at Politecnico di Milano.....

Lecturer and Tutor

GPU 101 (Extra Curricular course - Passion in Action),

October 2022 - June 2023

Politecnico di Milano

Lecturer and Tutor

FPGAcademy (Extra Curricular course - Passion in Action),

March 2022 - June 2022

Collaboration with External Institutions

Project Lead

Collaboration with Huxelerate S.r.l.,

Sept 2020 - November 2021

I was in charge of implementing multiple projects on FPGAs and GPUs regarding genome analysis acceleration; furthermore I was in charge of implementing multiple benchmark applications on the UPMEM platform exploiting Processing in Memory (PIM) architecture.

Technology Transfer

Startup

Co-Founder

GenoGra,

June 2023 - Now

I am the Co-Founder of a start-up (GenoGra) dealing with genome analysis. Awarded the first prize at the Startup Lombardia 2022 (25K€), the first prize at the Switch2Product 2022 (30K€) business competition and the Chimica Verde Award 2024 (25K€). In 2025, we also received a pre-seed funding of 1M€.

Patents

Method of aligning strings of characters representing genomic data and related hardware device

Pub. No.: US 2022/0108770 A1, Apr 2022

ALBERTO ZENI, Matteo Crespi, Lorenzo Di Tucci, Marco D. Santambrogio, Fabio Pizzato

Metodo di allineamento di stringhe di caratteri che rappresentano dati genomici

Pub. No.: 102019000006232, Nov 2019

ALBERTO ZENI, Matteo Crespi, Lorenzo Di Tucci, Marco D. Santambrogio, Fabio Pizzato

Methods for the alignment of sequence reads to non-acyclic genome graphs on heterogeneous computing systems

Pub. No.: WO2023170091A1, Under Evaluation

Guido Walter Di Donato, ALBERTO ZENI, Mirko Coggi, Guglielmo Bruno, Marco Domenico Santambrogio

Publications

Publication Impact

○ Based on [Google Scholar profile](#): *h-index 9, citations 294*

○ Based on [Scopus profile](#): *h-index 7, citations 184*

Data collected on October 19, 2026

MTIA 300: Meta's First Training Chip with Built-in NICs and Collective Offloading Engines

International Symposium on Computer Architecture (ISCA), July 2026

ALBERTO ZENI - member of the MTIA Team that published the paper

Leveraging Difference Recurrence Relations for High-Performance GPU Genome Alignment

International Conference on Parallel Architectures and Compilation Techniques (PACT), Oct 2024

ALBERTO ZENI, Seth Onken, Marco D. Santambrogio, Mehrzad Samadi

The Genomic Computing Revolution: Defining the Next Decades of Accelerating Genomics

IEEE High Performance Extreme Computing (HPEC) virtual conference

Harisankar Sadasivan, Artur Klauser, Juergen Hench, Yatish Turakhia, Gagandeep Singh, ALBERTO ZENI, Sarah Beecroft, Satish Narayanasamy, Jeff Nivala, Bob Robey, Onur Mutlu, Kristof Denolf, Sriranjani Sitaraman

Starlight: A Kernel Optimizer for GPU Processing

Journal of Parallel and Distributed Computing (JPDC), May 2024

ALBERTO ZENI, Emanuele Del Sozzo, Eleonora D'Arnese, Davide Conficconi, Marco D. Santambrogio

On the Genome Sequence Alignment FPGA Acceleration via KSW2z

International Symposium on Circuits and Systems (ISCAS), May 2023

ALBERTO ZENI, Guido Walter Di Donato, Alessia Della Valle, Filippo Carloni, Marco D. Santambrogio

TSUNAMI: a GPU implementation of the WFA algorithm

International Conference on Parallel Architectures and Compilation Techniques (PACT), Oct 2023

