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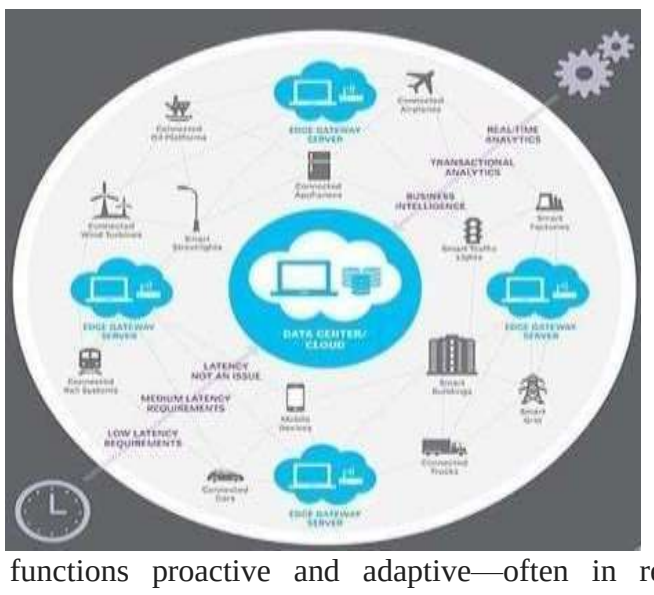
Edge Computing

"While Technology aims at making the lives of people easier, the moto of Edge Computing is focused on making computing faster."

Edge Computing is a distributed computing paradigm that brings computation and data closer to the sources of data. Edge computation happens near a physical location where data is being collected and analyzed rather than on a cloud server. Data is collected within the network from devices like IoT, sensors, etc. and they are processed in the edge server to give real-time inference.

Edge computing helps to unlock the potential of the vast number of unused data that's created by the connected devices. This can bring up new opportunities, provides faster and reliable data and consistent experience for customers by increasing operational efficiency. The explosive growth and increasing computing power of IoT devices has resulted in unprecedented size of data. Data size will continue to grow as 5G networks increase the number of connected mobile devices.

Importance of Edge Computing



Much of today's computing already happens at the edge in places like hospitals, factories and retail locations, processing the most sensitive data and powering critical systems that must function reliably and safely. These places require solutions with low latency that do not need a network connection. What makes edge so exciting is the potential it has for transforming business across every industry and function, from customer engagement and marketing to production and back-office operations. In all cases, edge helps make business functions proactive and adaptive—often in real time—leading to new, optimized experiences for people.

Moving Intelligence to the Edge

https://www.thinkebiz.net/what-edge-computing/

Benefits of Edge Computing

Speed & Latency :- Any system is less relevant if it takes longer to process data. In case of an autonomous vehicle, time is of the essence and most of the data it collects and required is pointless after a couple of seconds. Milliseconds matter, especially on a busy roadway. In many cases, there isn't time to round trip data back and forth between the cloud. Situations such as equipment failures and dangerous incidents call for the immediate analysis of data.

Security:-The increase of mobile computing has made enterprises much more vulnerable as company devices are now transported outside of the protected firewall perimeter of the enterprise. Companies overcome the issues of local compliance privacy regulations as well as the issue of data supremacy with thehelp of edge computing.

Cost Savings :- Although data storage cost have dropped significantly in the past decade or so, the cost of moving data around is on the rise as the volume of it increases. Experts expect connectivity costs to continue climbing as the volume of data spikes. They also anticipate that users will need to implement more bandwidth to handle the load, further driving up the price tag. Data that is created at the edge must be stored there at least temporarily. When sent to the cloud, it must be stored again, creating levels of redundancy. When redundant storage is reduced, redundant cost also reduces.

Reliability :- The processing of the data close to the end user makes edge computing more reliable as it is invulnerable to security threats and network outages. Before optimizing for speed, application architects are faced with the challenge of designing systems that enable workloads to perform their intended functions accurately and consistently when expected. Reliability is a cornerstone of application design and one of the primary considerations leading developers to the edge.

The extension of cloud to edge is giving application architects more flexibility in being able to address all questions in more granular terms.

-Compiled by Nilesh Jangid

Edge Computing Privacy and Security :-

Edge computing has been proposed as a new computing paradigm where resources like computation and storage are placed closer to the data source. It enables a new class of latency and bandwidth sensitive applications as data can be processed at the nearest edge. Without sending data to the cloud, edge computing therefore enhances security and privacy. Edge computing security always aimed at protecting data that lives or transports through devices out of centralized data centres.

