

# HKUST Engineering x HKSTP Distinguished Speaker Series

## Prof. Onur Mutlu

**Professor of Computer Science, ETH Zurich**

Onur Mutlu is a Professor of Computer Science at ETH Zurich. He is also a faculty member at Carnegie Mellon University, where he previously held the Strecker Early Career Professorship. His current broader research interests are in computer architecture, systems, hardware security, and bioinformatics.



Moderator: Prof. Tim Cheng, Dean, HKUST School of Engineering

7TH OCT 2020 | 5:00PM (HK TIME) | VIA ZOOM

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## Intelligent Architectures for Intelligent Machines

Computing is bottlenecked by data. Large amounts of application data overwhelm storage capability, communication capability, and computation capability of the modern machines we design today. As a result, many key applications' performance, efficiency and scalability are bottlenecked by data movement.

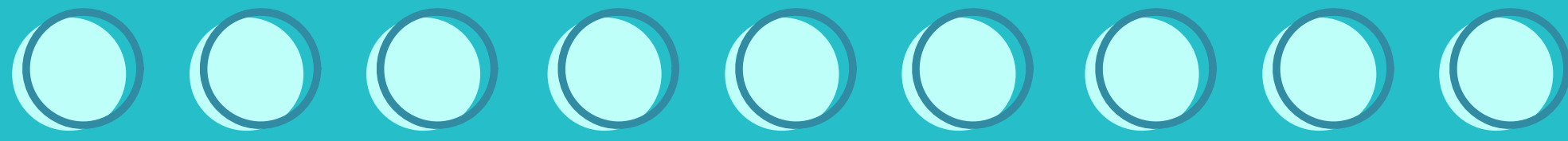
We describe three major shortcomings of modern architectures in terms of 1) dealing with data, 2) taking advantage of the vast amounts of data, and 3) exploiting different semantic properties of application data. We argue that an intelligent architecture should be designed to handle data well. We show that handling data well requires designing architectures based on three key principles: 1) data-centric, 2) data-driven, 3) data-aware. We give several examples for how to exploit each of these principles to design a much more efficient and high performance computing system.

We will especially discuss recent research that aims to fundamentally reduce memory latency and energy, and practically enable computation close to data, with at least two promising novel directions: 1) performing massively-parallel bulk operations in memory by exploiting the analog operational properties of memory, with low-cost changes, 2) exploiting the logic layer in 3D-stacked memory technology in various ways to accelerate important data-intensive applications. We discuss how to enable adoption of such fundamentally more intelligent architectures, which we believe are key to efficiency, performance, and sustainability.

We conclude with some guiding principles for future computing architecture and system designs. Throughout the talk, we will point out how open source hardware can enable innovation in and adoption of the paradigms we introduce.



# HKU Mech Eng x HKSTP Distinguished Speaker Series



## Prof. David Weitz

Mallinckrodt Professor of Physics and of Applied  
Physics, Harvard University

Prof. Weitz received his PhD in physics from Harvard University and then joined Exxon Research and Engineering Company, where he worked for nearly 18 years. He then became a professor of physics at the University of Pennsylvania and moved to Harvard at the end of the last millennium as professor of physics and applied physics.



Moderator: Prof. Anderson Shum, Professor & Associate Head,  
Department of Mechanical Engineering, The University of Hong Kong

8th Oct 2020 | 10:00-11:30am (HK Time) | via Zoom

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webinar materials after the webinar

## Droplet microfluidics for ultra- high throughput screening and super-sensitive detection

This talk will describe the use of drop-based microfluidics for very sensitive detection of biomarkers or cells for diagnostics and pathogen detection. The use of large numbers of small drops improves sensitivity and specificity of the detection. This technology is of particular use in these times of the pandemic. In addition, this talk will show how the small drops can be used for very high throughput screening applications, which is also of great value in detecting cell variability, both for oncology applications and for studies of pathogens.