Recognized Artifacts for Reusability, Reproducibility, and Availability

Giulia Gerometta, ALBERTO ZENI, Marco D. Santambrogio

A New Solution For a (Scaff)Old Problem: an FPGA Approach

30th Reconfigurable Architectures Workshop (RAW), May 2023

ALBERTO ZENI, Emanuele Del Sozzo, Beatrice Branchini, Marco D. Santambrogio

Surfing the Wavefront of Genome Alignment

International Symposium on Circuits and Systems (ISCAS), May 2022

Beatrice Branchini, Giulia Gerometta, Luisa Cicolini, ALBERTO ZENI, Emanuele Del Sozzo, Marco D. Santambrogio

Fast Genome Analysis Leveraging Exact String Matching

29th Reconfigurable Architectures Workshop (RAW), May 2022

Beatrice Branchini, Sofia Breschi, ALBERTO ZENI, Marco D. Santambrogio

Pushing the Level of Abstraction of Digital System Design: a Survey on How to Program FPGAs

ACM Computing Surveys (CSUR), April 2022

Emanuele Del Sozzo, Davide Conficconi, **ALBERTO ZENI**, Mirko Salaris, Donatella Sciuto, Marco D. Santambrogio

Optimized Implementation of the HPCG Benchmark on Reconfigurable Hardware

ACM European Conference on Parallel Processing (EURO-PAR), August 2021

ALBERTO ZENI, Kenneth O'Brien, Michaela Blott, Marco D. Santambrogio

The Importance of Being X-Drop: High Performance Genome Alignment on Reconfigurable Hardware

IEEE International Symposium on Field-Programmable Custom Computing Machines (FCCM), May 2021

ALBERTO ZENI, Guido Walter Di Donato, Marco Rabozzi, Lorenzo Di Tucci, Marco D. Santambrogio

LOGAN: High-Performance GPU-Based X-Drop Long-Read Alignment

IEEE International Parallel & Distributed Processing Symposium (IPDPS), May 2020

ALBERTO ZENI, Giulia Guidi, Marquita Ellis, Nan Ding, Marco D. Santambrogio, Steven Hofmeyr, Aydın Buluç, Leonid Oliker, Katherine Yelick

BWaveR: Leveraging Succinct Data Structures for DNA Sequence Mapping on FPGA

27th Reconfigurable Architectures Workshop (RAW), May 2020

Guido Walter Di Donato, **ALBERTO ZENI**, Lorenzo Di Tucci, Marco D. Santambrogio

An FPGA-based Computing Infrastructure Tailored to Efficiently Scaffold Genome Sequences

IEEE Symposium on Field-Programmable Custom Computing Machines (FCCM), Apr 2019

ALBERTO ZENI, Matteo Crespi, Lorenzo Di Tucci, Marco D. Santambrogio

circFA: an FPGA-based circular RNA aligner

2019 IEEE Biomedical and Health Informatics (BHI), May 2019

ALBERTO ZENI, Francesco Peverelli, Enrico Cabri, Lorenzo Di Tucci, Luca Cerina, Marco D. Santambrogio

Awards

Progetto Rocca Doctoral Fellowship

Awarded a sponsored "Progetto Rocca Doctoral Fellowship" at MIT for 10K\$

2023

First Prize at StartCup Lombardia 2022

First prize in the Life Science & MedTech category, awarded 25K€

2022

Finalist of the Xilinx Open Hardware Design Contest

KSW2 - Genomic Alignment Acceleration

2022

Finalist of the Xilinx Open Hardware Design Contest

Genomic co-processor for long read assembly on FPGA

2021

Finalist of the Xilinx Open Hardware Design Contest

Paladin: FPGA Long Read X-drop Aligner

2020

Paper winner of the BHI 2019 2nd Best Paper Award

circFA: an FPGA-based circular RNA aligner

2019

Finalist of the Xilinx Open Hardware Design Contest

circFA: an FPGA-based circular RNA aligner

2018

Organizational Experience

Member of the organizing committee

Member of the organizing committee of Cyber Physical Systems (CPS) Summer School, in Alghero (Sardinia)

September 2023

Lab Organizer

Co-Organizer of the "Creative Lab" at the Cyber Physical Systems (CPS) Summer School, in Pula (Sardinia)

September 2022

Conference Activities

Technical Committee

Part of the technical committee for International Workshop on Heterogeneous High-performance Reconfigurable Computing (H2RC 2024).

