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The Powerful Forces Driving the Digital Economy

How AI, Blockchain, Edge Computing and IoT will revolutionize business

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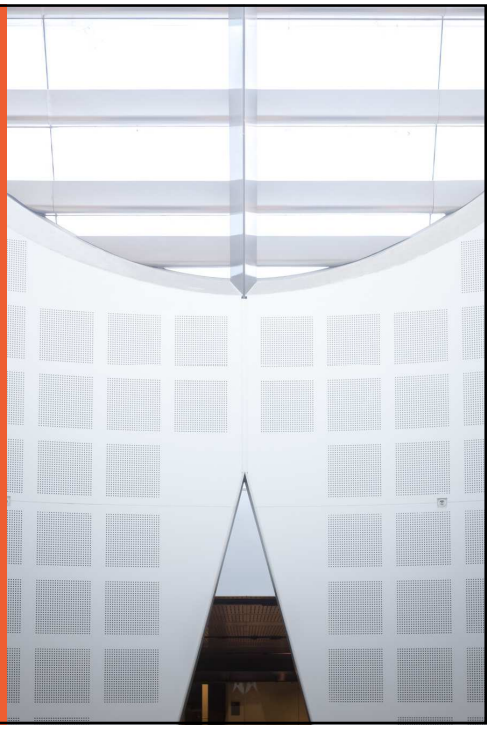
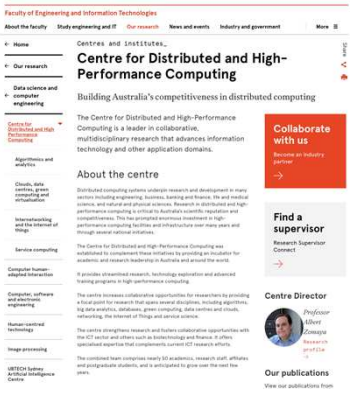


Centre for Distributed and High Performance Computing

- Centre Director – Professor Albert Zomaya
- 11 Researchers
- 20 Affiliates
- 30+ PhD and Masters Students
- Multiple Industry and Government partners



[1] Centre Website

Our Research




Algorithms and Analytics

Cloud computing and Virtualization

Internetworking and Internet of Things

Service Computing

Security

Our Research

Research article abstracts of last 5 years…

Digital Economy

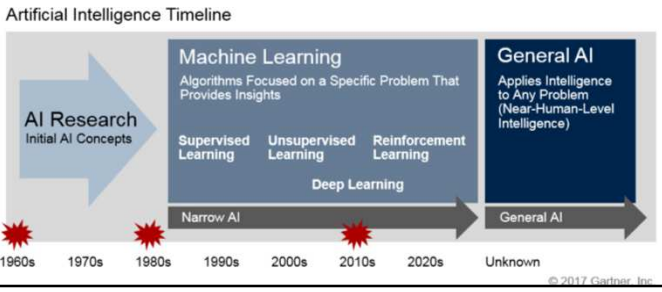
- **The transformational impact that ICT has on every single aspect of business cannot be denied, and it is a major contributor to national economies and wealth.**
- **R&D pattern in ICT industry has changed:**
  - 20% of R&D is about new technology,
  - 80% of R&D is about applying new technology
- **No single technique can dominate the field, it requires a new community of researchers with a user driven focus, creative thinking, and multidisciplinary approach.**

Artificial Intelligence (AI)

- **Today, AI enables systems to learn, adapt and potentially act autonomously for technology vendors.**
- **Use AI to enhance decision making, reinvent business models and ecosystems, and remake the customer experience will drive the payoff for digital initiatives through 2025 or even longer.**
- **The current AI is based on numerous technologies that have grown over many years, e.g. Bayes' theorem, gradient descent, decision trees, linear regression, artificial neural networks, etc.**

Artificial Intelligence (AI)

- **The success of AI is a result of:**
  - Advanced algorithms using supervised, unsupervised, ensemble, and reinforcement-learning techniques
  - The availability of massive amounts of data to feed machine learning
  - Hardware advances (GPU, TPU, HPC) delivering massive computing resources to process the huge amount of data and sophisticated algorithms
- **Today, AI is on the stage of "narrow AI", which is highly scoped machine-learning solutions that target a specific task.**



