EDGE INTELLIGENCE IN 5G AND BEYOND

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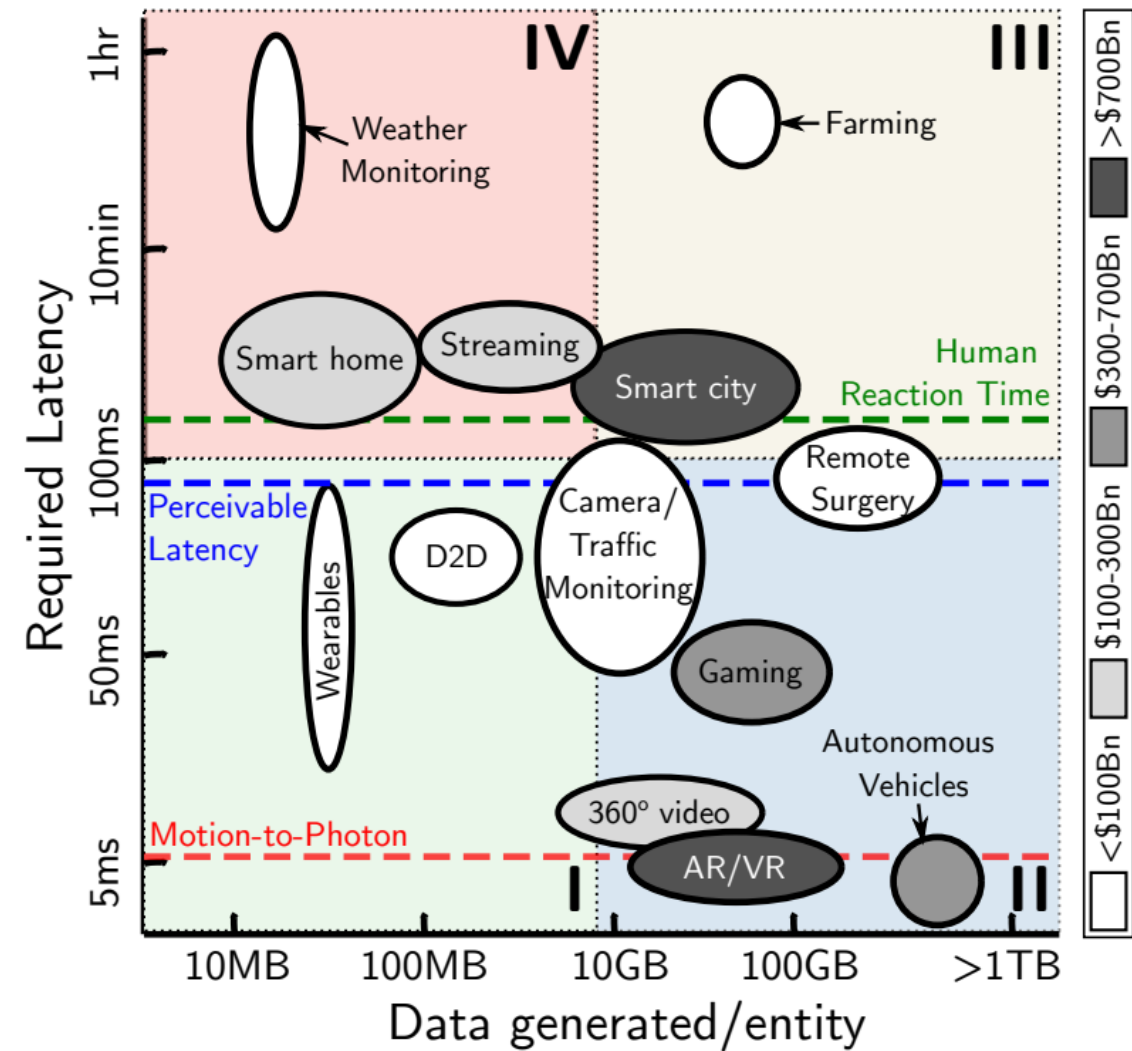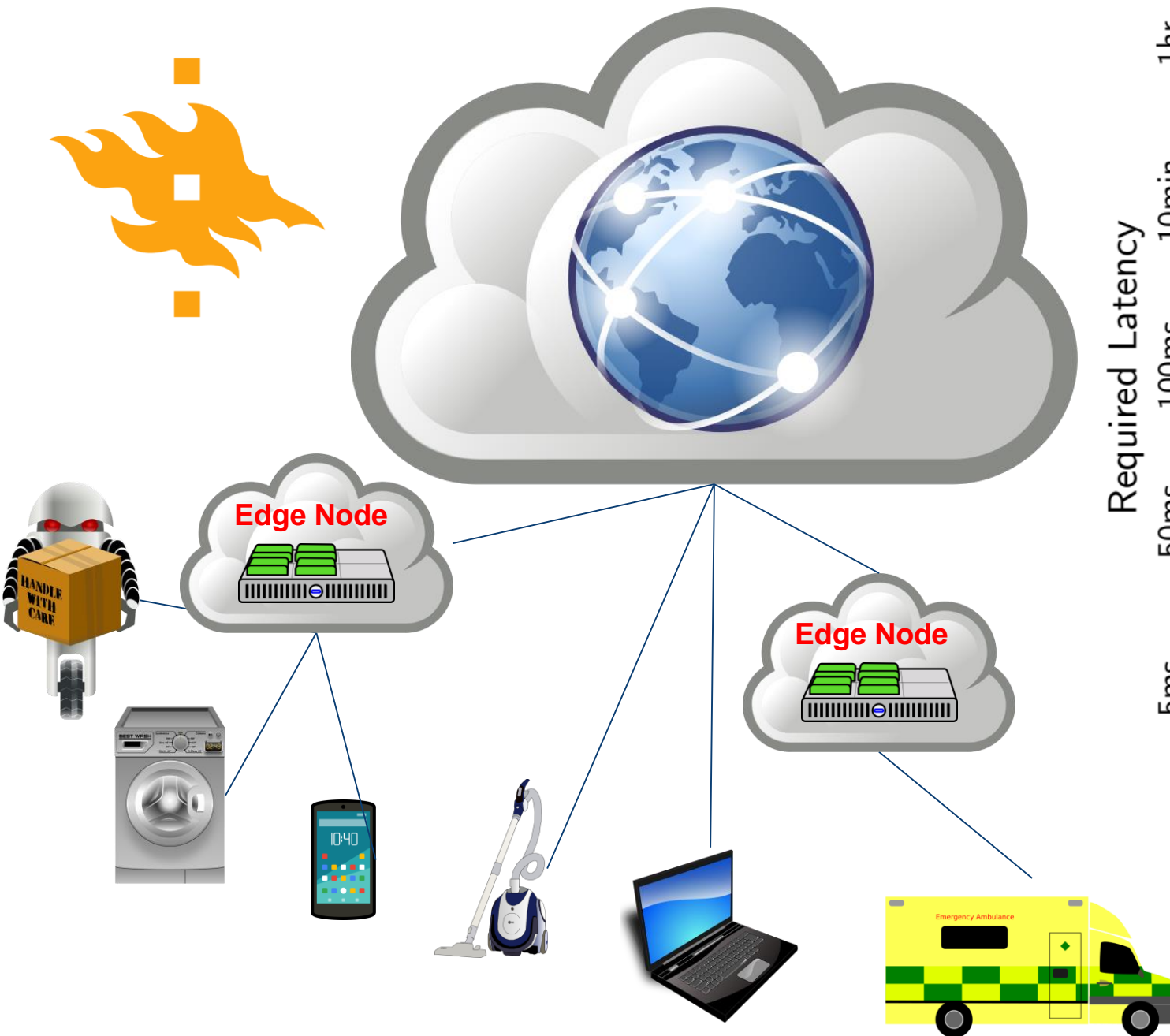| Brief Bio	
Masters	Indian Institute of Technology, Delhi, India
PhD	Inria, France
Docent	University of Helsinki

