DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)1

TechWorld 2025:
Big Data, Computer Science and Information Technologies

Conference Proceeding

August 26, 2025 - Virtual

Prolegomena to Information Technology: Higher Degree Capstone Units

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This paper is not about Information Technology (IT) *per* se, but *per accidens* in the special features of the teaching of IT higher degree "capstone" units and the supervision of doctoral candidates. Usually, the students are very intelligent and very well prepared in their *Bachelor* degrees, but IT is developing at such a pace that probably no graduate curriculum anywhere is ever completely up-to-date at any instant in time. This paper outlines one approach to the problem through a series of ten "prolegomena", each one of which consists of a central issue and eight related IT topics. The aim of each prolegomenon is not to teach and learn a new topic so much as to sensitise the students to those IT topics which are not covered in their coursework at a particular university. This is an attempt to avoid the not uncommon phenomenon of university graduates who do not know what they do not know! The process is also a limited introduction to managing continuing professional development during their future working careers. The students in these capstone units are placed in groups of four where they learn the essentials of teamwork, since they will be working in teams when they graduate. The capstone unit focuses on an industry-level project which can be elaborated in a minor thesis over two semesters. The projects come from industry colleagues in the USA and Europe. Naturally the prolegomena here are institution-related since they are trying to touch on the gaps within the syllabus of a particular institution. Interested readers will have to modify them to fit the context in their own institutional environment. Other features of capstone units include assisting the students to acquire those general employability skills related to their institution's graduate attributes; these are to help them in handling interviews both for their initial employment and later promotion opportunities.

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)2

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Conference Proceeding

August 26, 2025 - Virtual

Identity Security Platform Overview Integrating MFA (Multi-Factor Authentication) And SSO (Single Sign On)

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CyberArk Identity Security Platform provides a one-shop integration of multiple features layering different functionalities allowing for consumers to access different avenues from a single user-friendly, look-a-like interface. The platform is allowing for building a secure environment where the tool learns and adapts limiting access to resources functioning with zero trust. The underlying pieces of the platform are its ability to connect to multiple directory services, allow for validating identity by using multi-factor authentication, manage a complete identity life cycle and incorporate Single sign-on.

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)3

TechWorld 2025:
Big Data, Computer Science and Information Technologies

Conference Proceeding

August 26, 2025 - Virtual

Large Data, Little Victories: How Data-Driven Understandings Can Help Small Businesses make Better Decisions

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This thorough cross-sectional study reveals important insights into the complex links between Data Driven Insight (DDI), Decision Making Process (DMP), Resource Allocation (RA), and Business Outcome (BO). It was carried out by watching 150 organizations during the influential year of 2024. The results highlight the critical role of the Decision-Making Process and reveal a statistically significant positive correlation between DDI and BO, as well as a minor positive correlation between the two. Interestingly, the study finds that effective resource allocation is another important component that has a moderately positive correlation with business results. The measurement instrument's robustness is confirmed by the reliability statistics, which gives confidence to the collected data. Moreover, the ANOVA regression results highlight the substantial role that the interaction between DDI, DMP, and RA plays in explaining the variance in BO. These significant realizations stress the vital role that sound decision-making and wise resource management play in determining a company's success. In the changing world of 2024 and beyond, researchers and practitioners may devise strategies and make well-informed decisions that improve overall organizational performance, thanks to the actionable knowledge they possess.

Keywords: Data Driven Insights, Decision Making Process, Resources Allocation and Businesses Outcomes

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)4

World First: Browse the 3D Web without Limits, Protected and Invisible by Patented Design. Access Knowledge, Consume Securely, Whatever the Sector or State of Your Data

Herve Heully

Founder & CEO, New3S (New Spatial & Secure Solutions), France

In five years', time, the web will be a 3D universe where we'll navigate like drones, exploring digital territories, manipulating objects and ideas with immersive tactile interfaces. 3D tutorials and 3D printers will enable us to fix almost anything, while collaborative work will replace Taylorization. This freedom of discovery will become addictive and viral.

Over 80% of the world will have access to ultra-fast Internet, browsing digital twins of cities, objects, molecules or organs, exploring everything from hardware to health, leisure to safety, right up to the limits of intellectual property. Everything will be accessible, fun and educational, with no apparent risk.