Practical AI

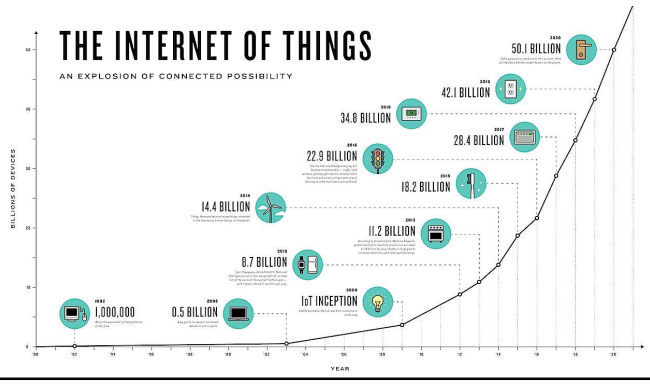
Ranking	Industry	High-potential use cases
1	Healthcare	• Supporting diagnosis by detecting variations in patient data • Early identification of potential pandemics • Imaging diagnostics
1	Automotive	• Autonomous fleets for ride sharing • Semi-autonomous features such as driver assist • Engine monitoring and predictive, autonomous maintenance
3	Financial services	• Personalized financial planning • Fraud detection and anti-money laundering • Automation of customer operations
4	Transportation and logistics	• Autonomous trucking and delivery • Traffic control and reduced congestion • Enhanced security
5	Technology, media, and telecommunications	• Media archiving, search, and recommendations • Customized content creation • Personalized marketing and advertising
6	Retail and consumer	• Personalized design and production • Anticipating customer demand • Inventory and delivery management
7	Energy	• Smart metering • More efficient grid operation and storage • Predictive infrastructure maintenance
8	Manufacturing	• Enhanced monitoring and auto-correction of processes • Supply chain and production optimization • On-demand production

Implications

- **Business problems will open the door to AI**
  - Leaders do not need to adopt AI for AI's sake. Instead, when they look for the best solution to a business need, AI will increasingly play a role.
- **New kinds of ROI (Return On Investment) measures are needed**
  - AI's most powerful benefits are often indirect, so organizations will want to explore other measures of ROI.

Internet of Things (IoT)

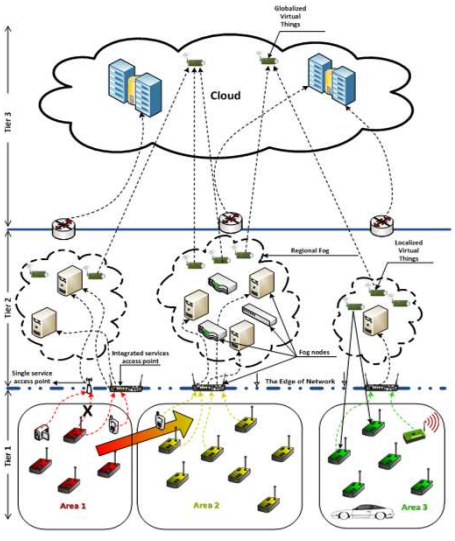
- **How to get the massive amounts of data need to feed AI (Cyber space)? How to "digitalize" business activities (Physical space)?**
- **IoT has become a technical enabler to establish the link in between the Cyber and Physical worlds.**



How AI can change IoT

- Increase data efficiency – selective sensing
- Save costs – decide what to do
- Compute on-the-fly – allows in-device computation (in-situ computation)
- Smart Things

Edge Computing

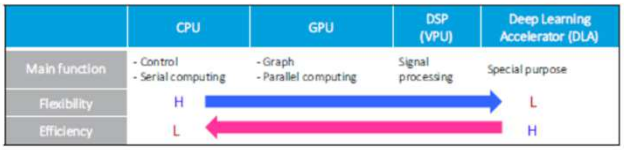


- Edge computing is a new distributed computing paradigm of processing data near the edge of network, where the data is being generated, instead of a centralized data-processing warehouse.
- Benefits
  - Increased data privacy in edge device applications
  - Energy consumption savings in edge devices
  - Location-aware data processing on edge devices

AI@Edge

- Edge AI opportunities

- Processors comparison for AI processing



- Challenges
  - AI working mode: inference@edge, training@cloud
  - Computational complexity and efficiency: lightweight and real-time

Blockchain

1. When computation (transistors) became cheap, PCs emerged;
2. When bandwidth became cheap, the Internet flourished;
3. When storage became cheap, Blockchain emerged.

The realization of Blockchain allows us to create a distributed, open to all (yet secure) way of recording important information. For the first time (at least on this scale), it is possible to issue and transfer assets in the virtual world by using the distributed ledger to record ownership and to establish continuity.

How AI can change Blockchain

- **Consensus mechanisms:** new consensus mechanisms
- **Scalability:** new data sharing techniques to make the system more efficient
- **Security and privacy:** guarantee a secure applications deployment for blockchain
- **Lack of talent:** to automate data science itself
- **Data gates:** all our data will be available on a blockchain and companies will be able to directly buy them from us!!!

Finally…

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AI + IoT + Edge Computing + Blockchain

1. IoT: sensing the world;
2. AI: thinking about the data;
3. Blockchain: committing transactions to memory (to remember);
4. Edge computing: a delivery model and a link to cloud computing and big data analytics

Thank You

Questions?

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