Part of the technical committee for the Student Research Competition (SRC) at PACT 2024.

Session Chair

Session Chair for IEEE 29th Reconfigurable Architectures Workshop (RAW 2022).

Reviewer

Reviewer for International Workshop on Heterogeneous High-performance Reconfigurable Computing (H2RC 2024)

Subreviewer for IEEE International Symposium on Circuits and Systems (ISCAS 2024).

Reviewer for the IEEE/ACM International Conference on Computer-Aided Design (ICCAD 2023).

Subreviewer for the ACM 37th ACM/SIGAPP Symposium On Applied Computing (SAC 2022).

Subreviewer for the IEEE 59th Design Automation Conference (DAC 2022).

Subreviewer for the IEEE International Symposium on Field-Programmable Custom Computing Machines (FCCM 2022).
 Subreviewer and Session Chair for the IEEE Reconfigurable Architectures Workshop (RAW 2022).
 Two times Subreviewer for ACM International Conference On Supercomputing 2022 (ICS 2022).
 Subreviewer for IEEE International Conference on Field Programmable Logic and Applications (FPL 2022).
 Subreviewer for the IEEE Reconfigurable Architectures Workshop (RAW 2021).
 Subreviewer for the IEEE International Symposium on Field-Programmable Custom Computing Machines (FCCM 2021).
 Subreviewer for the IEEE 58th Design Automation Conference (DAC 2021).
 Subreviewer for the ACM 31st Great Lakes Symposium on VLSI (GLSVLSI 2021).
 Subreviewer for IEEE/ACM 24th Design, Automation, and Test in Europe (DATE 2021).
 Subreviewer for IEEE 2nd International Conference on Autonomic Computing and Self-Organizing Systems (ACSOS 2021).

Attendance.....

IEEE/ACM International Conference on Parallel Architectures and Compilation Techniques (PACT 2024).
 Oxford Nanopore Boston Community Meeting (NCM 2024).
 IEEE/ACM International Conference on Parallel Architectures and Compilation Techniques (PACT 2023).
 IEEE International Symposium on Circuits and Systems (ISCAS 2023).
 IEEE/ACM Design, Automation and Test in Europe Conference (DATE 2022).
 IEEE Reconfigurable Architectures Workshop (RAW 2022).
 IEEE International Parallel & Distributed Processing Symposium (IPDPS 2022).
 IEEE Heterogeneous Accelerated Compute Clusters (HACCs) Workshop at FPL 2022.
 IEEE Annual International Symposium on Field-Programmable Custom Computing Machines, (FCCM 2021).
 ACM International European Conference on Parallel and Distributed Computing, (EUROPAR 2021).
 IEEE International Conference on Field-Programmable Logic and Applications, (FPL 2021).
 IEEE International Parallel & Distributed Processing Symposium (IPDPS 2020).

Journal Activities

Reviewer for Elsevier Journal of Parallel and Distributed Computing.
 Reviewer for Oxford Academics Bioinformatics.
 Reviewer for IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD).
 Reviewer for Springer Nature Scientific Reports.
 Reviewer for Elsevier Journal on Microprocessors and Microsystems: Embedded Hardware Design (MICPRO).
 Two times Reviewer for IEEE Transactions on Parallel and Distributed Systems (TPDS).
 Subreviewer for ACM Transactions on Reconfigurable Technology and Systems (TRETs).

Communication Skills

Conference Talks.....