Authentication and Access Control :

The authentication ensures the identity of a user is authorized which means it is a process of establishing proof of user's identities. Furthermore, the access control acts like a bridging point of all the security and privacy requirements by the control strategy, it determines who can access the resources (authentication) and what kind of actions can perform such as reading (confidentiality) and writing (integrity).

-Compiled by Riddhi Garudkar

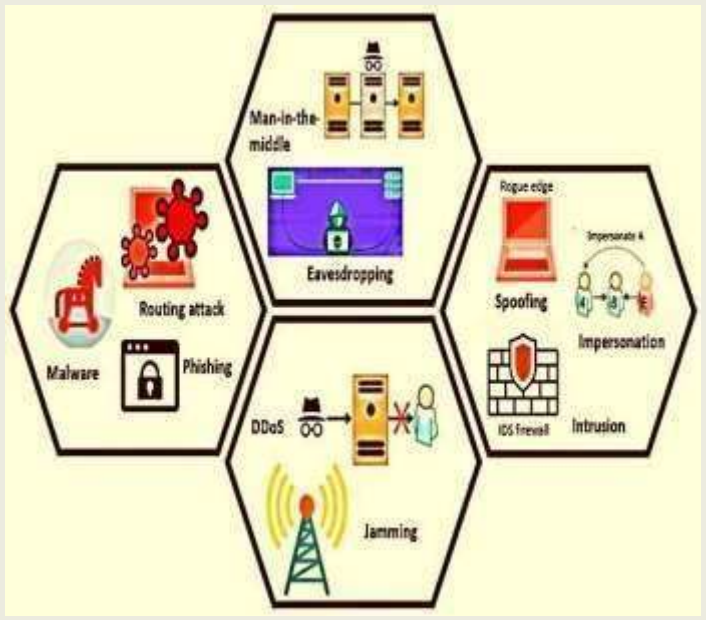
Some examples where in Edge Computing:

- AI
- Virtual Reality
- Augmented Reality
- The Internet of Things (IoT)
- Industrial Process Monitoring and Predictive Maintenance
- Agriculture
- Traffic Management System
- Autonomous Vehicles, Electric Vehicles and Charging Stations
- Manufacturing
- HealthCare & Medical Technology

Multi-Access Edge Computing Architecture, Data Security and Privacy:

Multi-Access Edge Computing (MEC) is an extension of cloud computing that aims to provide computation, storage, and networking capabilities at the edge of the network in close proximity to end-users. The MEC architecture supports applications and services that bridge between cloud computing and end-users. The architecture includes devices and systems that are interconnected, layered, and flexibly deployed. As a result of the technological advancements, MEC is facing a myriad of highly sophisticated threats. Data security and privacy become particularly severe in the MEC environment because data is scattered across different nodes and storage devices, including servers, PCs, mobile devices and wireless network sensors.

-Compiled by Prachi Purohit

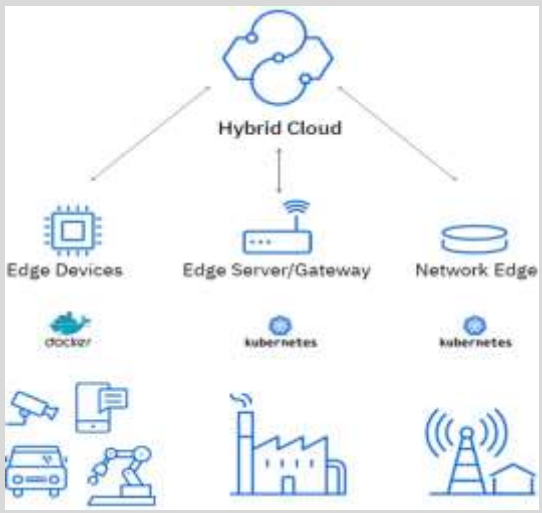


https://www.researchgate.net/figure/Security-and-Privacy-Attacks-_in-Edge-Computing_fig3_353212376

Relation between 5G and Edge Computing:

Through its increased performance, 5G can enhance edge computing applications by reducing latency, bettering application response times, and improving the ability of enterprises to collect and process data.

Combining 5G and edge computing is critical in attaining ultra-low latency in various edge devices and use cases.

