ISSUE NO:155
17-08-2024

MAGAZINE

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Department of CSE

Department Vision

To be a center for academic excellence in the field of Computer Science and Engineering education to enable graduates to be ethical and competent professionals.

Department Mission

To enable students to develop logic and problem solving approach that will help build their careers in the innovative field of computing and provide creative solutions for the benefit of society.

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METAVERSE

THE METAVERSE IS A VISION OF WHAT MANY IN THE COMPUTER INDUSTRY BELIEVE IS THE NEXT ITERATION OF THE INTERNET: A SINGLE, SHARED, IMMERSIVE, PERSISTENT, 3D VIRTUAL SPACE WHERE HUMANS EXPERIENCE LIFE IN WAYS THEY COULD NOT IN THE PHYSICAL WORLD.

SOME OF THE TECHNOLOGIES THAT PROVIDE ACCESS TO THIS VIRTUAL WORLD, SUCH AS VIRTUAL REALITY (VR) HEADSETS AND AUGMENTED REALITY (AR) GLASSES, ARE EVOLVING QUICKLY; OTHER CRITICAL COMPONENTS OF THE METAVERSE, SUCH AS ADEQUATE BANDWIDTH OR INTEROPERABILITY STANDARDS, ARE PROBABLY YEARS OFF OR MIGHT NEVER MATERIALIZE.

THE CONCEPT IS NOT NEW: THE TERM METAVERSE WAS COINED IN 1992 BY AUTHOR NEAL STEPHENSON IN HIS SCI-FI NOVEL SNOW CRASH, AND WORK ON THE TECHNOLOGIES THAT UNDERPIN A VIRTUAL REALITY-BASED INTERNET DATE BACK DECADES SEVERAL OTHER TECHNOLOGIES, IN ADDITION TO VIRTUAL REALITY, PLAY A ROLE IN SHAPING THE METAVERSE.

AN EARLY APPLICATION OF METAVERSE TECHNOLOGIES INVOLVES WORKPLACE TRAINING. SOME HOSPITALS ARE ALREADY USING VR AND AR TO TRAIN FOR COMMON MEDICAL PROCEDURES. ONE TECHNOLOGY RECENTLY APPROVED BY THE FDA IS MEDIVIS, AN AR SURGICAL SYSTEM THAT LETS SURGEONS QUICKLY SYNC WITH A HOSPITAL'S DIGITAL IMAGING SYSTEM.

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Brain-computer interfaces (BCI)

BRAIN-COMPUTER INTERFACES (BCI) ARE DEVICES THAT CREATE A DIRECT COMMUNICATION PATHWAY BETWEEN A BRAIN'S ELECTRICAL ACTIVITY AND AN EXTERNAL OUTPUT. THEIR SENSORS CAPTURE ELECTROPHYSIOLOGICAL SIGNALS TRANSMITTED BETWEEN THE BRAIN'S NEURONS AND RELAY THAT INFORMATION TO AN EXTERNAL SOURCE, LIKE A COMPUTER OR A ROBOTIC LIMB, WHICH ESSENTIALLY LETS A PERSON TURN THEIR THOUGHTS INTO ACTIONS.

HOW DO BRAIN-COMPUTER INTERFACES WORK?

WHEN WE MAKE A DECISION — OR EVEN THINK ABOUT MAKING A DECISION — ELECTRICAL CHEMICAL SIGNALS SPARK. THIS PHENOMENON IS LOCATED IN OUR NERVOUS SYSTEM; MORE SPECIFICALLY, IN THE GAPS BETWEEN NEURONS, KNOWN AS SYNAPSES, AS THEY COMMUNICATE BACK AND FORTH.

IN ORDER TO CAPTURE THIS BRAIN ACTIVITY, BCIS PLACE ELECTRODES PROXIMAL TO THESE CONVERSATIONS. THESE SENSORS DETECT VOLTAGES, MEASURING THE FREQUENCY AND INTENSITY OF EACH "SPIKE" AS THEY FIRE OR POTENTIALLY FIRE.

