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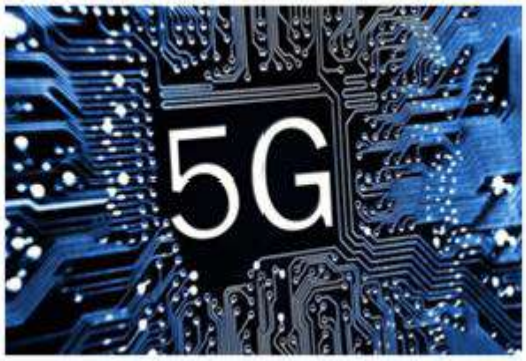
Introducing 5G networks Characteristics and usages



The fifth generation networks (5G) is currently under development and will hit the market at the horizon 2020. Compared with the current 4G LTE technology, 5G is targeting to reach both high speed (1 Gbps), low power and low latency (1ms or less), for massive IoT, tactile internet and Robotics

The drones use case best illustrates all 5G next coming challenges: Low latency for fast-response-time, LAN and WAN combination to support fast moving drones, high speed data rates to exploit high quantities of navigation data and sensors to actuators communications for complex navigation software heuristics.

5G technology is driven by 8 specification requirements

- Up to 10Gbps data rate ->10 to 100x improvement over 4G and 4.5G networks
- 1 millisecond latency
- 1000x bandwidth per unit area
- Up to 100x number of connected devices per unit area (compared with 4G LTE)
- 99.999% availability
- 100% coverage.
- 90% reduction in network energy usage
- Up to 10-year battery life for low power IoT devices

Latency benefits example:

A car running at 100Km/h will move 27.6m every second, or 2.7cm every millisecond. If the road sensors capture an unexpected event on the road, <1ms network(s) latency means that the information will reach the car from the cloud in a time frame that corresponds to less than 1meter motion (between the time the event occurred and the time the car control system gets the information).

MANIKANTA K (ECE Dept)

Nuraphone

Headphones are like glasses: What works for you won't necessarily work for your friend. In many cases what's considered good or bad is totally subjective.

The result is that most people have no idea how to describe what sounds good or bad to them. They know what they like, but not why. This is a problem, says Kyle Slater, the co-founder of audio company Nura.

Once the nuraphone has created your hearing profile it sonically moulds your music so that it matches your hearing system and delivers all the detail of the music you love. Once personalised you can listen to your favourite music in stunning detail from your favourite player.

This ground breaking device tunes your audio to your hearing –How do they work?

Here's the smart bit. The Nuraphones work by testing something called the Otoacousticreponse. When you hear a sound, your inner ear (everything past the ear drum, more specifically the cochlea) actually makes a sound back. It's a tiny, miniscule sound, but it's a response from your inner hair cells – these are the tiny filaments that vibrate in response to sounds entering your ear, translating soundwaves into electrical signals that are sent to your brain. This Otoacoustic response is a measure of the condition of these vital hair cells, when they're damaged you lose sensitivity to certain sound frequencies, sometimes we hear this as tinnitus. This test is most commonly used to test hearing in newborns, since it can measure your auditory sensitivity without words.

PRAJWAL (ISE,3rd year)

In-display Fingerprint Sensor

Synaptics Incorporated (NASDAQ: SYNA), the leading developer of human interface solutions, today announced its Clear ID™ FS9500 optical in-display fingerprint sensor has been honored for technical innovation with Best of Show recognition at CES 2018 from

several leading industry publications, including Android Authority, Android Central, Digital Trends, Tech Radar, TechnoBuffalo, Toms Guide, andCES

Serious Security:

Synaptics optical fingerprint sensors are available with SentryPoint™ technology, offering OEMs a wide-range of unique and highly secure authentication features including: Quantum Matcher™ for adaptive fingerprint template matching and authentication; PurePrint™ anti-spoof technology to examine fingerprint images using unique artificial intelligence technology to distinguish between spoofs and actual fingers; and SecureLink™ which combines support for TLS protocol with ECC authentication and AES encryption.

How do they work?