But danger lurks: a simple incident (data theft, substitution of a virtual component) could lead to the production of defective, weakened or even dangerous objects, unknowingly integrated into the consumer chain. Traceability will become blurred, and these "modified" objects will represent a real threat.

The whole world will become accustomed to "touching" virtually everything, comparing details and testing before buying. Companies that don't respect 3D web standards will disappear, wiped off the map in a matter of months.

This reality is no longer fiction: the era of the three-dimensional web is about to take hold, mixing the real and the fake, security and pitfalls. We need to anticipate the risks if we are to take full advantage of this revolution, where innovation rubs shoulders with counterfeiting, and where the invisible becomes an asset. Anticipating the worst to experience the best: that's the challenge of this fascinating new era.

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)5

Optimizing Deep Learning Models for Hardware Efficiency on Edge Platforms

Kaiqi Zhao

Tenure-track assistant professor in the Computer Science and Engineering Department at Oakland University, Michigan, USA

Dr. Kaiqi Zhao is a tenure-track Assistant Professor in the Department of Computer Science and Engineering at Oakland University, Michigan, where she has been serving since August 2024. She is the founder and director of the Efficient AI Lab, which focuses on designing scalable, high-performance, and hardware-efficient machine learning models to enable intelligent computing on edge devices.

Dr. Zhao earned her Ph.D. from the School of Computing and Augmented Intelligence at Arizona State University under the mentorship of Prof. Ming Zhao. Her research centers on model compression and efficient deep learning, with the goal of advancing the automation and deployment of compact, high-performing AI models for real-world applications.

Her work bridges both fundamental research and practical impact. As the first author, she has published in top-tier AI and edge computing venues such as AISTATS, ICASSP (Oral), Interspeech (Oral), and ACM/IEEE SEC (Best Poster Award). She has also co-authored papers in leading systems and edge computing conferences, including IEEE ICDCS, USENIX HotEdge, and USENIX OpML. Notably, her research on Knowledge Distillation via Module Replacing for Automatic Speech Recognition has been integrated into the Amazon Alexa library for production use.

Dr. Zhao is a dedicated contributor to the research community. She currently serves as a reviewer for the U.S. National Science Foundation (NSF, 2025) and as a Program Committee (PC) member for AAAI (2023–2025). She was also the Ph.D. Forum Chair for ACM/IEEE SEC in 2021. In addition, she regularly reviews for premier AI conferences including NeurIPS, ICML, ICLR, AAAI, AISTATS, ICASSP, and Interspeech (2022–2025), and top-tier journals such as the IEEE Internet of Things Journal (IF: 11.1), IEEE Transactions on Neural Networks and Learning Systems (IF: 10.2), IEEE Transactions on Circuits and Systems for Video Technology (IF: 8.3), and IEEE Transactions on Intelligent Vehicles (IF: 8.2).

Dr. Zhao's research is driven by a passion for building intelligent systems that are not only powerful but also efficient and deployable—paving the way for next-generation AI solutions on edge platforms.

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)6

Resource-Aware Serverless Computing: Leveraging Stateless Paradigms for Cost-Optimized Cloud Applications

Amine Barrak

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Resource-Aware Serverless Computing: Leveraging Stateless Paradigms for Cost-Optimized Cloud Applications. As cloud adoption continues to grow, so does the need for cost-effective and scalable application design. This talk explores how stateless paradigms, including serverless computing, stateless databases, and event-driven architectures, are being increasingly adopted to address performance, scalability, and cost challenges in modern cloud environments.

We discuss how resource-aware design helps match application components to the appropriate compute, memory, and bandwidth resources. The focus is on stateless application design, which avoids persistent state within compute components, enabling seamless scaling and distributed execution.

While stateless services offer many advantages, they also introduce challenges such as cold starts, repeated dependency uploads, and limited runtime control. To address these issues, we explore several optimization strategies, including code refactoring, reducing unnecessary complexity, and batch processing to minimize invocation overhead. We also examine how to orchestrate services efficiently in stateless environments using workflows and state coordination.

The talk concludes with a case study on distributed machine learning training using serverless computing, illustrating how stateless, resource-aware strategies can significantly reduce infrastructure costs while maintaining performance.

