



ELSEWHERE IN THE CS

Computer Highlights Society Magazines

The IEEE Computer Society's lineup of 12 peer-reviewed technical magazines covers cutting-edge topics ranging from software design and computer graphics to Internet computing and security, from scientific applications and machine intelligence to visualization and microchip design. Here are highlights from recent issues.

computing in SCIENCE & ENGINEERING

Performant, Portable, and Productive Parallel Programming With Standard Languages

The perfect solution to the P3 (performance, portability, productivity) problem is a single version of an application that gives high performance across a wide range of target systems and is easy to develop and maintain. Actual solutions give up some level of performance, portability, or productivity, or all three. In this article from the September/October 2021 issue of *Computing in Science & Engineering*, the authors review three periods in the past 65 years when the P3 problem had good solutions. But it is harder today, with greater parallelism. The authors propose a machine model to help programmers design algorithms and data structures that will exhibit performance portability.

IEEE Annals of the History of Computing

Tymshare's Changes to the Project Genie SDS-940 Operating System: A Historical Review

The University of California's Project Genie was a DARPA-sponsored project to create an interactive

programming environment. The SDS-930 was a relatively inexpensive machine with a maximum of 32 K of physical memory. To create a time-sharing machine from the base SDS-930 architecture, Pirtle and Lichtenberger extended the '930 architecture to include protection and memory mapping. Deutsch and Lampson implemented an operating system for the modified '930. Ultimately, SDS decided to market the Berkeley modifications to the '930 and denoted it the '940. They sold the machine to a new company called Tymshare. Tymshare heavily modified the Berkeley operating system over more than five years. Read more in this article from the July–September 2021 issue of *IEEE Annals of the History of Computing*.

IEEE Computer Graphics AND APPLICATIONS

Interactive Visualization of Hyperspectral Images Based on Neural Networks

It is challenging to interpret hyperspectral images in an intuitive and meaningful way, as they usually contain hundreds of dimensions. The authors of this article from the September/October 2021 issue of *IEEE Computer Graphics and Applications* develop a visualization tool for hyperspectral images based on neural networks, which allows a user to specify the regions of interest, select bands of interest, and obtain hyperspectral classification results in a scatterplot generated from hyperspectral features. A cascade neural network is trained to generate a scatterplot that matches the cluster centers labeled by the user. The inferred scatterplot not only shows the clusters of points but also reveals relationships of substances. The trained neural network can be reused for time-varying hyperspectral data analysis without retraining.

IEEE Intelligent Systems

FedRec: Federated Recommendation With Explicit Feedback

Recommendation models have been widely embedded in various online services, most of which are designed with the assumption that users' original behaviors are available in a central server. This may violate user privacy. This article from the September/October 2021 issue of *IEEE Intelligent Systems* follows a recent work called federated collaborative filtering for item recommendation with implicit feedback. The authors propose a novel and generic federated recommendation framework for rating prediction with explicit feedback. Specifically, they federate some basic and advanced factorization-based recommendation models both in batch style and in stochastic style.

IEEE Internet Computing

Revisiting the Arguments for Edge Computing Research

This article from the September/October 2021 issue of *IEEE Internet Computing* argues that low latency, high bandwidth, device proliferation, sustainable digital infrastructure, and data privacy and sovereignty continue to motivate the need for edge computing research even though its initial concepts were formulated more than a decade ago.

IEEE micro

Universal Graph-Based Scheduling for Quantum Systems

High-fidelity operation of a quantum system requires precise tuning of control parameters. Calibration of a quantum system is often achieved by running complex series of dependent experiments, and a full system calibration can require tens of calibration experiments to complete. Optimal control parameters drift over time, and components of experimental quantum systems are susceptible to failure. Hence, continuous operation of a quantum system requires automated background processes such as frequent recalibration and monitoring. In this article from the September/October 2021 issue of *IEEE Micro*, the authors present a scheduling tool kit that schedules experiments based on a directed acyclic graph using a configurable traversal algorithm. The scheduler can be triggered from any process, enabling universal feedback between the scheduler and the quantum control system.

IEEE MultiMedia

From Semantic to Spatial Awareness: Vehicle Reidentification With Multiple Attention Mechanisms

The rapid development and popularization of video surveillance highlight the critical and challenging problem of vehicle reidentification, which suffers from the limited interinstance discrepancy between different vehicle identities and large intrainstance differences of the same vehicle. In this article from the July–September 2021 issue of *IEEE MultiMedia*, the authors propose a novel multilevel attention network to hierarchically learn an efficient feature embedding for vehicle re-ID. Three kinds of attention are designed in the network: hard local-level attention to localize vehicle salient parts, soft pixel-level attention to refine attended pixels both globally and locally, and spatial attention to enhance the encoder's spatial awareness of salient regions within the windscreen area.

IEEE pervasive COMPUTING

Sensing Social Behavior With Smart Trousers

Nonverbal signals play an important role in social interaction. Body orientation, posture, hand movements, and leg movements all contribute to successful communication, though research has typically focused on cues transmitted from the torso alone. The authors of this article from the July–September 2021 issue of *IEEE Pervasive Computing* explore lower body movements and address two issues: the empirical question of what social signals they provide and the technical question of how these movements could be sensed unintrusively and in situations where traditional methods prove challenging. The authors propose a soft, wearable sensing system for clothing. Bespoke “smart” trousers with embedded textile pressure sensors are designed and deployed in seated, multiparty conversations.

IEEE SECURITY & PRIVACY

Parental Controls: Safer Internet Solutions or New Pitfalls?

Parental-control solutions often require dangerous privileges to function. This article from the November/December 2021 issue of *IEEE Security & Privacy* analyzes privacy

and security risks of popular solutions and finds that many leak personal information and are vulnerable to attacks, betraying the trust of parents and children.


IEEE Software

Data-Driven Technical Debt Management: Software Engineering or Data Science Challenge?

In this article from the November/December 2021 issue of *IEEE Software*, the authors summarize experience with data-driven technical debt management that they gained through several industry research projects. They report challenges and their consequences, propose solutions, and sketch improvement directions.

IT Professional

Data Anonymization for Maintenance Knowledge Sharing

Formerly considered part of general enterprise costs, industrial maintenance has become critical for business continuity and a real source of data. Despite the heavy investments made by companies in smart manufacturing, traditional maintenance practices still dominate the industrial landscape. Maintenance knowledge sharing between industries can significantly optimize maintenance activity and improve process efficiency. Different international standards and initiatives are promoting such an approach. However, this trend failed to gain ground in the manufacturing industry. In this article from the September/October 2021 issue of *IT Professional*, the authors present the results of an investigation about the real roadblocks that obstruct the progress of the maintenance knowledge-sharing approach. 

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