"Leveraging Difference Recurrence Relations for High-Performance GPU Genome Alignment", at IEEE/ACM International Conference on Parallel Architectures and Compilation Techniques (PACT)	2024
"TSUNAMI: a GPU implementation of the WFA algorithm", at IEEE/ACM International Conference on Parallel Architectures and Compilation Techniques (PACT)	2023
"On the Genome Sequence Alignment FPGA Acceleration via KSW2z", at IEEE International Symposium on Circuits and Systems (ISCAS)	2021
"Optimized Implementation of the HPCG Benchmark on Reconfigurable Hardware", at ACM European Conference on Parallel Processing (EURO-PAR)	2020
"The Importance of Being X-Drop: High Performance Genome Alignment on Reconfigurable Hardware", at IEEE International Symposium on Field-Programmable Custom Computing Machines (FCCM)	2020
"LOGAN: High-Performance GPU-Based X-Drop Long-Read Alignment", at IEEE International Parallel & Distributed Processing Symposium (IPDPS)	

Invited Talks.....

"A framework for the aided design of High Performant Genome Analysis applications on heterogeneous Architectures",
at **Politecnico Di Milano**, Milan, Italy

2024

"A framework for the aided design of High Performant Genome Analysis applications on heterogeneous Architectures",
at Colloquia Doctoralia, **Politecnico Di Milano**, Milan, Italy

2023

"On the acceleration of KSW2 on NVIDIA GPUs",
at **NVIDIA Corporation**, Santa Clara (USA) - Online

"On the acceleration of KSW2 on NVIDIA GPUs",
at **Brigham and Women Hospital**, Boston (USA)

"Paving the way for Fast and Accurate Genome Analysis",
at Colloquia Doctoralia, **Politecnico Di Milano**, Milan, Italy

2022

"Minimap2-ax: GPU accelerated Minimap2",
at **NVIDIA Corporation**, Santa Clara (USA) - Online

"Paving the way for Fast and Accurate Genome Analysis",
at NVIDIA Corporation, Santa Clara (USA) - Online

"Heterogeneous High Performance Computing @ NECSTLab",
at **Politecnico Di Milano** - Milano (Italy)

"Improving Genome Analysis through heterogeneous architectures",
at **NVIDIA Corporation**, Santa Clara (USA) - Online

"Improving Genome Analysis through heterogeneous architectures",
at **Politecnico Di Milano** - Milano (Italy)

"Improving Genome Analysis through heterogeneous architectures",
at **Anthem Blue Cross Blue Shield** - Chicago (USA)

"Improving Genome Analysis through heterogeneous architectures",
at **Northwestern University** (NU) - Chicago (USA)

"Improving Genome Analysis through heterogeneous architectures",
at **University of Illinois** at Chicago (UIC) - Chicago (USA)

2021

"Optimized Implementation of the HPCG Benchmark on Reconfigurable Hardware",
at the **XACC Tech Talk**, (Virtual)

"Introduction to Hardware-Accelerated Genomic Applications",
at NECSTLab Research Line Fair Event, (Virtual), for: **Xilinx, University of California Berkeley, LBNL**

Languages.....

Italian: Native, English: Advanced

Master Thesis Co-Advisor

"On the analysis of performance and flexibility of the Wavefront alignment Algorithm: a GPU Approach"

Student: Giulia Gerometta

Advisor: M. D. Santambrogio

Ongoing

"A Methodology For Accelerating Variant Calling on GPU"

Student: Beatrice Branchini

Advisor: M. D. Santambrogio

2022

"Genomic Co-processor for Long Read Assembly"

Student: Marina Martí Quesada

Advisors: M. D. Santambrogio, J. C. Vilella

2021

"A Methodology to Enhance Quality Performance of Third Generation DNA Sequences Error Correction"

Student: Matteo Crespi

Advisors: M. D. Santambrogio

2020

Association and Volunteer

IEEE Student Chair - Politecnico di Milano

2020 - 2024

IEEE Member

2018 - Now

IEEE Young Professionals Member

2018 - Now

<i>IEEE Women in Engineering Member</i>	<i>2019 - Now</i>
<i>IEEE Circuits and Systems Society Member</i>	<i>2023 - Now</i>
<i>IEEE Computer Society Member</i>	<i>2021 - Now</i>
<i>IEEE Engineering in Medicine and Biology Society Member</i>	<i>2022 - Now</i>