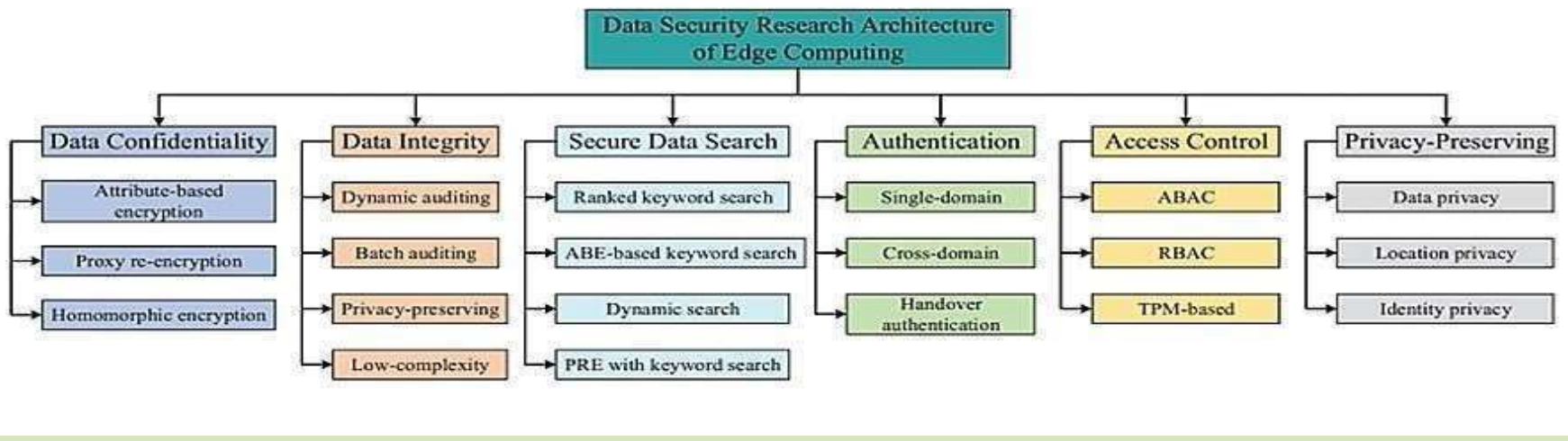


https://www.ibm.com/cloud/smartpapers/5g-edge-computing/

-Compiled by Sanskruti Talegoankar

Facts

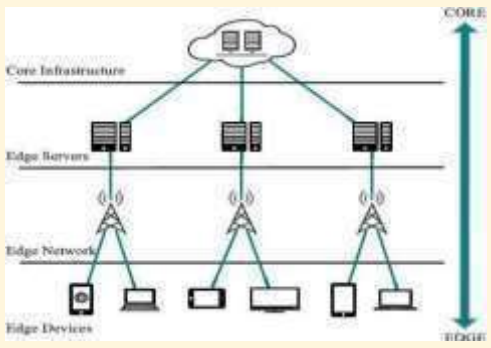
- *The prediction says that the coming decade will see approximately 100 trillion sensors attached to our global economy, which will create a humongous amount of information.*
- *Edge computing influences Internet of Things strongly as every internet-connected device produces a lot of information and handling every bit of it is not feasible.*



https://ieeexplore.ieee.org/document/9330515

Application of Edge Computing

DATA PRIVACY :



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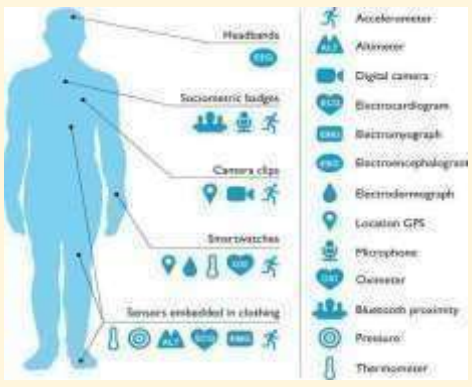
Edge computing is reshaping health care by bringing big data processing and storage closer tothe source, to support game- changing technologies such as the internet of things, artificial intelligence, and robotics. Since the main role of this is to accelerate connectivity between medical software and services to rural areas.

PREDECTIVE MAINTENANCE :

Machines generate a large amount of raw data that burdens the central host. It helps to remove the unwanted data and only pass the necessary data to the cloud. Data generated by the machine on the shop floor can help the manufacturer track data patterns and make their decision more accurate and valuable, but the main problem they face is accessing data. Cloud computing increases the chances of stealing the data as all data are transfer to the central host, so it necessary to follow privacy and security. It deploy applications across local branch offices and reduce the need of cloud computing it also reduce the chance of loss of data.

