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NEURAL ARCHITECTURE SEARCH FOR ROBUST NETWORKS IN 6G-ENABLED MASSIVE loT DOMAIN

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Abstract:

6G technology enables AI-based massive IoT to manage network resources and data with ultra-high speed, responsive network and wide coverage. However, many artificial intelligence-enabled internet of things (AIoT) systems are vulnerable to adversarial example attacks. Therefore, designing robust deep learning models that can be deployed on resource- constrained devices has become an important research topic in the field of 6G- enabled AIoT. In this paper, we propose a method for automatically searching for robust and efficient neural network structures for AIoT systems. By introducing a skip connection structure, a feature map with reduced front-end influence can be used for calculations during the classification process.

Keywords: 6G Technology, IOT, Intelligence enabled.

1. INTRODUCTION

Today's technological aspirations will represent tomorrows reality with technologies such as holographic telepresence, eHealth and wellness applications, pervasive connectivity in smart environments, industry 4.0 and massive robotics, massive unmanned mobility in three dimensions, augmented reality (AR) and virtual reality (VR) to name a few.

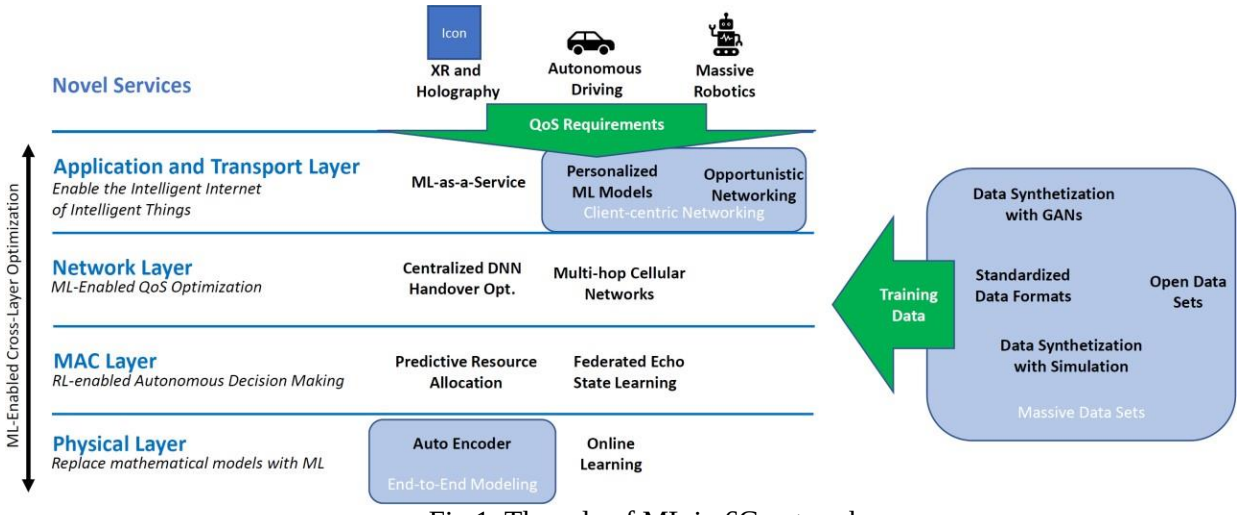

Fig.1. The role of ML in 6G networks

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Each of them is expected to require more e effective and wireless communications than ever before and 6G wireless Networks must provide broadband, near-instant, and reliable connectivity to enable frequencies and by using a large variety of technologies. Moreover, the evolution of technologies is towards more intelligent device in the internet of network in a static, simplistic and rigid manner. The same need will likely emerge for other traditional services such as phone calls or a video streaming, where the wireless communication network will no longer just provide a connection between two or more people, but will bring the need to properly authenticate both parties, guarantee the security of data and recognizing possible abnormal behaviors and events.

2. PROPOSED SYSTEM

5G wireless network is considered, a key enabler, for intelligent information society of 2020. Extensive efforts are being made by 3rd generation partnership project (3GPP) to encourage further development of 5G technologies. In the meantime, IEEE 8011ax standard for wireless local area network is being introduced It is anticipated that even after introduction of millimeter wave (mm-wave) and massive multi input multi output (MIMO) (with large scale arrays of antennas), 5G can maximum achieve 20 Gb/s transmission for end user. The latest applications such as internet of things (IoT), artificial intelligence (AI), cognition cycle (CC), IP multimedia subsystem (IMS), vehicular network and machine learning, will depict the next generation of cellular network, viz: 6G.

