

# Table of Contents

## DEPARTMENTS

[Cerf's up](#)

[Departments](#)

[BLOG @ CACM](#)

## SECTIONS

[China region](#)

[China Region Special](#)

[Section: Hot Topics](#)

[China Region Special](#)

[Section: Big Trends](#)

[Practice](#)

[Contributed articles](#)

[Review articles](#)

[Research highlights](#)

## COLUMNS

[News](#)

[Legally speaking](#)

[Inside risks](#)

[Education](#)

[Viewpoint](#)

[Last byte](#)

### DEPARTMENT: CERF'S UP

## The Upper Layers of the Internet

The Internet Protocol layer does not know or care what it carries in its payloads except that they are made up of binary bits. Above the application layer, however, the meaning of the content becomes important.

*Vinton G. Cerf*

Page 5

### DEPARTMENT: DEPARTMENTS

## Self-Reference and Section 230

The explosive growth of social-media platforms has led to the proliferation of "bad" speech on social-media platforms, which has become politically untenable.

*Moshe Y. Vardi*

Page 7

### DEPARTMENT: BLOG@CACM

## The Gap in CS, Mulling Irrational Exuberance

Carl Hewitt suggests computer science needs a reference resource, while Vijay Kumar decries intellectual dishonesty in technology forecasting.

*Carl Hewitt, Vijay Kumar*

Pages 8-9

### COLUMN: NEWS

## AI, Explain Yourself

It is increasingly important to understand how artificial intelligence comes to a decision.

*Don Monroe*

Pages 11-13

## A New Movement in Seismology

Unused telecom fiber might be used to detect earthquakes, uncover other secrets in the soil.

*Neil Savage*

Pages 14-15

## Weighing the Impact of GDPR

The EU data regulation will affect computer, Internet, and technology usage within and outside the EU; how it will play out remains to be seen.

*Samuel Greengard*

Pages 16-18

### COLUMN: LEGALLY SPEAKING

## The EU's Controversial Digital Single Market Directive

Should copyright enforcement have precedence over the interests of users in information privacy and fundamental freedoms?

*Pamela Samuelson*

Pages 20-23

### COLUMN: INSIDE RISKS

## The Big Picture

A systems-oriented view of trustworthiness.

*Steven M. Bellovin, Peter G. Neumann*

Pages 24-26

### COLUMN: EDUCATION

## How Machine Learning Impacts the Undergraduate Computing Curriculum

### SIGN IN for Full Access

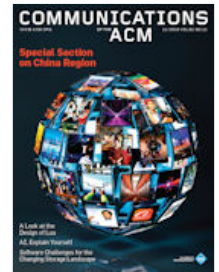
User Name

Password

» [Forgot Password?](#)

» [Create an ACM Web Account](#)

[SIGN IN](#)



[Previous Issue](#) [Next Issue](#)

[View the Digital Library](#)

[View the Digital Edition](#)

[Download a PDF of this issue](#)

### ABOUT COMMUNICATIONS

[Editorial Board](#)

[Editorial Staff](#)

[Author Center](#)

[Editorial Calendar](#)

### COMMUNICATE!

[Send us Feedback](#)

[Submit a Letter to the Editor](#)

[Contact the Publisher](#)

[Contact the Editor-in-Chief](#)

The growing importance of machine learning creates challenging questions for computing education.

*R. Benjamin Shapiro, Rebecca Fiebrink, Peter Norvig*  
Pages 27-29

#### COLUMN: VIEWPOINT

### Using Any Surface to Realize a New Paradigm for Wireless Communications

Programmable wireless environments use unique customizable software processes rather than traditional rigid channel models.

*C. Liaskos, A. Tsioliariidou, A. Pitsillides, S. Ioannidis, I. Akyildiz*  
Pages 30-33

### Crude and Rude?

Old ways in the new oil business.

*Janne Lahtiranta, Sami Hyrynsalmi*  
Pages 34-35

#### SECTION: CHINA REGION

### Introducing *Communications'* Regional Special Sections

I am pleased to introduce the first regional special section of *Communications*, which we hope will become a feature that you anticipate and enjoy, and of course value for the insights and perspectives it presents!

*Andrew A. Chien*  
Pages 36-37

#### SECTION: CHINA REGION SPECIAL SECTION: HOT TOPICS

### Welcome to the China Region Special Section

We are pleased to present the China Region special section.

*Wenguang Chen, Xiang-Yang Li*  
Page 38

### China's Computing Ambitions

China plans to become the world's high-tech leader, and quickly.

*Elliott Zaagman*  
Pages 40-41

### Quantum Communication at 7,600km and Beyond

There are two major challenges to achieving secure quantum cryptography over long distances.

*Chao-Yang Lu, Cheng-Zhi Peng, Jian-Wei Pan*  
Pages 42-43

### The Future of Artificial Intelligence in China

In addition to government-supported academic research, China's technical giants, such as Baidu, Alibaba, Tencent, and Huawei, are actively investing in AI research and related development.

*Jun Zhu, Tiejun Huang, Wenguang Chen, Wen Gao*  
Pages 44-45

### Consumers, Corporations, and Government: Computing in China

Unique historical, socioeconomic, and political conditions have created a distinctive path for China's rapid integration of computing and technology into its economy and society.

*Peter Guy*  
Pages 46-47

### Regional Computing Culture and Personalities

Despite China's massive market and bountiful opportunities for computing careers, Chinese corporations face great obstacles in attracting high-tech talent.

