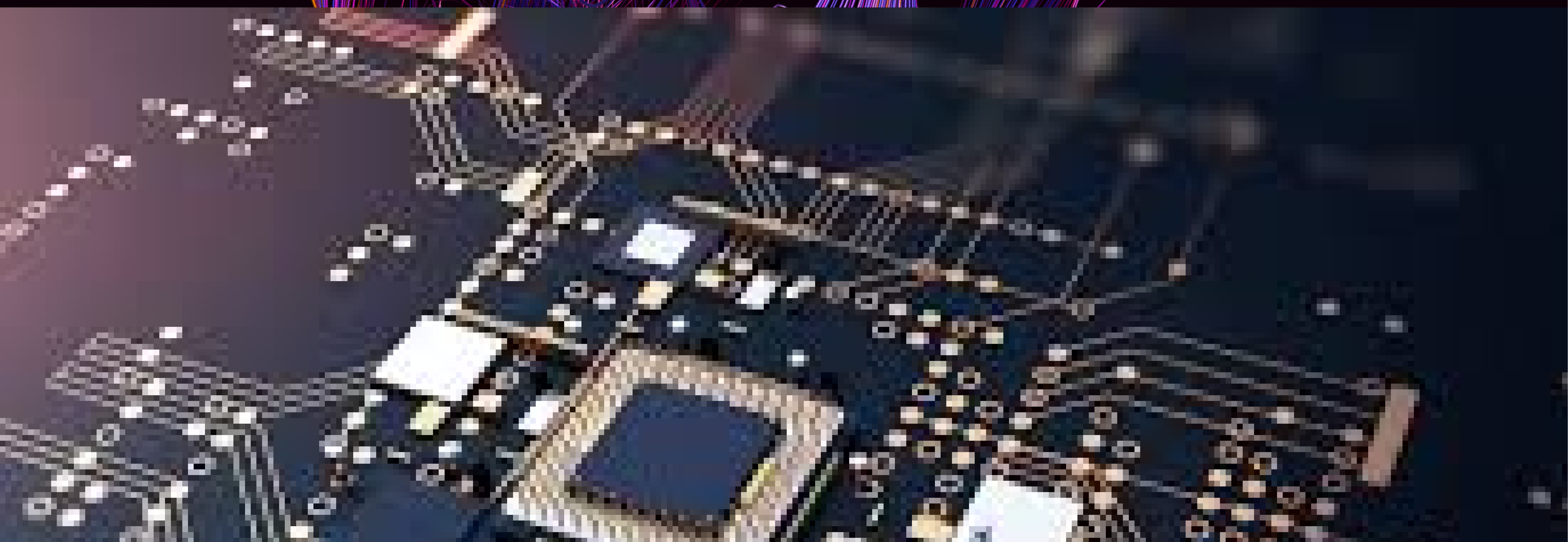
SRI VENKATESWARA COLLEGE OF ENGINEERING
(AUTONOMOUS)

Department of Electronics and Communication Engineering

RISE MAGAZINE

Recent Innovations In Sophisticated Electronics



DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

RISE-MAGAZINE

Recent Innovations In Sophisticated Electronics

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ECE

DEPARTMENT PROFILE

- Electronics and Communication Engineering has emerged as the major driving force in the present day Information Technology revolution. It is acting as a bridge between different disciplines of engineering and technology. It has penetrated into other prominent sectors such as health care, instrumentation, agriculture, automation, signal processing, remote sensing etc.., The recent developments such as IoT, Artificial Intelligence and the mercurial advancements in the field of communication.

Vision

- To be a focal centre for academic excellence in competing global standards and dynamics in the field of Electronics and Communication Engineering with research and services focusing on effective communication skills, entrepreneurial, ethical and social concern.

Mission

- To impart quality technical education in Electronics and Communication Engineering with well established infrastructure, state of the art laboratories, core instructions and cognizant faculty.
- To prepare the young and dynamic Electronics and Communication Engineers professionally deft and intellectually adept with knowledge, behaviour and information competency.
- To enable the learners for changing trends in the field of Electronics and Communication Engineering with a focus on career guidance, placements and higher education by Industry-Institute relationship.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: Graduates should be cognizant in basic science, fundamental engineering stream along with core related domains in ECE and Allied fields.

PEO2: Graduates should understand issues related to design, problem solving, and intellectually adept with knowledge, behavior and information competency.

PEO3: Graduates should demonstrate their technical, communication, research, aptitudes along with leadership skills in professional environment to empower employability, higher education and entrepreneurs successfully through industry-institute interaction.

PEO4: Graduate should be motivated with high ethical, human values and team work towards development of the societ.

PROGRAM OUTCOMES

PO1: ENGINEERING KNOWLEDGE: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: PROBLEM ANALYSIS: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: DESIGN/DEVELOPMENT OF SOLUTIONS: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: MODERN TOOL USAGE: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: THE ENGINEER AND SOCIETY: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: ENVIRONMENT AND SUSTAINABILITY: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: ETHICS: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: INDIVIDUAL AND TEAM WORK: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: COMMUNICATION: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: PROJECT MANAGEMENT AND FINANCE: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: LIFE-LONG LEARNING: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES

PSO1: An ability to get an employment in Electronics and Communication Engineering field and related industries and to participate & succeed in competitive examinations like GRE, GATE,TOEFL, PSUs, etc.