"Data and programs are being swept up from desktop PCs and corporate server rooms and installed in the compute cloud."
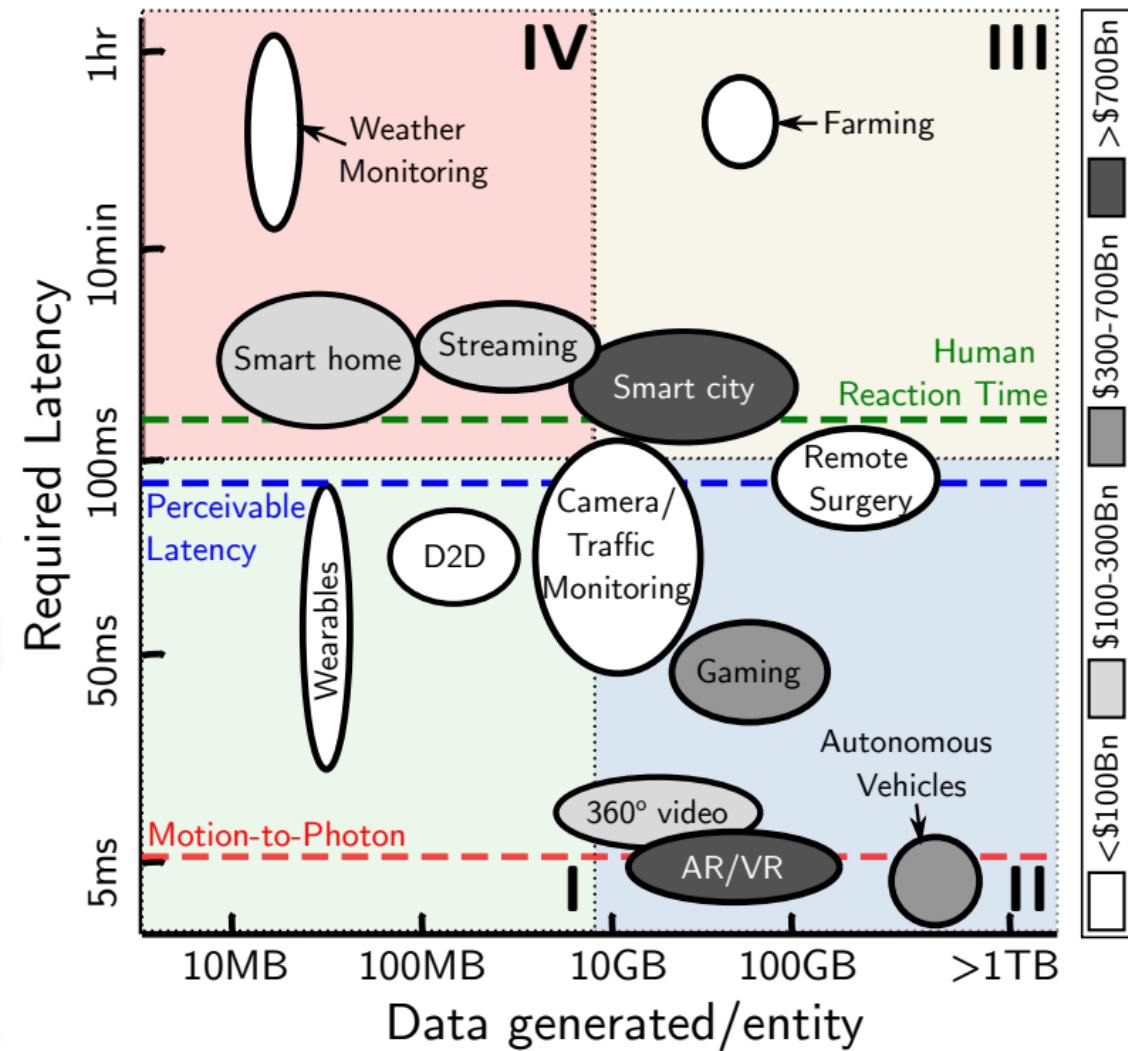