The concept of 6G will be the key enabler in order to achieve this blueprint. It is anticipated that 6G will be autonomous with intelligence and consciousness like human. Moreover, 6G technology will:

- Support ultra-high definition videos with extremely high throughput
- Allow highly low latency communications such as 10 μs, especially for industrial internet
- Support Nano technologies which include internet of nan-things, implantable Nano-sensors and Nano-devices with extremely high energy efficiency
- Support space and deep sea communications
- Enhance and support existing 5G key applications.

3. NEURAL ARCHITECTURE SEARCH

Developing neural network models often requires significant architecture engineering. You can sometimes get by with transfer learning, but if you really want the best possible performance it's usually best to design your own network. This requires specialized skills (read: *expensive* from a business standpoint) and is challenging in general; we may not even know the limits of the current state-of-the- art techniques! It's a lot of trial and error and the experimentation itself is time consuming and expensive. This is where NAS comes in. NAS is an algorithm that *searches* for the best *neural network architecture*. Most of the algorithms work in this following way. Start off by defining a set of "building blocks" that can possibly be used for our network. For example, the state-of-the-art NASNet paper proposes these commonly used blocks for an image recognition network.

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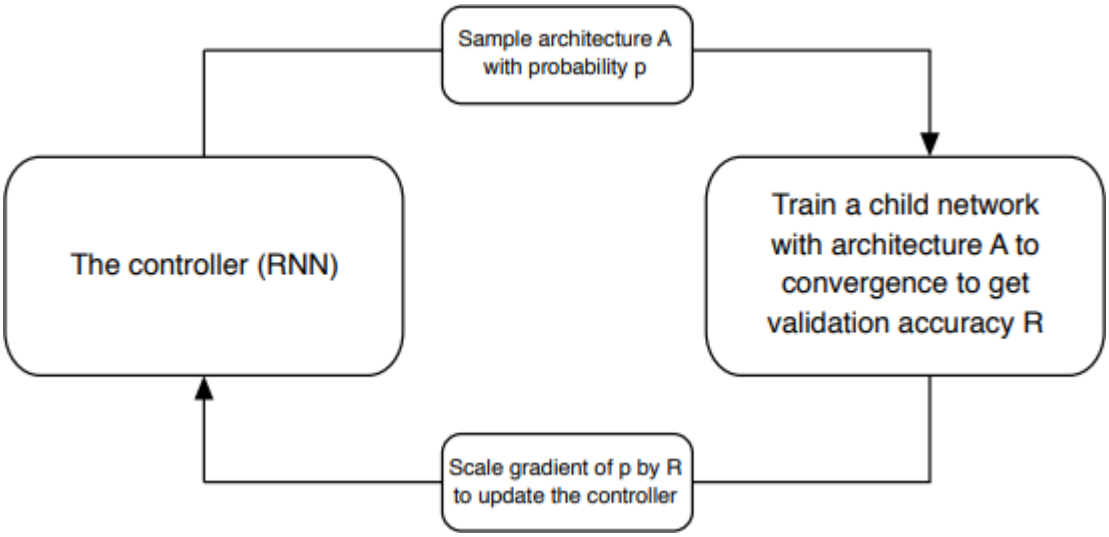

Fig.2. Overview of Neural Architecture Search

Part of the reason this algorithm succeeds and the paper demonstrates such great results is because of the constraints and assumptions made with it. The NAS discovered architecture is trained and tested on a much-smaller-than-real-world dataset. This is done because training on something large, like ImageNet would take a very long time. But, the idea is that a network that performs better on a smaller, yet similarly structured dataset should also perform better on a larger and more complex one, which has generally been true in the deep learning era. Cloud AutoML does have a steep price of $20 USD and unfortunately you can't export your model once it's trained; you'll have to use their API to run your network on the cloud. There are a few other alternatives that are completely free, but do require a tad bit more work.AutoKeras is a project that uses the ENAS algorithm. It can be installed using pip. Since it's written in Keras it's quite easy to control and play with, so you can even dive into the ENAS algorithm and try making some modifications. Overall there's several options to use AutoML today.