HEALTH CARE :



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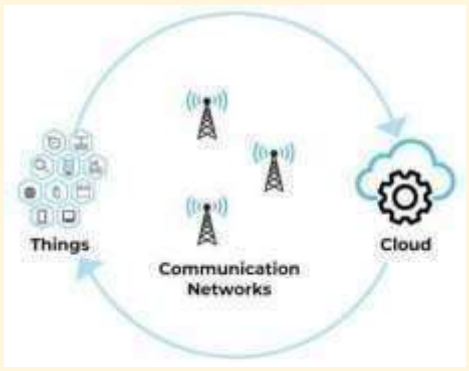
MANUFACTURING INDUSTRY :



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-Compiled by Lakita Vangari and Shreya Darde

Challenges in Edge Computing

Edge Computing uses memory to store and calculation of data to bring them as close as possible wherever they are required.

Network Bandwidth :- The name itself shows a special role of bandwidth (frequencies). Various enterprises distributed higher frequencies at central data center and lower frequencies to endpoints. On the other side Edge computing required more bandwidth across all the ends of server.

Latency :- When higher amount of data transmits then latency occurs. The latency means delayed in transmission of data. In an Edge server, if the computation is taking place closer to data, then latency can be reduced.

Distributed Computing :- For better understanding it can be defined as a system consisting of software components spread over different computers but working as a single entity. Most of the servers the module are assigned far away from each other. Whereas edge computing tries to make them work together and tends to bring all the system closer to each other.

Security & Encryption : - When there is discussion about Clouds computing or Edge computing the most serious question arises about security. Any device in edge server display vulnerable endpoint and IOT (Internet Of Things)is notorious for its lack of robust security and embedded devices are not designed with measurable security, also not updated as they should be.

-Compiled by Om Edwankar and Vishal Tiwari

Career Opportunities >>>

Despite challenges that arise when realising edge computing, there are numerous opportunities for academic research.

How to start a career in edge computing ?

To starting a career in edge computing, there are a few things to do. First, invest in data science education and knowledge. Data is a critical component of edge computing, and those who understand how to collect, analyze and interpret it will be in high demand. Second, build up your cybersecurity skills. Edge computing systems are often deployed in sensitive environments, so those who can help protect them from attack will be invaluable. Finally, get to know DevOps principles. Many companies with edge computing job openings are implementing a DevOps approach. Therefore, DevOps is a key part of edge computing, so understanding its basics will give you a leg up in the field.

Below are 5 edge computing careers that are currently in great demand.

Edge network engineer

Edge network engineers are responsible for designing, setting up and maintaining edge computing networks. In edge computing, data is processed at or near the edge of the network rather than at a centralized location. This can benefit applications that require low latency or high reliability.

Edge IoT architect

The role of an edge IoT architect is to design and oversee the implementation of edge computing solutions for IoT devices. This can involve working with chipsets, operating systems, middleware and applications.

Edge software engineer

Edge software engineers are responsible for developing and managing software applications hosted on edge servers. Edge servers are located at the edge of a network, close to the users accessing the applications. This is different from traditional server architectures, which often have servers located in centralized data centers. Edge software engineers must be able to design, develop and deploy optimized applications for edge computing environments. They also need to be able to troubleshoot and resolve any issues that may arise with the applications.

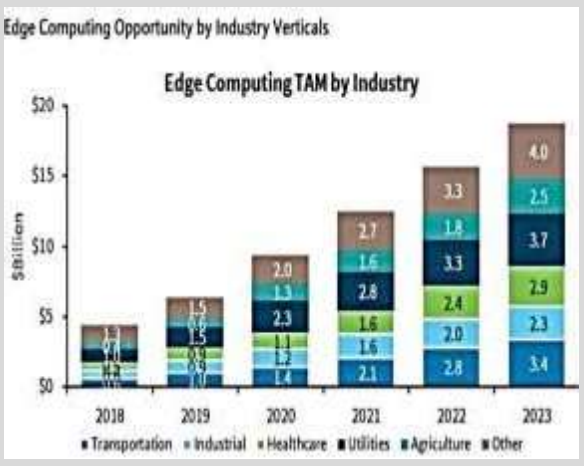
Edge solutions architect

The edge solutions architect role is responsible for driving the adoption of edge computing solutions. In addition, as a subject-matter expert, they will support the launch of new edge products, educate customers and partners on edge capabilities, and provide guidance on edge architecture and deployment best practices.

https://www.techrepublic.com/article/edge-computing-careers/

Edge security specialist

While edge computing allows businesses to reduce latency and improve performance, it comes with several risk. One of these is security. Edge computing increases the threat attack surface and several security challenges. As a result, companies must plan their edge deployments carefully; otherwise, the security risks will outweigh the benefits. Edge security specialists are responsible for securing edge computing deployments. They work with businesses to assess security. This includes ensuring that edge devices, such as sensors and edge gateway, are correctly configured and secured. The Edge security specialist works with network administrators to ensure that edge networking devices are adequately protected. They should also be familiar with industry- standard security technologies, such as firewalls and intrusion detection/prevention systems.