Designed for smartphones with infinity displays, Synaptics' Clear ID in-display fingerprint sensors magically activate in the display only when needed. Clear ID is faster than alternative biometrics such as 3D facial, highly-secure with SentryPoint™ technology, and very convenient with one-touch/one-step biometric authentication directly in the touchscreen display of the smartphone.

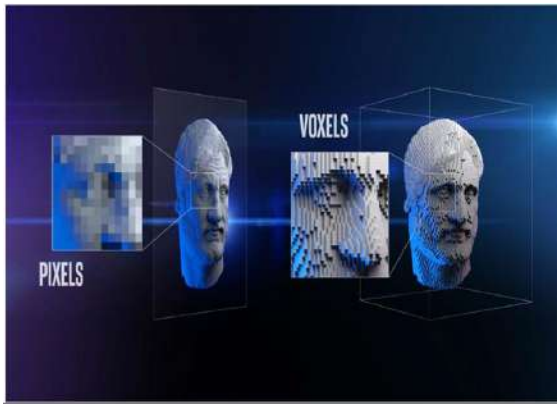
RAKSHITH P BHAT(ISE,3rd year)

Voxel(Volumetric Pixels)

A volumetric pixel (volume pixel or voxel) is the three-dimensional (3D) equivalent of a pixel and the tiniest distinguishable element of a 3D object. It is a volume element that represents a specific grid value in 3D space. However, like pixels, voxels do not contain information about their position in 3D space. Rather, coordinates are inferred based on their designated positions relative to other surrounding voxels.

One may compare volume pixels to bricks, which are stacked and used to build bigger structures. In this scenario, each brick is placed next to each other, but the bricks are not defined.

This is how Intel's VR broadcast will look like Voxels can contain multiple scalar values, essentially vector (tensor) data; in the case of ultrasound scans with B-mode and Doppler data, density, and volumetric flow rate are captured as separate channels of data relating to the same voxel positions.

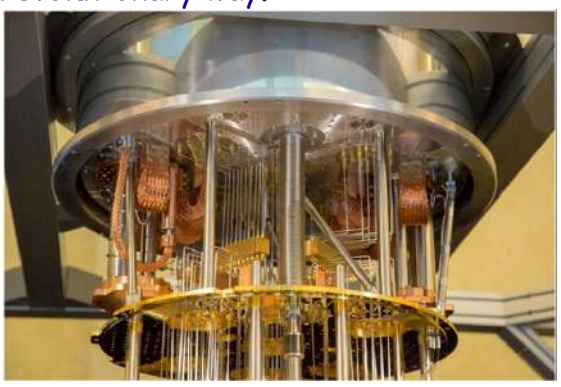


The world's largest chipmaker set the stage for this shift to data perfectly. In fact, the setting was almost surreal. Humans, artificial intelligence-driven virtual avatars, LED-covered dancers, flying lights… the real and the virtual matched beat for beat, step for step before Krzanich stepped on to the stage for his CES 2018 keynote. The past week has been the most discordant for Intel in a while, but data-only band Algorithm helped the chipmaker start-off with all the right notes at the world's largest tech show. Truly, data can rock.

RAKSHITH P BHAT(3rd year,ISE)

IBM 50-bit Quantum Computer

From afar, it looks like a steampunk chandelier. An intricate collection of tubes and wires that culminate in a small steel cylinder at the bottom. It is, in fact, one of the most sophisticated quantum computers ever built. The processor inside has 50 quantum bits, or qubits, that process tasks in a (potentially) revolutionary way.



Researchers have already conducted experiments with quantum computers. Scientists at IBM were able to simulate beryllium hydride (BeH_2) on a seven-qubit quantum processor last September, for example. But critics want to see a quantum computer accomplish something more tangible, which is more meaningful for the everyday

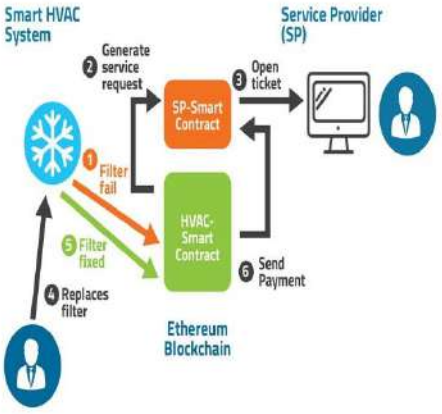
consumer. That day, unfortunately, could still be a long way off.

