Noise in Neural Networks

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Internet of Things

How do we define Internet of Things?

[1] Roberto Minerva, Abyi Biru, and Domenico Rotondi. "Towards a definition of the Internet of Things (IoT)". In: *IEEE Internet Initiative* 1.1 (2015), pp. 1–86.

[2] *Lexico*. https://www.lexico.com/definition/internet_of_things.

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- A network of items — each embedded with sensors — which are connected to the Internet.[1]

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IEEE Internet of Things

Contribute to the *ever-changing* definition of IoT
iot.ieee.org/definition

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Internet of Things - Milestones

- 1969 - ARPANET
- 1980's - Commercial Internet services
- 1993 - Global Positioning System
- 2017 - IPv6 Standard

IPv6 - 128 bit addresses as opposed to 32 bit addresses in IPv4
$2^{128} = 3.4 * 10^{38}$ addresses

The first's in IoT

- 1982 - World's first IoT device - Carnegie Mellon University, School of Computer Science,USA
- Toaster (1990), Webcam/Coffee pot(1993).........
- LG Internet Digital DIOS (2000) - First Internet Refrigerator

CMU SCS connected coke machine

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[3] *CMU Coke Machine*. https://www.cs.cmu.edu/~coke/.

[4] *CMU Coke Machine Pic*. https://knowyourmeme.com/memes/internet-coke-machine.

[5] *LG Internet Digital DIOS*. https://en.wikipedia.org/wiki/Internet_Digital_DIOS.

Comparison of RF technologies

Parameters	WiFi	WiMAX	LR-WPAN	Mobile communication	Bluetooth	LoRa
Standard	IEEE 802.11 a/c/b/ d/g/n	IEEE 802.16	IEEE 802.15.4 (ZigBee)	2G-GSM, CDMA 3G-UMTS, CDMA2000 4G-LTE	IEEE 802.15.1	LoRaWAN R1.0
Frequency band	5–60 GHz	2–66 GHz	868/915 MHz, 2.4 GHz	865 MHz, 2.4 GHz	2.4 GHz	868/900 MHz
Data rate	1 Mb/s–6.75 Gb/s	1 Mb/s–1 Gb/s (Fixed) 50–100 Mb/s (mobile)	40–250 Kb/s	2G: 50–100 kb/s 3G: 200 kb/s 4G: 0.1–1 Gb/s	1–24 Mb/s	0.3–50 Kb/s
Transmission range	20–100 m	< 50Km	10–20 m	Entire cellular area	8–10 m	< 30 Km
Energy consumption	High	Medium	Low	Medium	Bluetooth: Medium BLE: Very Low	Very Low
Cost	High	High	Low	Medium	Low	High

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[6] Partha Pratim Ray. "A survey on Internet of Things architectures". In: *Journal of King Saud University-Computer and Information Sciences* 30.3 (2018), pp. 291–319.