APPLICATIONS OF BRAIN-COMPUTER INTERFACES: ROBOTIC LIMBS AND WHEELCHAIRS , WIRELESS HEADSETS ,SPELLERS

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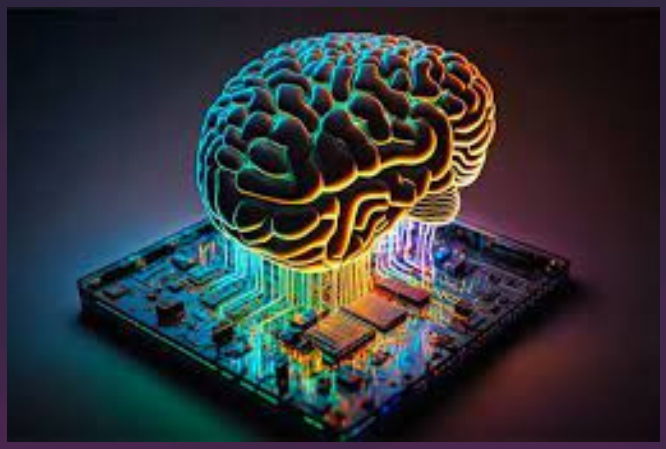
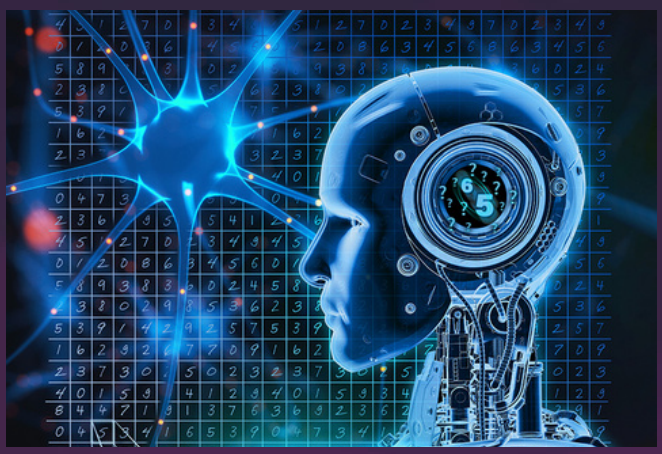
Neuromorphic Computing

NEUROMORPHIC COMPUTING, INSPIRED BY THE HUMAN BRAIN'S STRUCTURE AND FUNCTION, REPRESENTS A REVOLUTIONARY APPROACH TO COMPUTATIONAL TECHNOLOGY. MIMICKING NEURAL NETWORKS, ARTIFICIAL NEURONS COMMUNICATE THROUGH SPIKE-BASED ACTIVITY, FACILITATING PARALLEL PROCESSING AND RESOURCE EFFICIENCY. SYNAPTIC PLASTICITY ENABLES LEARNING AND ADAPTATION, AKIN TO THE BRAIN'S ABILITY TO REWIRE ITSELF BASED ON EXPERIENCE. THIS UNIQUE DESIGN NOT ONLY ENHANCES COMPUTATIONAL POWER BUT ALSO ENABLES REAL-TIME PROCESSING AND ADAPTABILITY TO CHANGING ENVIRONMENTS.

THE APPLICATIONS OF NEUROMORPHIC COMPUTING ARE VAST AND DIVERSE. IN ARTIFICIAL INTELLIGENCE, IT SHOWS PROMISE FOR TASKS LIKE IMAGE AND SPEECH RECOGNITION, NATURAL LANGUAGE PROCESSING, AND AUTONOMOUS NAVIGATION. IN HEALTHCARE, IT COULD REVOLUTIONIZE MEDICAL IMAGING ANALYSIS, DRUG DISCOVERY, AND PERSONALIZED MEDICINE. ADDITIONALLY, NEUROMORPHIC SYSTEMS HAVE POTENTIAL IN SCIENTIFIC COMPUTING, FACILITATING THE SIMULATION OF COMPLEX BIOLOGICAL SYSTEMS.

AS RESEARCH PROGRESSES, THE POTENTIAL FOR NEUROMORPHIC COMPUTING TO REDEFINE COMPUTING CAPABILITIES GROWS, PROMISING A FUTURE WHERE MACHINES CAN LEARN, ADAPT, AND PROCESS INFORMATION MORE AKIN TO THE HUMAN BRAIN.





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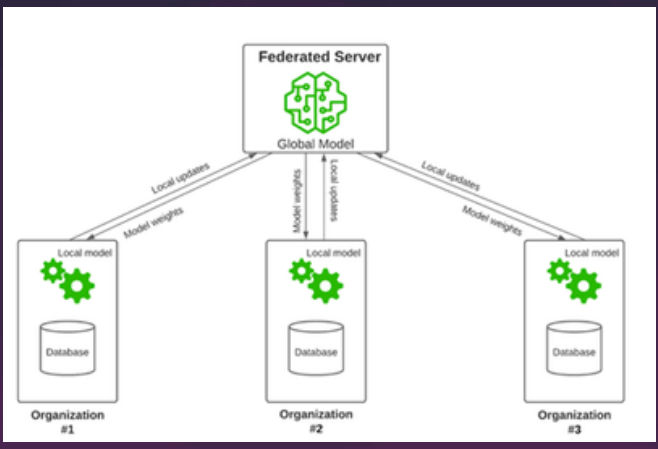
Federated Learning