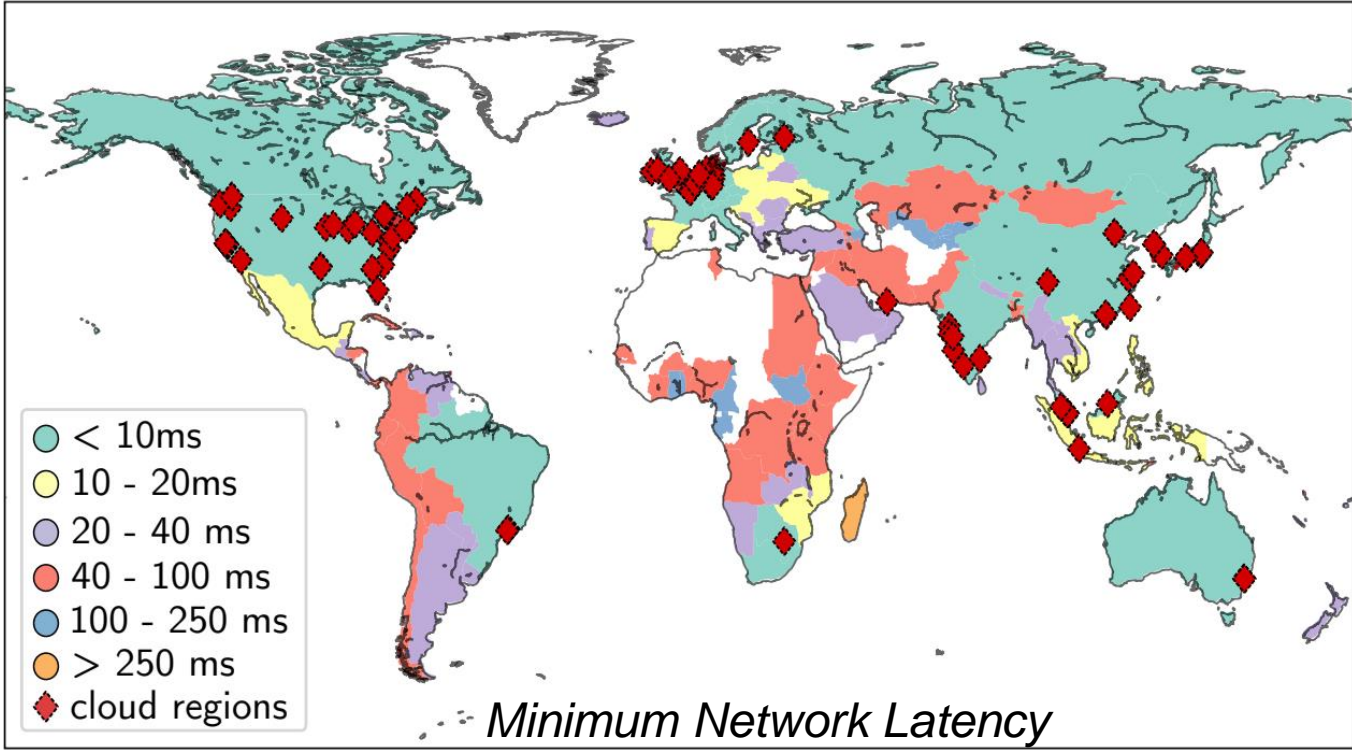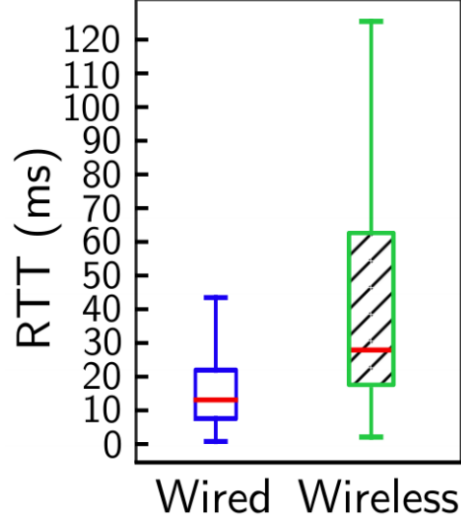
Brian Hayes. 2008. **Cloud computing**. Commun. ACM 51, 7 (July 2008)