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)7

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Conference Proceeding

August 26, 2025 - Virtual

From Principles to Processes: Implementing responsible AI across national Borders

Ina Schöne

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In an era in which artificial intelligence is fundamentally transforming business models, government, and society, we need clear, universally applicable guidelines. This speech outlines why international standards are more than just technical regulations: They build trust, ensure competitiveness, and enable cross-border cooperation in risk management, transparency, and liability. Established standards (ISO/IEC, OECD Principles, EU AI Act, NIST Guidelines) show us how we can align AI data processing with fundamental ethical values to make AI safe, fair, and sustainable. Adaptable governance models, auditability, human-centered AI design principles, and the building of multilateral coalitions are central to responsibly channeling innovation drivers. Ethics in AI is not a matter of ideology, but of operational implementation. How can the principles of responsible AI (fairness, transparency, safety, accountability) be transformed into concrete, measurable processes that work across diverse legal and cultural contexts? Risk-based regulation, auditability, human-centered design, grievance mechanisms, supply chain commitments, and certifiable compliance programs are key building blocks. Key messages Why international standards are essential, especially when AI processes data in security-relevant environments (cybersecurity, infrastructure, border protection)? Why AI-specific standardization is necessary and how it increases trust and resilience in security- critical ecosystems? How international standards facilitate cross-border collaboration, risk management, and compliance – building trust and enabling cross-border collaboration? What key standards exist (ISO/IEC, OECD Principles, EU AI Act, NIST) and what added value they offer for security policy, industry, and research. What action policymakers, businesses, and civil society should take promptly? In a globally connected world, AI ethics determine not only morality, but also economic sovereignty and social trust. International standards are not an obstacle, but rather the common toolbox that makes innovations safe and fair. Participants will learn why we have universally understandable yet flexibly adaptable layers of norms that guide regulation, business, and society toward a common ethical compass, transcending national egoism and technological fragmentation. Practical solutions provide inputs for implementation, as a lack of AI ethics is linked to liability issues

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)8

TechWorld 2025:
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Conference Proceeding

August 26, 2025 - Virtual

AI for Financial Wellness – Moving from Debt Recovery to Empowerment

Tenny Enoch Devadas C

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AI-Powered Financial Recovery: A New Era of Empowered Living As personal debt reaches unprecedented levels, traditional relief efforts often fail to effectively engage those most at risk. This work presents an AI-powered framework that leverages behavioural analytics, public financial data, and social media sentiment to proactively identify individuals in financial distress. By integrating classification models, NLP, and recommendation engines with real-time data pipelines, the system delivers personalized, ethical interventions that improve outreach and promote long-term financial wellness.

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)9

The Convergence of AI and Supply Chain Resilience: Current Practices and Future Paradigms

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The integration of artificial intelligence (AI) into supply chain management signifies a transformative shift in business approaches to forecasting, planning, and operational efficiency. As organizations strive to enhance their competitive advantage and adapt to increasingly complex global markets, AI technologies present promising solutions to longstanding challenges within the supply chain domain.

During this session we examine the potential impact of AI on supply chain management, with a particular emphasis on its applications in demand forecasting, inventory optimization, and adaptive decision-making processes. By leveraging machine learning algorithms and advanced data analytics, companies are positioned to achieve unprecedented levels of accuracy in predicting market trends and consumer behavior.

Moreover, the implementation of AI-driven systems is anticipated to significantly enhance inventory management, reducing waste and optimizing stock levels across the supply chain network. As these technologies continue to evolve, the prospect of autonomous decision-making systems capable of rapid adaptation to market disruptions and changes presents an exciting frontier for supply chain resilience and agility.

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)10

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August 26, 2025 - Virtual

Towards Tunable Advantages of Quantum-Like Teams. Interdependent Teams Counter the Disadvantages of Gen-AI

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We provide a mathematical overview to enable any agentic system of "intelligent" machines, artificial intelligence (AI) and humans to interact in roles forming the structure interdependently performing team tasks. Our quantum-like model, maybe the only mathematical model of interdependence, captures the tradeoffs by a team's choices as it expends its available energy on structure versus performance, forming an uncertainty (entropy) relationship. We address the support for our quantum-like model of uncertainty relations, the goals in this research, and the future for our research: 1. Redundancy reduces interdependence. With this finding, we confirm the existence of interdependence in all systems with teams. 2. Teams with orthogonal roles are best. This second finding is the root cause of humans, including scientists, not appreciating the role of interdependence in "squeezing" information states in teams. 3. Cognitive reports seldom equal behavior. The last finding solidifies our research, and explains why social scientists are absent from contributing to the mathematics of team science. In this talk, we review the need of a mathematics for team operations, the literature, the quantum-like mathematics in our model of agents, our hypothesis that freely organized teams enjoy significant advantages over command decision making (CDM) systems, and field results. We close with future plans and a generalization about squeezing states to control interdependent systems.