IBM unveiled the world's first 50-qubit quantum computer.The biggest challenge, IBM Research Vice President Jeffrey Welser told me, is isolating the chip from unwanted "noise." This includes electrical, magnetic and thermal noise -- just the temperature of the room renders the whole machine useless.IBM has a storied history in quantum computing. The company's researchers helped create the field of quantum information processing, and it has pursued fundamental research in the area for decades.It has also been making significant progress toward useful quantum systems, first by making quantum computers accessible through the cloud and developing relevant software tools, and second by showinghow even a simple machine can do useful work in fields like chemistry.

NIKHIL GOWDA(3rd year,ISE)

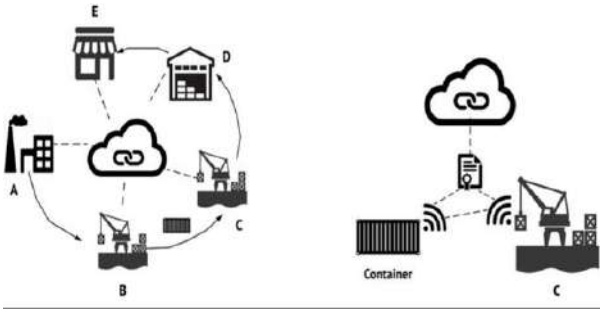
Blockchains and Smart Contracts for the Internet of Things

We also point out certain issues that should be considered before the deployment of a blockchain network in an IoT setting: from transactional privacy to the expected value of the digitized assets traded on the network. Wherever applicable, we identify solutions and workarounds. Our conclusion is that the blockchain-IoT combination is powerful and can cause significant transformations across several industries, paving the way for new business models and novel, distributed applications.



We then move into the IoT domain, and describe how a blockchain-IoT combination: 1) facilitates the sharing of services and resources leading to the creation of a marketplace of services between devices and 2) allows us to automate in a cryptographically verifiable manner several existing, time-consuming workflows.

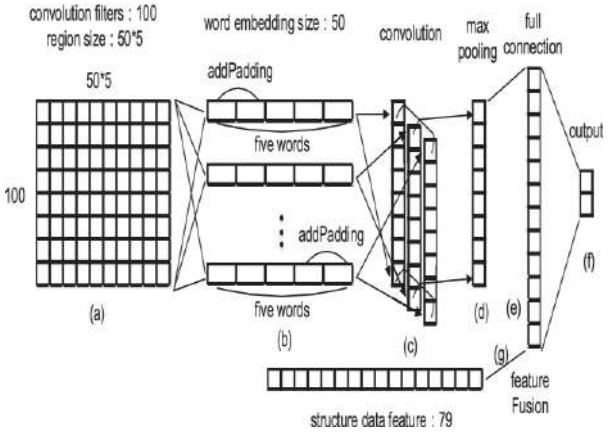
Motivated by the recent explosion of interest around blockchains, we examine whether they make a good fit for the Internet of Things (IoT) sector. Blockchains allow us to have a distributed peer-to-peer network where non-trusting members can interact with each other without a trusted intermediary, in a verifiable manner. We review how this mechanism works and also look into smart contracts-scripts that reside on the blockchain that allow for the automation of multi-step processes.

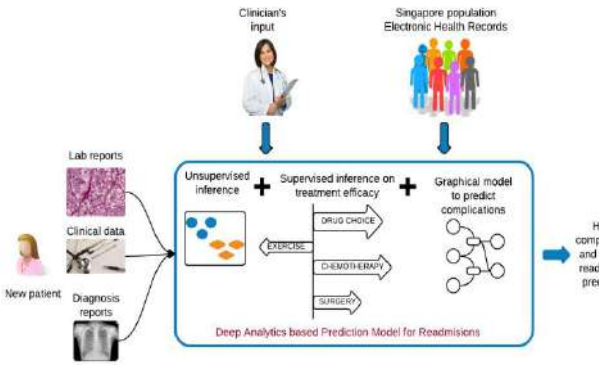


THEJASWINI S (3rd year)