"The concentration of computing resources into a few large data centres implicit in cloud computing would fundamentally limit its ability to sustain latency-sensitive and bandwidth-hungry applications that would emerge in the future."

Mahadev Satyanarayanan. **How we created edge computing**. Nature Electronics 2, 42 (2019).

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Images sourced from openclipart.org

Nitinder Mohan, Lorenzo Corneo, Aleksandr Zavodovski, Suzan Bayhan, Walter Wong, and Jussi Kangasharju. **Pruning Edge Research with Latency Shears.** In HotNets '20. DOI:https://doi.org/10.1145/3422604.3425943
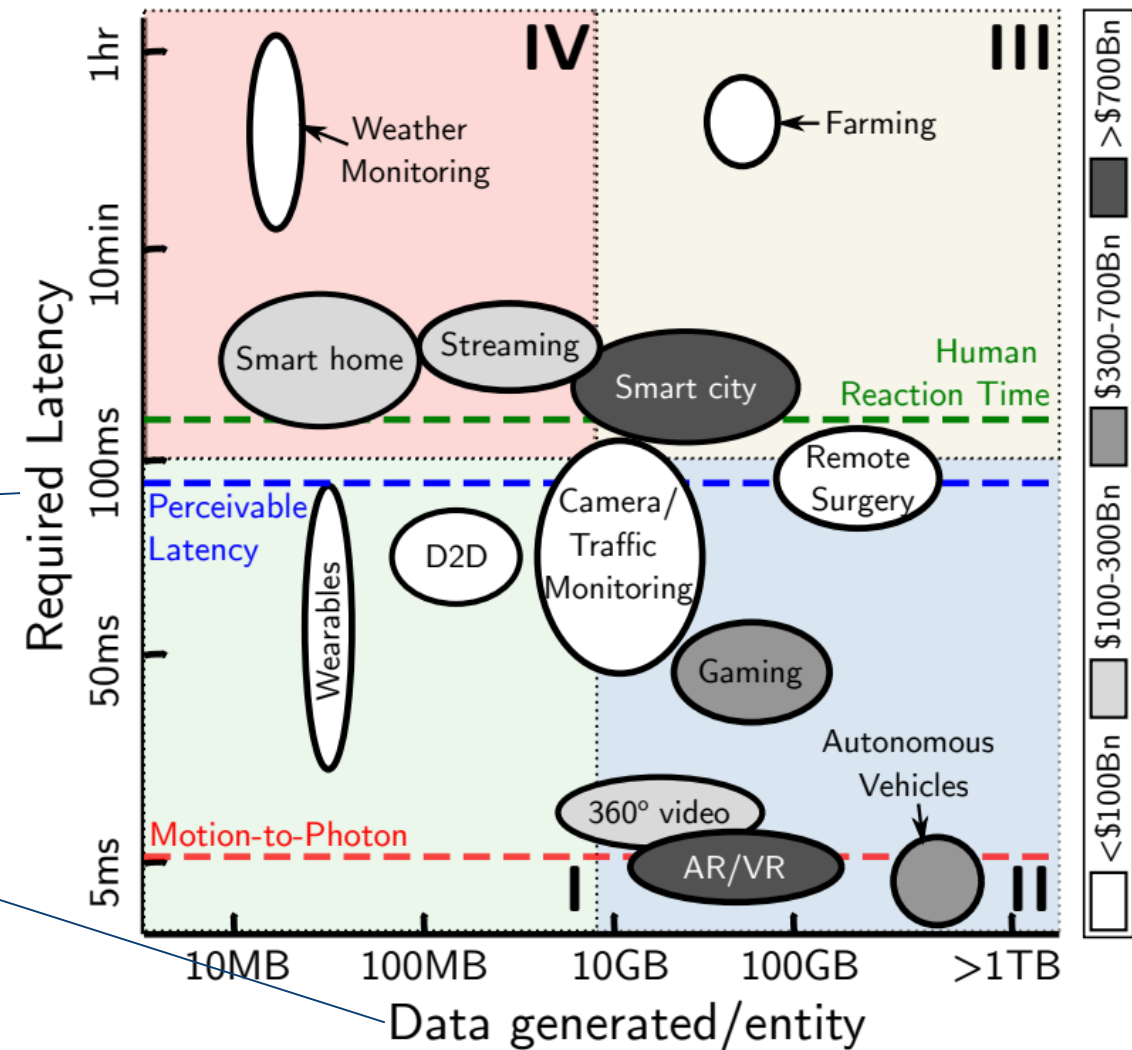
Minimum Network Latency

Nitinder Mohan, Lorenzo Corneo, Aleksandr Zavodovski, Suzan Bayhan, Walter Wong, and Jussi Kangasharju. **Pruning Edge Research with Latency Shears.** In HotNets '20. DOI:https://doi.org/10.1145/3422604.3425943