Keywords: Symmetry, Quantum-Like Uncertainty Relationships, Team Mechanics, Control of Interdependence, Cognition and Behavior, "Squeezed" Information in Teams

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)11

A Deep Dive into Real-Time Data Streaming and Scalable Architectures

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The Power of Real-Time Data Streaming in Modern Architectures

In today's hyperconnected world, businesses demand instant insights to drive decisions, optimize operations, and enhance customer experiences. Real-time data streaming has emerged as the backbone of this transformation, enabling organizations to process and analyze data as it happens—eliminating latency and unlocking unprecedented agility.

This session dives deep into the tools, patterns, and challenges of building scalable real-time systems. We'll explore:

- Why batch processing is no longer enough in an era of IoT, financial trading, and personalized user interactions
- Architecting with Apache Kafka & Flink to handle millions of events/sec with fault tolerance
- Proven use cases from pricing engines to fraud detection, where streaming delivers 3–10x performance gains
- Avoiding the pitfalls of state management, out-of-order events, and resource bottlenecks

Attendees will leave with actionable strategies to modernize legacy pipelines, reduce cloud costs, and harness streaming data as a competitive weapon. Whether you're building event-driven microservices or AI-powered analytics, this talk will reshape how you think about data in motion.

(Ideal for: Architects, Data Engineers, and Tech Leaders ready to future-proof their systems.)

Key Highlights:

- Cutting-Edge Focus: Beyond basics—covers modern challenges like stream-table duality and serverless streaming
- Battle-Tested Examples: Draws from real-world implementations in finance, e-commerce, and cloud platforms
- Vendor-Neutral Insights: Principles apply across Kafka, Pulsar, AWS Kinesis, and other platforms

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)12

AI-Powered Zero Downtime: Intelligent Approaches to Always-On Systems

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In an era where user expectations demand 24/7 availability, zero downtime is no longer optional — it's essential. This talk explores how AI and intelligent automation are transforming the way we design, monitor, and operate highly available systems. We'll cover traditional zero-downtime strategies like blue-green deployments, canary releases, and feature flagging — then take it a step further by introducing AI-driven enhancements. From predictive failure detection using machine learning models, to adaptive traffic routing during live deployments, to AI-based observability for root cause analysis — modern systems are becoming smarter, not just more stable. You'll learn how AI can proactively identify risks, optimize resource utilization, and even automate rollback or scaling decisions in real-time. By blending tried-and-tested DevOps practices with intelligent decision-making, organizations can achieve a new level of resilience, performance, and user trust. This session is ideal for engineers, architects, and tech leaders who want to future-proof their infrastructure and move beyond manual, reactive operations. Join us to discover how AI is accelerating the path to true zero downtime — turning it from an operational challenge into a strategic advantage.

DOI: doi.org/10.47363/JMCA/TechWorld2025/2025(4)13

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Conference Proceeding

August 26, 2025 - Virtual

Driving Digital Transformation through Intelligent ERP: A Perspective on SAP S/4HANA, AI, and Supply Chain Innovation

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Digital transformation has become imperative for businesses aiming to remain competitive in a rapidly evolving technological landscape. Intelligent Enterprise Resource Planning (ERP) systems, particularly SAP S/4HANA integrated with artificial intelligence (AI), have emerged as pivotal tools enabling transformative efficiencies and innovation within supply chain operations. This paper explores SAP S/4HANA & #39s capabilities as an intelligent ERP, emphasizing its AI-driven functionalities such as predictive analytics, robotic process automation, and real-time decision-making. Through detailed analysis and real-world case studies, the research highlights the significant impact of integrating intelligent ERP on supply chain management, demonstrating measurable improvements in efficiency, responsiveness, and strategic decision-making. Finally, this study discusses implementation challenges and presents best practices to ensure successful adoption, concluding with insights into future trends shaping the intelligent ERP landscape.