Disease Prediction by Machine Learning Over Big Data From Healthcare Communities

With big data growth in biomedical and healthcare communities, accurate analysis of medical data benefits early disease detection, patient care, and community services. However, the analysis accuracy is reduced when the quality of medical data is incomplete. Moreover, different regions exhibit unique characteristics of certain regional diseases, which may weaken the prediction of disease outbreaks. In this paper, we streamline machine learning algorithms for effective prediction of chronic disease outbreak in disease-frequent communities



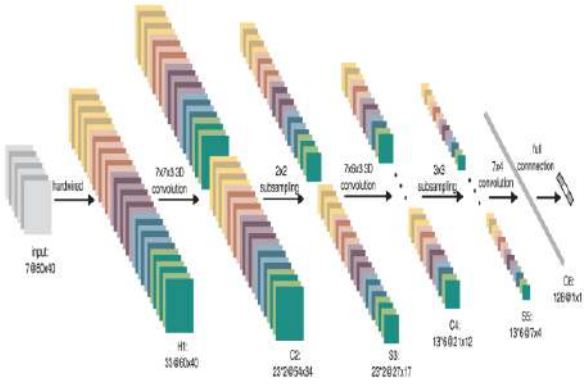


We experiment the modified prediction models over real-life hospital data collected from central China in 2013-2015. To overcome the difficulty of incomplete data, we use a latent factor model to reconstruct the missing data. We experiment on a regional chronic disease of cerebral infarction. We propose a new convolutional neural network (CNN)-based multimodal disease risk prediction algorithm using structured and unstructured data from hospital. To the best of our knowledge, none of the existing work focused on both data types in the area of medical big data analytics. Compared with several typical prediction algorithms, the prediction accuracy of our proposed algorithm reaches 94.8% with a convergence speed, which is faster than that of the CNN-based unimodal disease risk prediction algorithm.

THEJASWINI S (3rd year)

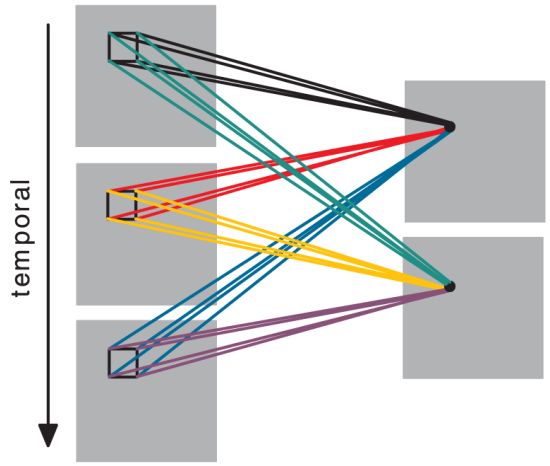
3D Convolutional Neural Networks for Human Action Recognition

We consider the automated recognition of human actions in surveillance videos. Most current methods build classifiers based on complex handcrafted features computed from the raw inputs. Convolutional neural networks (CNNs) are a type of deep model that can act directly on the raw inputs. However, such models are currently limited to handling 2D inputs. In this artical, we develop a novel 3D CNN model for action recognition.



This model extracts features from both the spatial and the temporal dimensions by performing 3D convolutions, thereby capturing the motion information encoded in multiple adjacent frames. The developed model generates multiple channels of information from the

input frames, and the final feature representation combines information from all channels.



To further boost the performance, we propose regularizing the outputs with high-level features and combining the predictions of a variety of different models. We apply the developed models to recognize human actions in the real-world environment of airport surveillance videos, and they achieve superior performance in comparison to baseline methods. Note that a 3D convolutional kernel can only extract one type of features from the frame cube since the kernel weights are replicated across the entire cube. A general design principle of CNNs is that the number of feature maps should be increased in late layers by generating multiple types of features from the same set of lower level feature maps. Similarly to the case of 2D convolution, this can be achieved by applying multiple 3D convolutions with distinct kernels to the same location in the previous layer

THEJASWINI S (3rd year)

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