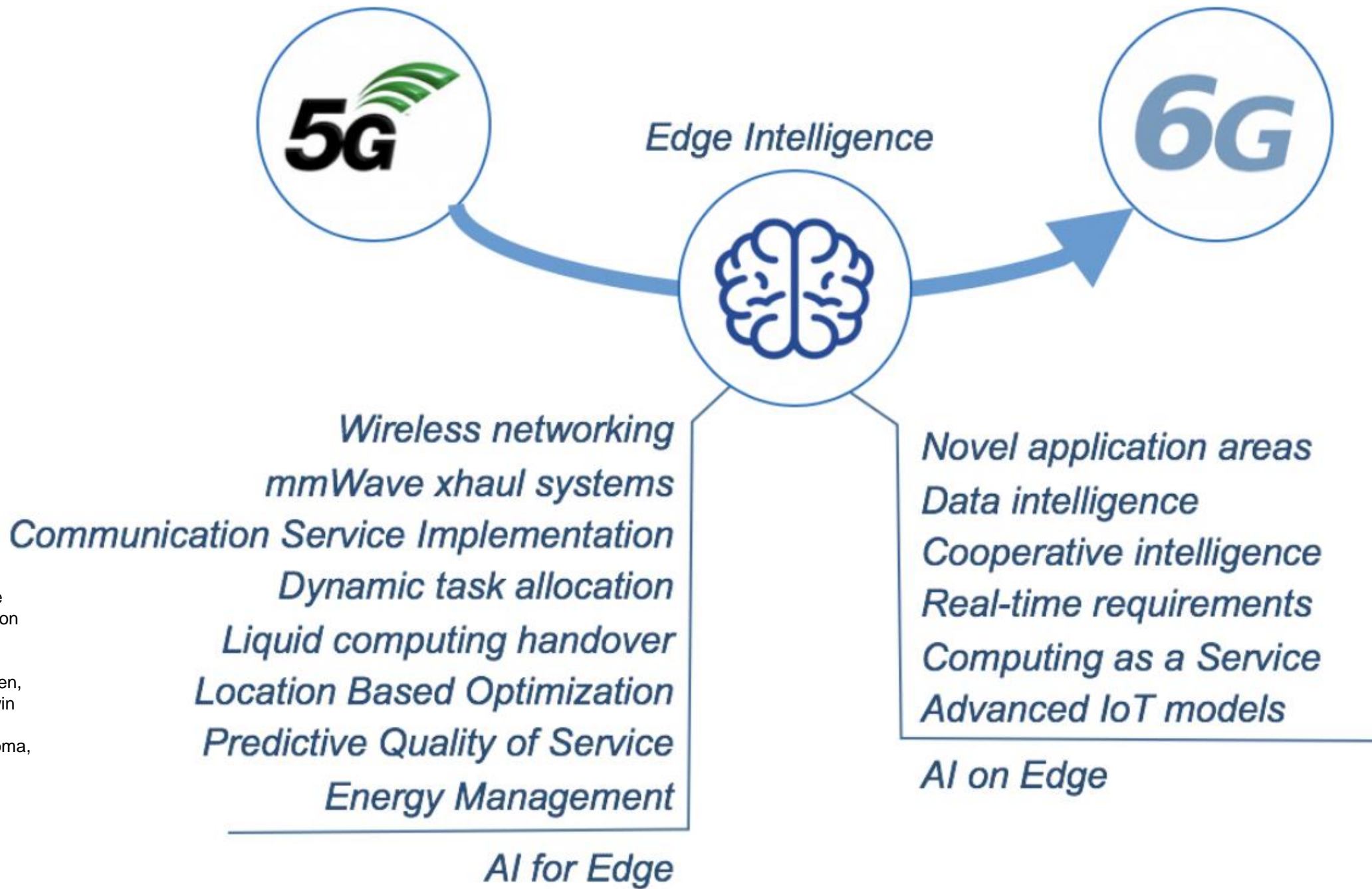**Required Latency = Network Latency + Processing Latency**

Use Case Requirements

- Latency

- Bandwidth

- Storage

• Reliability

• Security and Privacy

• Costs (and Pricing)

• Usability

• Application Lifecycle Management

• …

Edge Intelligence

Wireless networking
mmWave xhaul systems
Communication Service Implementation
Dynamic task allocation
Liquid computing handover
Location Based Optimization
Predictive Quality of Service
Energy Management

AI for Edge

Novel application areas
Data intelligence
Cooperative intelligence
Real-time requirements
Computing as a Service
Advanced IoT models

