

## A Computational Lens on Economics

Our digital infrastructure, which has become a key component of the economic system in developed countries, is one of the few components that did not buckle under the stress of COVID-19.

*Moshe Y. Vardi*

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## Challenge Yourself by Reaching for

### the Highest Bar

"Challenge yourself and reach for the highest bar. If you succeed, keep pushing the boundaries," my friend advised when I started my career at IBM Research. These words have been a guiding force in my career ever since.

*Yosuke Ozawa*

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DEPARTMENT: LETTERS

TO THE EDITOR

## Computing's Role in Climate Warming

As a computer scientist, I was embarrassed to read the Viewpoint "Conferences in an Era of Expensive Carbon" (March 2020) from four fellow computer scientists.

*CACM Staff*

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DEPARTMENT:

BLOG@CACM

## Transitioning to Distance Learning and Virtual Conferencing

John Arquilla considers responses to the Coronavirus pandemic, while Mark Guzdial ponders the impacts of competitive enrollment.

*John Arquilla, Mark Guzdial*

Pages 10-11

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COLUMN: NEWS

## The Quantum Threat

Cryptographers are developing algorithms to ensure security in a world of quantum computing.

*Gregory Mone*

Pages 12-14

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## Your Wish Is My CMD

Artificial intelligence could automate software coding.

*Neil Savage*

Pages 15-16

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## Reducing and Eliminating E-

### Waste

We need to mitigate the environmental impact of disposing of electronics at their end of useful life.

*Keith Kirkpatrick*

Pages 17-19

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COLUMN: LEGALLY

SPEAKING

## AI Authorship?

Considering the role of humans in copyright protection of outputs produced by artificial intelligence.

*Pamela Samuelson*

Pages 20-22

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COLUMN: ECONOMIC AND

## BUSINESS DIMENSIONS

### Proposal: A Market for Truth to Address False Ads on Social Media

Guaranteeing truth in advertising.

*Marshall W. Van Alstyne*

Pages 23-25

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COLUMN: COMPUTING

## ETHICS

### For Impactful Community Engagement: Check Your Role

Toward a more equitable distribution of the benefits of technological change.

*Kathleen H. Pine, Margaret M. Hinrichs, Jieshu Wang, Dana Lewis, Erik Johnston*

Pages 26-28

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COLUMN: VIEWPOINT

### Consumers vs. Citizens in Democracy's Public Sphere

Attempting to balance the challenging trade-offs between individual rights and our obligations to one another.

*Allison Stanger*

Pages 29-31

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Call For a Wake  
Standard for

### Artificial Intelligence

Suggesting a Voice Name System (VNS) to talk to any object in the world.

*Brian Subirana*

Pages 32-35

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SECTION: PRACTICE

### The Best Place to Build a Subway

Building projects despite (and because of) existing complex systems.

*Pat Helland*

Pages 36-39

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Demystifying  
Stablecoins

Cryptography meets monetary policy.

*Jeremy Clark, Didem Demirag, Seyedehmahsa Moosavi*

Pages 40-46

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SECTION: CONTRIBUTED

## ARTICLES

### Domain-Specific Hardware Accelerators

DSAs gain efficiency from specialization and performance from parallelism.

*William J. Dally, Yatish Turakhia, Song Han*

Pages 48-57

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The Data Science  
Life Cycle: A

### Disciplined Approach to Advancing Data Science as a Science

A cycle that traces ways to define the landscape of data science.

*Victoria Stodden*

Pages 58-66

## **Training Deep Neural Networks**

Google's TPU supercomputers train deep neural networks 50x faster than general-purpose supercomputers running a high-performance computing benchmark.

*Norman P. Jouppi, Doe Hyun Yoon, George Kurian, Sheng Li, Nishant Patil, James Laudon, Cliff Young, David Patterson*  
Pages 67-78

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**SECTION: REVIEW**

### **ARTICLES**

## **Some Simple Economics of the Blockchain**

Blockchain technology can shape innovation and competition in digital platforms, but under what conditions?

*Christian Catalini, Joshua S. Gans*  
Pages 80-90

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**SECTION: RESEARCH**

### **HIGHLIGHTS**

## **Technical Perspective: Why 'Correct' Computers Can Leak Your Information**

"Spectre Attacks: Exploiting Speculative Execution," by Paul Kocher, *et al.*, reviews how speculative execution and caches can be exploited, presents specific exploits using speculative branches that are direct and indirect, and ...

*Mark D. Hill*  
Page 92

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**Spectre Attacks:  
Exploiting**

## **Speculative Execution**

This paper describes practical attacks that combine methodology from side-channel attacks, fault attacks, and return-oriented programming that can read arbitrary memory from the victim's process.

*Paul Kocher, Jann Horn, Anders Fogh, Daniel Genkin, Daniel Gruss, Werner Haas, Mike Hamburg, Moritz Lipp, Stefan Mangard, Thomas Prescher, Michael Schwarz, Yuval Yarom*  
Pages 93-101

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**Technical  
Perspective: ASIC**

## **Clouds: Specializing the Datacenter**

Can we build purpose-built, warehouse-scale datacenters customized for large-scale arrays of ASIC accelerators or, to use a term coined in the paper by Michael Bedford Taylor, *et al.*, ASIC clouds?

*Parthasarathy Ranganathan*  
Page 102

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**ASIC Clouds:  
Specializing the**

## **Datacenter for Planet-Scale Applications**

This paper distills lessons from Bitcoin ASIC Clouds and applies them to other large scale workloads, showing superior TCO (total cost of ownership) versus CPU and GPU.

*Michael Bedford Taylor, Luis Vega, Moein Khazraee, Ikuo Magaki, Scott Davidson, Dustin Richmond*  
Pages 103-109

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**COLUMN: LAST BYTE**

## **Strategic Padding**

Choosing how to best navigate turbulent current events.

*Dennis Shasha*  
Pages 112-ff