4. ANALYSIS

Given the massive capabilities of 5G cellular mobile wireless communications networks and their likely evolution, is there any tangible rationale for 6G networks? If yes, then, what are the missing units from LTE and 5G that 6G must integrate? Academicians, industries, and research communities have set out research modalities on the formulation, definition, design, and identification of important core-enabling technologies driving the initiation toward a "beyond 5G" or 6G system . This section will cover a large range of topics discussed in recently published works about the vision and key features of 6G communications. First, this section starts with a brief view of the expected applications that will be supported by 6G communications and which will lead to identifying the key features that are required in such communications. Accordingly, service providers harnessing THz waves are expected for communications in areas with many devices or large amounts of data. Especially with the increasing adoption of smart homes, buildings, cities, and societies, 6G will fulfill the need for human-to-machine and M2M communications that will arise, particularly with the development of robotic and self-directed, unmanned aerial vehicle systems. This technology is enshrined in the concept of the Internet of Everything (IoE). One can

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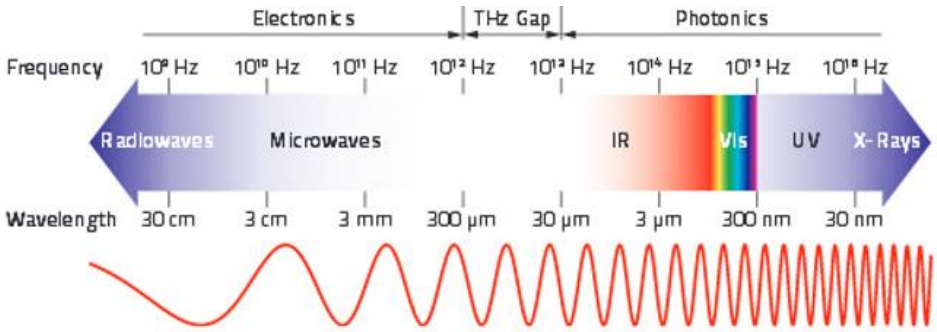

Frequency (THz)	Wavelength (µm)	Propagation mechanism	Attenuation effects	Supported link distances (m)	Approximate Bandwidth (THz)
0.3-3	1000-100	LOS, Reflection	Free Space Loss	< 10	Up to 0.3
3-30	100-10		Molecular Absorption High H_2O Peaks	< 1	> 1

infer that 6G will convey an ultra-dense network capability encouraging super network flexibility with the capacity to cleverly assimilate divergent techniques to instantaneously meet the numerous applications conditions. Conversely, an extended THz band communication technology is equipped with the capability to concurrently assist macro-scale and micro-scale services, such as terabit WLAN and nano-sensor networks. present an extensive and exhaustive review of THz band within the range of 0.1–10 THz for assisting Tbps high-speed communications. However, utilizing that spectrum presents many challenges that must be addressed. The Federal Communications Commission (FCC) and the International Commission on Non-Ionizing Radiation Protection standards are utilized to protect humans from potential hazards such as those to the eyes and skin tissues, which are highly sensitive to heat due to the low level of blood flow. In addition, the biological and molecular impact of THz radiation on the environment requires careful consideration. Electromotive force transmission is another novel concept which will be presented in 6G to mitigate health issues.

CONCLUSION

During the worldwide deployment of 5G networks, industrial and academia synergy have commenced to conceptualize the next generation of wireless communication systems (6G) to address the coming challenges of the drastic increase in wireless data traffic. 6G technology allows bitrates of up to Tbps with a latency less than 1 ms, apart from introducing a group of new services. This study started by highlighting a vision and the key features aimed at fostering future 6G in the following dimensions: energy efficiency; intelligence; spectral efficiency; security, secrecy, and privacy; affordability; and customization. Then, we discussed the several potential challenges associated with 6G technology and the potential solutions to fostering future 6G. Finally, this work concludes with international research activities that aim to create a vision for future 6G. \

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