QUO VADIS - ARTIFICIAL INTELLIGENCE INTERNET OF THINGS, INTERNET OF BEHAVIORS AND NANO-GENERATORS: OPPORTUNITIES, CHALLENGES AND ETHICAL CONCERNS

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Abstract: The current landscape in the 21st century has become exceedingly complex and interconnected by resources, systems, and networks – both physical and virtual. Using cyber-physical systems (CPS), the Internet of Things (IoT) based devices form highly connected and adaptive environments through smart and intelligent systems and protocols to provide situational awareness. The use of Artificial Intelligence plays a pivotal role in augmenting the potential of the IoTs, now commonly termed as AIoT. Potential applications of AIoT are driving the growth and evolution of IoT, with significant impacts on consumers, the research community, the public sector, as well as commercial and industrial sectors. One of the constraints that limit such operations is the sources of energy to power such devices. Recent advances in next-generation triboelectric nanogenerators (TENG) along with the integration of finite-state machines (FSM) and built-in edge computing in onboard IoT devices have reduced the energy requirement, thus shifting the energy storage requirements to built-in power generation and ambient sources. It is essential to have the synergetic integration of exponential technologies to minimize energy storage and reduce energy consumption in commercial off-the-shelf (COTS) configurations. As the complexity and functionality of systems around us increase exponentially, combinatorial technologies in conjunction with artificial intelligence (AI), machine learning (ML), and data analytics (DA) are used as decision support tools to provide a comprehensive analysis and strategy to optimize usage[1,2]. The economic and societal potential of such systems is vastly greater than what has been realized, and major investments are being made worldwide to develop the technology, hence CPS, in conjunction with AI with IoT (AIoT) and the Internet of Behavior (IoB) will further expand the boundaries of smart and connected systems to provide numerous societal opportunities. Applications of AIoTs, IoB, and onboard energy harvesting devices also include tactile sensing, smart agriculture, and transportation logistics. Despite its tremendous beneficial applications, there are potential concerns about privacy, security, and exploitation for nefarious misinformation/disinformation purposes. A balanced *Quo Vadis* viewpoint will be presented.

Keywords: AIoT, IoB, TENG, CPS, FSM, COTS, Ethical concerns

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