AI on Edge

Ella Peltonen, Mehdi Bennis, Michele Capobianco, Merouane Debbah, Aaron Ding, Felipe Gil-Castiñeira, Marko Jurmu, Teemu Karvonen, Markus Kelanti, Adrian Kliks, Teemu Leppänen, Lauri Lovén, Tommi Mikkonen, Ashwin Rao, Sumudu Samarakoon, Kari Seppänen, Paweł Sroka, Sasu Tarkoma, Tingting Yang. **6G White Paper on Edge Intelligence**
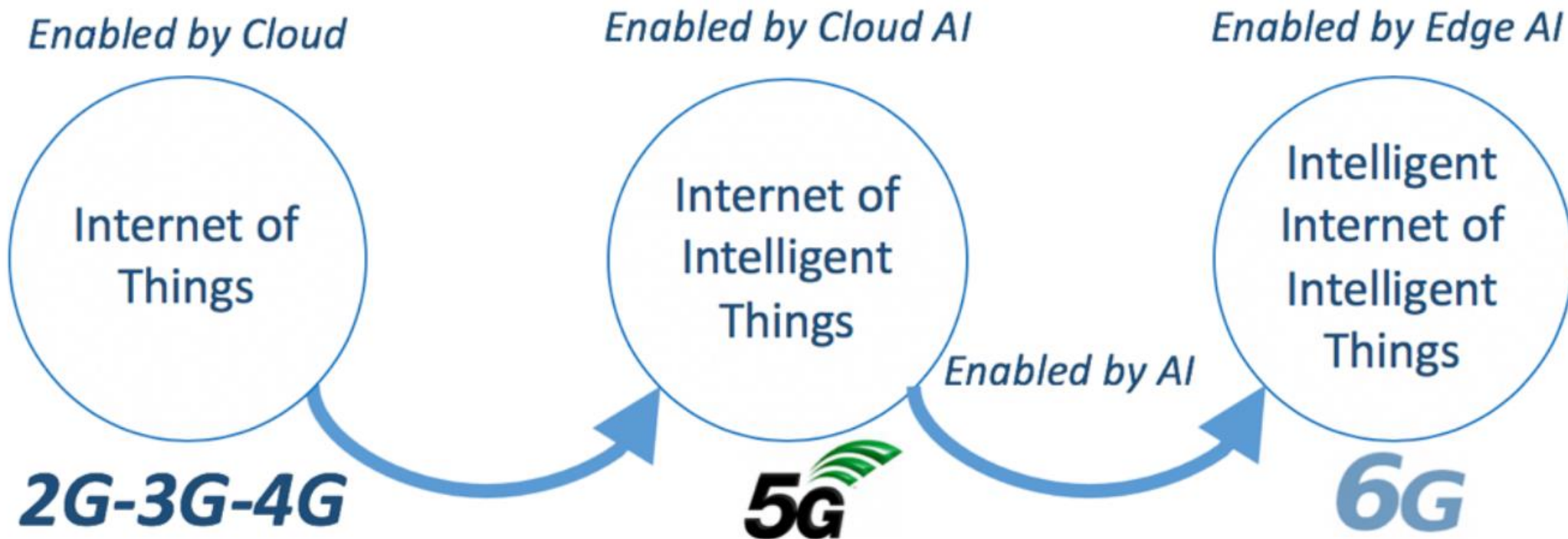
EDGE AI SIG

https://fcai.fi/edge-ai

- Aimed to harness the synergy between AI and Edge computing and improving the interaction between two flagships: **the 6G flagship, and the FCAI flagship.**

  - **Edge for AI –** Enable AI applications to harness resources placed at the network edge

  - **AI for Edge –** AI for tasks related to the lifecycle of edge computing.
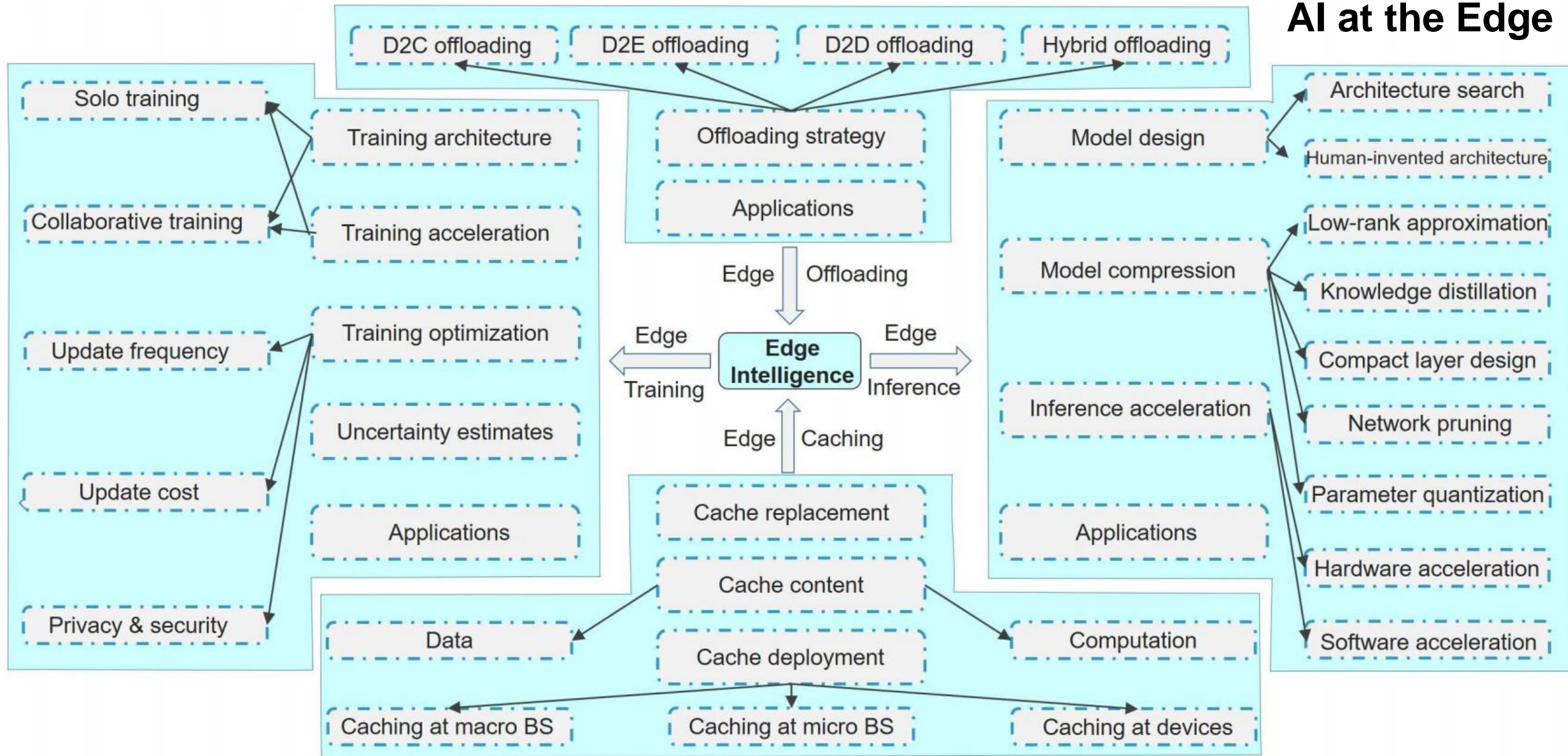
5G FORCE