-Compiled by Siddhi Sharma and Mayur Tawde

ALUMNI TALK

Meet our Alumni and General Secretary of VCET year 2018

Mr. Arun Nambiar

Technology Consultant – Accenture IPS Advisory

MBA(PGPM) Great Lakes Institute of Management, Chennai

Ex Data scientist at Infosys Limited

1. How are your work profile & responsibility as Technology Consultant at Accenture?

The responsibilities majorly depend on the project assigned. The purpose of a Tech consultant is to collaborate with clients to advise, innovate, architect and transform their technology landscape leveraging the latest technologies and industry-specific platforms/ products/ solution.

2. Why did you go with an MBA (PGPM) and specifically in Analytics?

While I was at Infosys, I had built a good technical skill set and was eager to learn more about the business aspects and have a holistic view of things. PGPM at Great Lakes was ideal for me as they need candidates with 2-3 years of industry experience and they had an Analytics major available. Also, It was a one-year program thereby saving me a year.

3. How did you get interested in AI/ML?

During the initial training period at Infosys I noticed one of my friends learning ML. Out of curiosity, I did some research and went through free resources and got really interested in it. After that, I did 1-2 years of selfstudy, participating in competitions along with work and tried to take up extra projects apart from daily work. Eventually, I got selected into the AI/ML team. These companies have lots of opportunities if you have the right skill. It takes genuine interest to keep updating yourself and to put the efforts into practice.

4. What do you think about the future of machine learning?

There is so much research and development going on worldwide on AI. New advanced ML models and tools are coming up every year in the market, but the industry usage of AI is lagging w.r.t the theoretical research. The adoption of AI/ML solutions is increasing exponentially and companies will need highly skilled AI/ML professionals. If you are planning to build a career around it then make it a habit to be up to date with the latest technology trends and tools. College subjects or online courses can only give you a base to start and you will have to work and practice your skills a lot to set yourself apart.

5. What has been your most challenging or rewarding academic experience so far?

One-year MBA at Great lakes was very challenging since the schedule was very hectic and also because I was getting back to college after 4 years of working in IT. But it was very rewarding in terms of both business and technology knowledge gained, networking with 100s of professionals and personal development. I was able to sustain and perform well among the 300+ batchmates from across India so I consider that an achievement. At VCET though, balancing studies and other committee activities was something challenging.

6. How was your experience in college and your key learnings in the four years of Engineering?

I enjoyed my 4 years of engineering to the fullest, be it studies, co-curricular or committees. I had a habit of trying to do anything or everything I could get my hands into. The professors are one of the best you will find and will support you a lot if you seek help or wish to do anything different. Prioritizing stuffs, balancing studies and other things was something I learned during my college days. I feel, the college strived a lot to give a well-rounded education and experience to us and this included getting experts from industries to speak, support in organizing new events, competitions and also for Zeal. Student's council was like my second home. Working with a lot of batchmates in different committees helped me in building socializing skills and taught me leadership and team management skills. These skills and habits did wonders for me later.

7. What are your valuable suggestions for young engineers?

Do have a long-term goal and try to work towards it slowly and steadily. I would suggest taking out some time every day to build your engineering and personal skills, be it anything, coding, blogging, building a product, working on your startup idea, working on your personality or speaking skills etc. Not everyone has the same EQ or IQ so try to spend time to know your strengths, weaknesses, likes, and dislikes and work on them as this will help in choosing or creating your career path. At the same time, this is the time to explore, fail, and win at new things as well. There are tons of opportunities out there in various engineering fields if you have adequate or good skills. Do internships and participate in competitions. Also, you must have heard this a lot but again having strong time management and continuous learning habits will set you apart from others in future!

Find and connect friends/ colleagues/Profs with similar interests or with whom you can grow. Build a good network, not just limited to college friends, as this will help you later. After a few years, your network will be your net worth.

-Interviewed by Kushal Raut and Shreya Darde

🎓 Toppers of Academic year 2021-2022 🎓

SE	TE	BE
VIJAY PATIL – CGPA 9.69 NIKHIL KARGATIA – CGPA 9.44 HETSI PARMAR – CGPA 8.92	RIDDHESH VANJARA – CGPA 9.93 KUSHAL RAUT – CGPA 9.72 HARSH DODIYA – CGPA 9.68	SHRADDHA PATIL – CGPA 9.46 AKASH SANKHE – CGPA 9.4 ADISHA WAGHMARE – CGPA 9.2

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