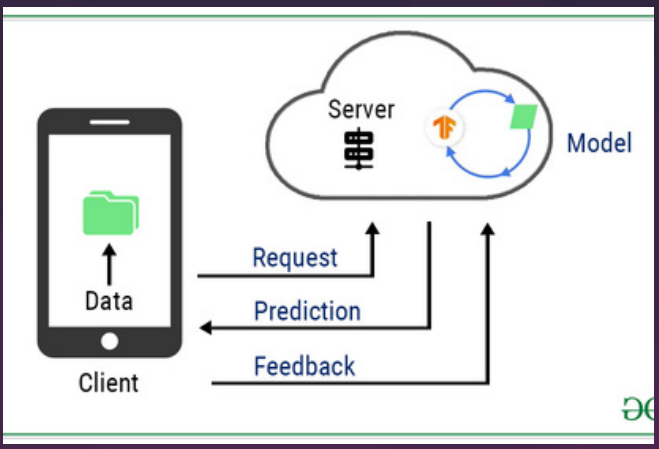
FEDERATED LEARNING IS A DECENTRALIZED MACHINE LEARNING APPROACH THAT ENABLES MODEL TRAINING ACROSS MULTIPLE DEVICES OR SERVERS HOLDING LOCAL DATA SAMPLES, WITHOUT EXCHANGING THEM. IT ALLOWS FOR COLLABORATIVE MODEL TRAINING WHILE KEEPING DATA LOCALIZED AND PRESERVING PRIVACY.

IN FEDERATED LEARNING, A GLOBAL MODEL IS TRAINED COLLABORATIVELY ACROSS MULTIPLE DEVICES OR SERVERS, WITH EACH DEVICE OR SERVER HOLDING A SUBSET OF THE DATA. INSTEAD OF SENDING RAW DATA TO A CENTRAL SERVER, ONLY MODEL UPDATES, USUALLY IN THE FORM OF GRADIENTS, ARE TRANSMITTED. THESE UPDATES ARE AGGREGATED TO IMPROVE THE GLOBAL MODEL, WHICH IS THEN SENT BACK TO THE PARTICIPATING DEVICES FOR FURTHER TRAINING.

THIS APPROACH HAS NUMEROUS APPLICATIONS, PARTICULARLY IN SCENARIOS WHERE DATA PRIVACY IS CRITICAL, SUCH AS HEALTHCARE, FINANCE, AND TELECOMMUNICATIONS. FOR INSTANCE, IN HEALTHCARE, HOSPITALS CAN COLLABORATE TO IMPROVE MEDICAL DIAGNOSTIC MODELS WITHOUT SHARING SENSITIVE PATIENT DATA. SIMILARLY, IN THE FINANCIAL SECTOR, BANKS CAN COLLABORATE ON FRAUD DETECTION MODELS WHILE KEEPING CUSTOMER DATA SECURE.

FEDERATED LEARNING ENABLES COLLABORATIVE MODEL TRAINING WHILE ADDRESSING PRIVACY CONCERNS, MAKING IT A PROMISING APPROACH FOR VARIOUS INDUSTRIES SEEKING TO HARNESS THE POWER OF MACHINE LEARNING WHILE SAFEGUARDING SENSITIVE DATA.





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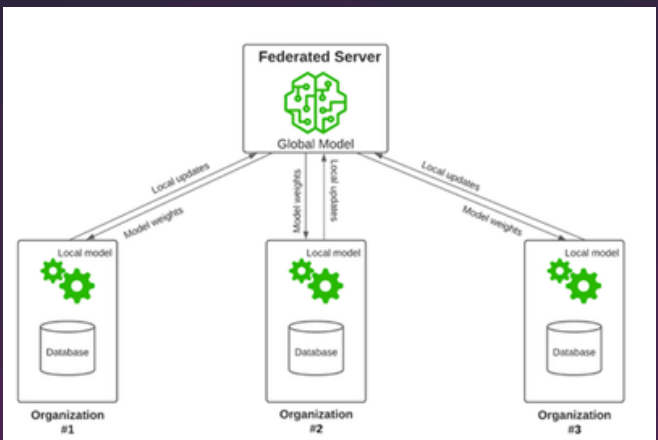

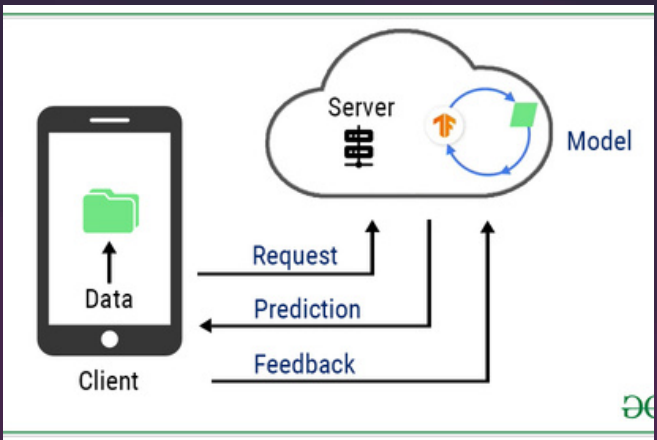

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