https://5gtnf.fi/projects/5g-force/

- 5G-FORCE is a research project led by a team of 5G multidisciplinary experts that provide a platform including cutting edge technologies on 5G radio, networking, machine Learning and security to facilitate experiment of verticals.

Enabled by Cloud — 2G-3G-4G: Internet of Things

Enabled by Cloud AI — 5G: Internet of Intelligent Things

Enabled by AI / Enabled by Edge AI — 6G: Intelligent Internet of Intelligent Things

AI at the Edge

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Dianlei Xu, Tong Li, Yong Li, Xiang Su, Sasu Tarkoma, Tao Jiang, Jon Crowcroft, Pan Hui
Edge Intelligence: Architectures, Challenges, and Applications   Edge Intelligence in 5G and Beyond / Ashwin Rao   17/12/2020   9
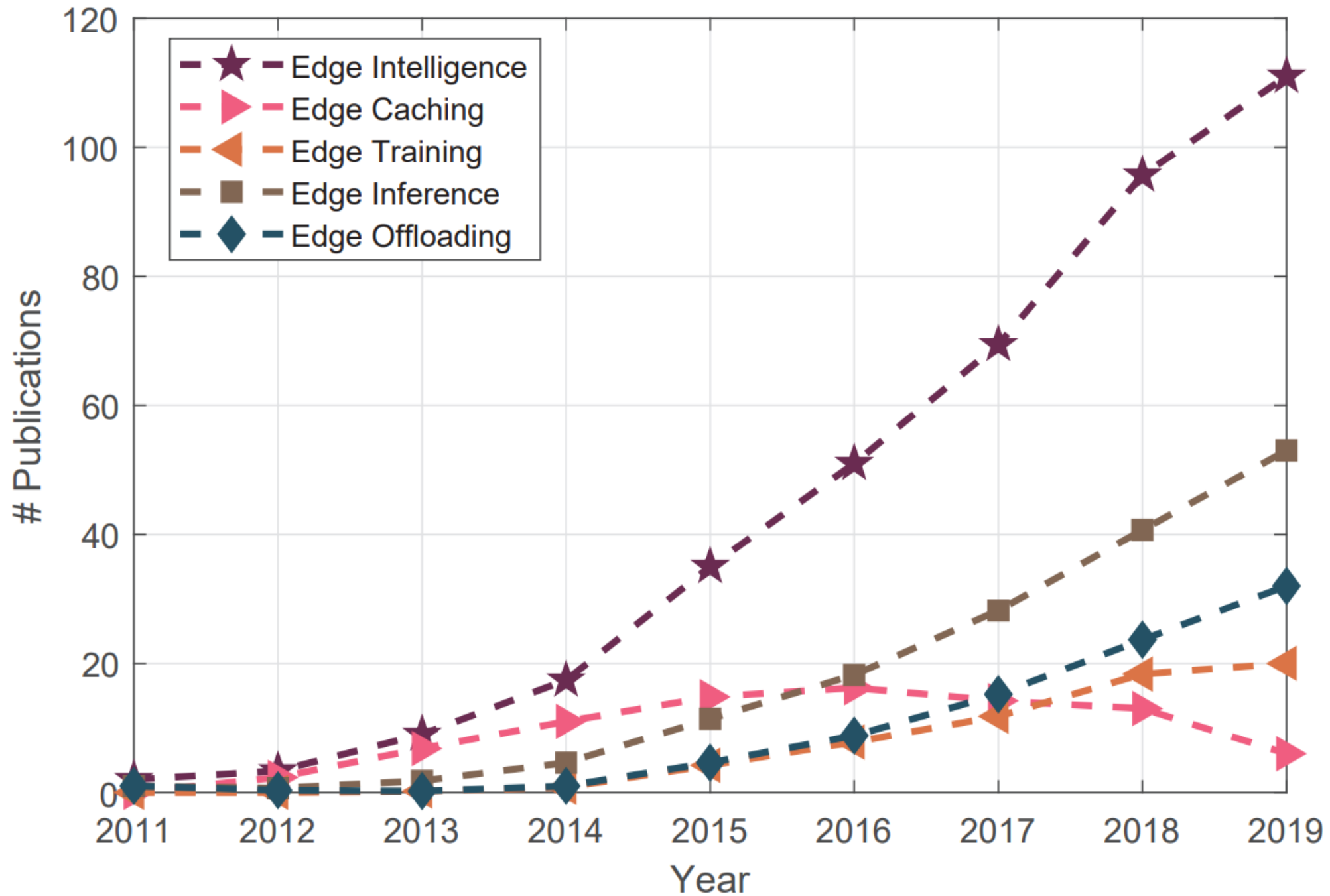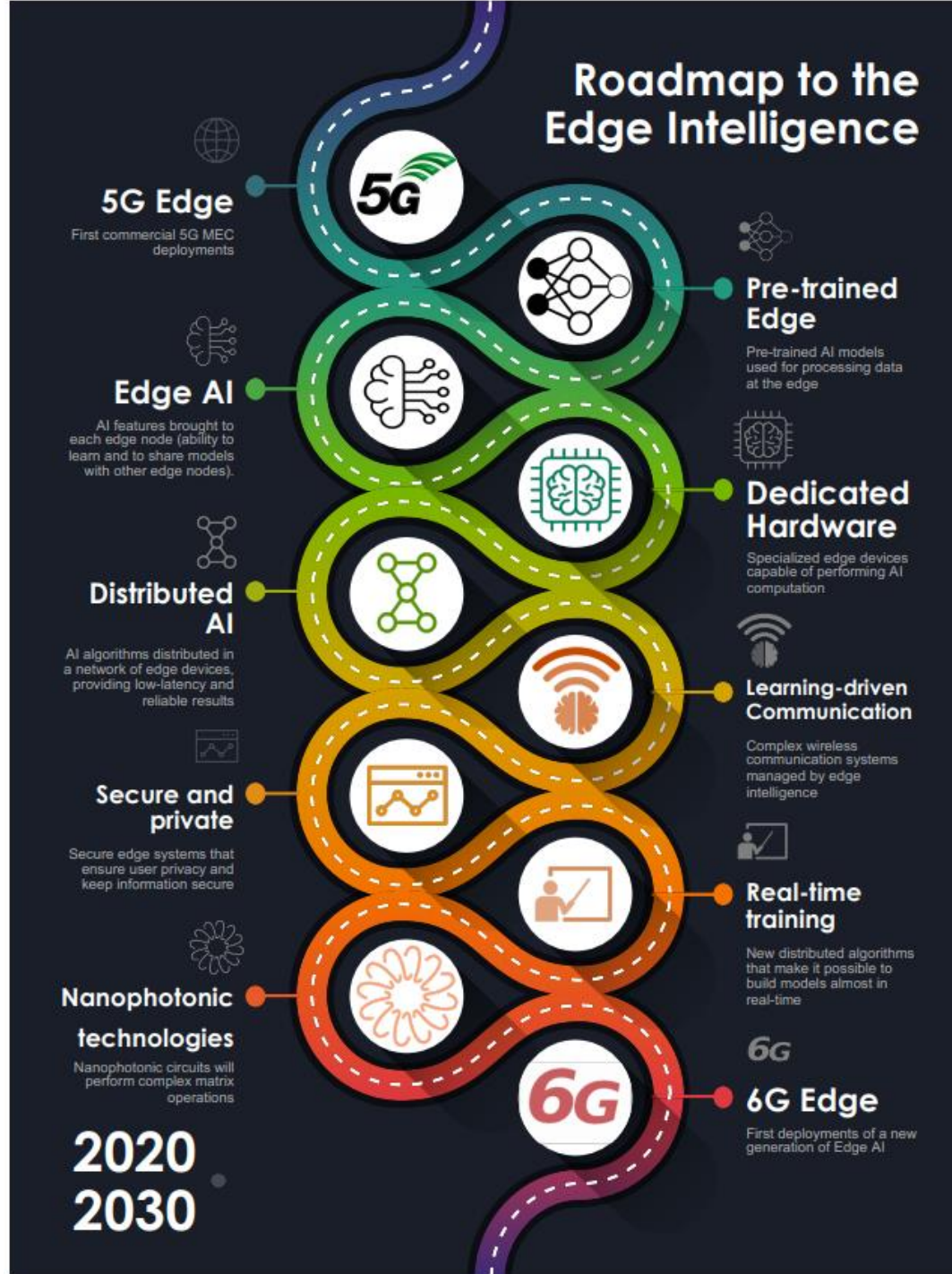
Dianlei Xu, Tong Li, Yong Li, Xiang Su, Sasu Tarkoma, Tao Jiang, Jon Crowcroft, Pan Hui **Edge Intelligence: Architectures, Challenges, and Applications**

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Ella Peltonen, Mehdi Bennis, Michele Capobianco, Merouane Debbah, Aaron Ding, Felipe Gil-Castiñeira, Marko Jurmu, Teemu Karvonen, Markus Kelanti, Adrian Kliks, Teemu Leppänen, Lauri Lovén, Tommi Mikkonen, Ashwin Rao, Sumudu Samarakoon, Kari Seppänen, Paweł Sroka, Sasu Tarkoma, Tingting Yang. **6G White Paper on Edge Intelligence**

"I don't see that human intelligence is something that humans can never understand." John McCarthy, March 1989

http://jmc.stanford.edu/

Food for Thought: Are you looking for AI or IA solutions?

- Intelligence Amplification (IA) – the use of information technology in augmenting human intelligence

- Artificial Intelligence (AI) – It is the science and engineering of making intelligent machines [http://jmc.stanford.edu/articles/whatisai.html]

THANK YOU

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