*San Zhang*  
Pages 48-49

### Can China Lead the Development of Data Trading and Sharing Markets?

A survey of China's data trading and sharing markets.

*Xiang-Yang Li, Jianwei Qian, Xiaoyang Wang*  
Pages 50-51

## Exploiting Psychology and Social Behavior for Game Stickiness

Interactive video games, which support various forms of collaboration and confrontation among gamers, create an obsessive stickiness.

*Luyi Xu*

Pages 52-53

### SECTION: CHINA REGION SPECIAL SECTION: BIG TRENDS

## People Logistics in Smart Cities

Governments have been searching for new technologies to make cities in China more efficient, and smart mobility has been the top priority in all solutions.

*Wanli Min, Liang Yu, Lei Yu, Shubo He*

Pages 54-59

## Cloud Bursting for the World's Largest Consumer Market

The development and popularization of cloud computing, especially in emerging domains, brings great convenience and also poses new challenges.

*Hai Jin, Haibo Chen, Hong Gao, Xiang-Yang Li, Song Wu*

Pages 60-64

## Fintech: AI Powers Financial Services to Improve People's Lives

Financial technology, or fintech, is a fast-evolving field that has reshaped the financial industry.

*Yuan Qi, Jing Xiao*

Pages 65-69

## Is Last-Mile Delivery a 'Killer App' for Self-Driving Vehicles?

There are two dimensions of challenge to an efficient autonomous delivery vehicle solution.

*Huaxia Xia, Haiming Yang*

Pages 70-75

## Video Consumption, Social Networking, and Influence

China's online video industry has as many similarities as differences with the U.S.

*Yue Zhuge*

Pages 76-81

## Will Supercomputers Be Super-Data and Super-AI Machines?

New challenges in architecture, system software, and application technologies must be addressed to help develop next-generation exascale supercomputing systems.

*Yutong Lu, Depei Qian, Haohuan Fu, Wenguang Chen*

Pages 82-87

### SECTION: PRACTICE

## Corp to Cloud: Google's Virtual Desktops

How Google moved its virtual desktops to the cloud.

*Matt Fata, Philippe-Joseph Arida, Patrick Hahn, Betsy Beyer*

Pages 88-94

## Research for Practice: Knowledge Base Construction in the Machine-Learning Era

Three critical design points: Joint learning, weak supervision, and new representations.

*Alex Ratner, Chris Ré, Peter Bailis*

Pages 95-97

## Tracking and Controlling Microservice Dependencies

Dependency management is a crucial part of system and software design.

*Silvia Esparrachiarri Ghirelli, Tanya Reilly, Ashleigh Rentz*

Pages 98-104

### SECTION: CONTRIBUTED ARTICLES

## Skill Discovery in Virtual Assistants

Skill recommendations must be provided when users need them most, without being obtrusive or distracting.

*Ryen W. White*

Pages 106-113

## A Look at the Design of Lua

Simplicity, small size, portability, and embeddability set Lua apart from other scripting languages.

*Roberto Ierusalimsky, Luiz Henrique De Figueiredo, Waldemar Celes*  
Pages 114-123

## **Modern Debugging: The Art of Finding a Needle in a Haystack**

Systematic use of proven debugging approaches and tools lets programmers address even apparently intractable bugs.

*Diomidis Spinellis*  
Pages 124-134

### **SECTION: REVIEW ARTICLES**

## **Software Challenges for the Changing Storage Landscape**

Conventional storage software stacks are unable to meet the needs of high-performance Storage-Class Memory technology. It is time to rethink 50-year-old architectures.

*Daniel Waddington, Jim Harris*  
Pages 136-145

### **SECTION: RESEARCH HIGHLIGHTS**

## **Technical Perspective: Backdoor Engineering**

"Where Did I Leave My Keys?" by Checkoway *et al.* reports on the amazing independent reconstruction of a backdoor, discovered in the firmware of a VPN router commonly used to secure access to corporate intranets.

*Markus G. Kuhn*  
Page 147

## **Where Did I Leave My Keys?: Lessons from the Juniper Dual EC Incident**

In this paper, we describe the results of a full independent analysis of the ScreenOS randomness and VPN key establishment protocol subsystems, which we carried out in response to the Juniper Dual Elliptic Curve incident.

*Stephen Checkoway, Jacob Maskiewicz, Christina Garman, Joshua Fried, Shaanan Cohney, Matthew Green, Nadia Heninger, Ralf-Philipp Weinmann, Eric Rescorla, Hovav Shacham*  
Pages 148-155

## **Technical Perspective: Making Sleep Tracking More User Friendly**

"LIBS: A Bioelectrical Sensing System from Human Ears for Staging Whole-Night Sleep Study" provides a nice balance in terms of minimizing the burden on users and the granularity at which we can automatically track various measures ...

*Tanzeem Choudhury*  
Page 156

## **LIBS: A Bioelectrical Sensing System from Human Ears for Staging Whole-Night Sleep Study**

We explore a new form of wearable systems, called LIBS, that can continuously record biosignals such as brain wave, eye movements, and facial muscle contractions, with high sensitivity and reliability.

*Anh Nguyen, Raghda Alqurashi, Zohreh Raghebi, Farnoush Banaei-Kashani, Ann C. Halbower, Tam Vu*  
Pages 157-165

### **COLUMN: LAST BYTE**

## **Between the Abbey and the Edge of Time**

A photo marks my place, then and now

*Brian Clegg*  
Pages 176-ff