3rd Workshop on Architecture for Health (Arch4Health)

In Conjunction with ICS 2026
Belfast, Northern Ireland

Nika Mansouri Ghiasi, Konstantina Koliogeorgi, Onur Mutlu



SAFARI

ETH zürich

Opportunities



Recent biotechnological advances enable high-throughput, low-cost, and accurate biological data generation

- Genome sequencing
- Continuous wearable sensing
- Medical imagining
- …



This wealth of data enables unique opportunities for advancing healthcare

- Precision medicine
- Bedside personalized care
- Discovering early warning signs of communicable diseases
- Continuous physiological tracking
- Enhanced diagnostic capabilities
- …

Challenges

Efficiently analyzing large-scale biological data
poses significant challenges
for conventional computing systems



Performance & Scalability



Energy Efficiency



Privacy & Security



Cost Effectiveness

Goals of Arch4Health



Exploring the key computational challenges in health-related applications

&

The vital role of computer architecture in overcoming them to advance healthcare

Example Areas



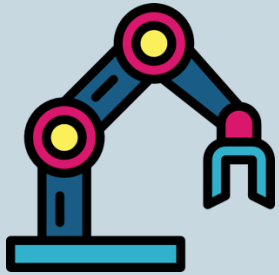
Computational Biology
- Genomics
- Metagenomics
- Gene Editing
- Drug Discovery
- Proteomics
- Other Areas in Precision Medicine



Neuroscience
- Brain-Machine Interfaces
- Prosthetics



Wearable Systems & Bio-Sensors



Medical Robotics



Mental Health



Medical Imaging
- Brain Scans
- Radiology
- Single-Cell Analysis



Agent-Based Simulation

& More…

New Paper on the Arch4Health Initiative

Architecture for Health Initiative (Arch4Health): Computational Challenges in Health-Related Applications and the Role of Computer Architecture in Addressing Them

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Switzerland

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ETH Zürich
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ETH Zürich
Switzerland

https://arxiv.org/pdf/2606.22685

Agenda

Time	Speaker	Title
9:00 - 9:15	Nika Mansouri Ghiasi Konstantina Koliogeorgi Onur Mutlu (ETH Zurich)	Welcome Notes Architecture for Health: Exploring Computational Challenges in Health-Related Applications and How Computer Architecture Can Address Them
9:15 - 10:00	Hasindu Gamaarachchi (School of Computer Science and Engineering, UNSW Sydney)	Scalable, Portable and Live Nanopore Sequence Analysis
10:00 - 10:30	Max Doblas (Barcelona Supercomputing Center)	From Algorithm to Silicon Hardware-Software Co-Design of a RISC-V Edit Distance Accelerator for Sequence Alignment
10:30 - 11:00 — Coffee Break		
11:00 - 11:45	Krishna Kant (Temple University)	Chronic Disease Management Networks
11:45 - 12:30	Onur Mutlu (ETH Zurich)	Accelerating Genome Analysis
12:30 - 13:30 — Lunch Break		
13:30 - 14:15	Bertil Schmidt (JGU Mainz)	Addressing Key Challenges in Accelerated Computing for Omics Pipelines
14:15 - 14:40	Zeynep Akcil, Can Alkan (Bilkent University)	POACHA: Partial Order Alignment Computation Hardware Acceleration
14:40 - 15:00	Eirini Tzermpou (ETH Zurich)	A High-Performance and Low-Cost Algorithm-Architecture Co-Design for Graph-based Genome Analysis
15:00 - 15:30 — Coffee Break		
15:30 - 15:50	Eric Santigosa-Lepe (Barcelona Supercomputing Center)	Sequence Alignment Acceleration on the Edge Using an FPGA MPSoC
15:50 - 16:10	Berkan Şahin (Bilkent University)	In-depth data movement characterization of DNA read mapping algorithms
16:10 - 16:25	Raghu Shankar (Tech Entrepreneur)	Genomics: Scale-up and Scale-out with System in a Package as-a-Platform
16:25 - 16:40	Nika Mansouri Ghiasi (ETH Zurich)	Storage-Centric System Designs for Enabling Fast, Efficient, and Low-Cost Genomic and Metagenomic Analyses
16:40 - 16:55	Konstantina Koliogeorgi (ETH Zurich)	MARS: Processing-In-Memory Acceleration of Raw Signal Genome Analysis Inside the Storage Subsystem
16:55 - 17:00	Nika Mansouri Ghiasi Konstantina Koliogeorgi Onur Mutlu (ETH Zurich)	Closing Remarks

Organizers



Nika Mansouri Ghiasi

- Recently defended PhD, currently researcher and lecturer in the SAFARI Research Group at ETH Zurich
- https://sites.google.com/view/nikamansourighiasi



Dr. Konstantina Koliogeorgi

- Postdoctoral Researcher and Lecturer in the SAFARI Research Group at ETH Zurich
- https://bit.ly/konkoliogeorgi-linkedin



Prof. Onur Mutlu

- Professor of Computer Science at ETH Zurich
- https://people.inf.ethz.ch/omutlu/

More Info



https://events.safari.ethz.ch/ics26-arch4health/

More Info on the 2nd Arch4Health

Second Workshop on Architecture for Health



Arch4Health

A full-day workshop @ HPCA 2026, Sydney

31st January 2026 (Saturday)

Organizers: Nika Mansouri Ghiasi, Dr. Konstantina Koliogeorgi, and Prof. Onur Mutlu

The workshop will cover 10 talks, spanning critical topics in

- Algorithms, software, and hardware designs for data-intensive applications in health and life sciences
- Harnessing the power of electrical signals in genomics
- AI & algorithms in biology
- Indexing and querying petabyte-scale biological sequences
- Data-centric system designs for fast and low-cost genomics and metagenomics

Detailed Agenda:



Example Areas

Computational Biology
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- Metagenomics
- Gene Editing
- Drug Discovery
- Proteomics
- Other Areas in Precision Medicine

Neuroscience
- Brain-Machine Interfaces
- Prosthetics

Wearable Systems & Bio-Sensors

Medical Robotics

Medical Imaging
- Brain Scans
- Radiology
- Single-Cell Analysis

Agent-Based Simulation

& More…

Challenges

Efficiently analyzing large-scale biological data poses significant challenges for conventional computing systems

- **Performance & Scalability**
- **Energy Efficiency**
- **Privacy & Security**
- **Cost Effectiveness**

Arch4Health @ MICRO 2025

More Info:

YouTube:

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We will be back at 15.30, Belfast time.



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