PSO2: Should be able to design and test various electronic systems that perform analog and digital processing functions.

Renewable Energy

Renewable energy uses energy sources that are continually replenished by naturethe sun, the wind, water, the Earth’s heat, and plants. Renewable energy technologies turn these fuels into usable forms of energy most often electricity, but also heat, chemicals, or mechanical power.

Today we primarily use fossil fuels to heat and power our homes and fuel our cars. It’s convenient to use coal, oil, and natural gas for meeting our energy needs, but we have a limited supply of these fuels on the Earth. We’re using them much more rapidly than they are being created. Eventually, they will run out. And because of safety concerns and waste disposal problems, the United States will retire much of its nuclear capacity by 2020. In the meantime, the nation’s energy needs are expected to grow by 33 percent during the next 20 years. Renewable energy can help fill the gap.

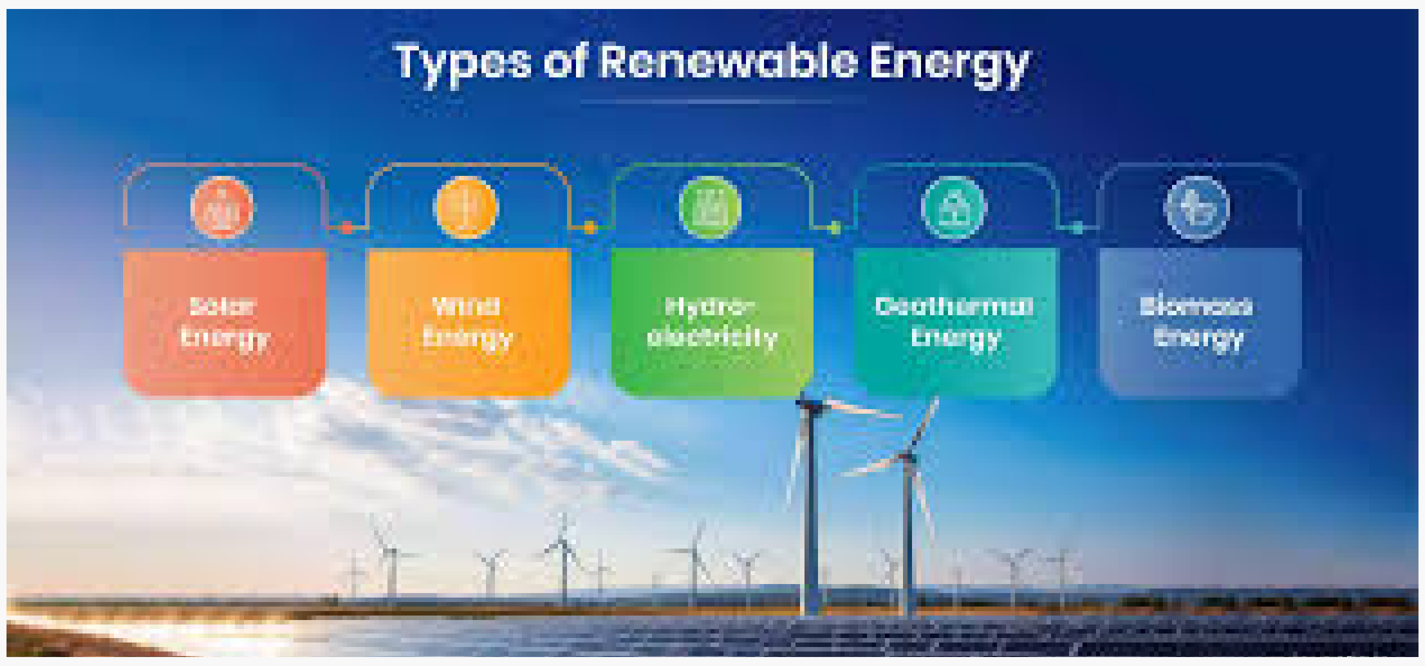
Even if we had an unlimited supply of fossil fuels, using renewable energy is better for the environment. We often call renewable energy technologies “clean” or “green” because they produce few if any pollutants. Burning fossil fuels, however, sends greenhouse gases into the atmosphere, trapping the sun’s heat and contributing to global warming. Climate scientists generally agree that the Earth’s average temperature has risen in the past century. If this trend continues, sea levels will rise, and scientists predict that floods, heat waves, droughts, and other extreme weather conditions could occur more often.

Hydropower is our most mature and largest source of renewable power, producing about 10 percent of the nation’s electricity. Existing hydropower capacity is about 77,000 megawatts (MW). Hydropower plants convert the energy in flowing water into electricity. The most common form of hydropower uses a dam on a river to retain a large reservoir of water. Water is released through turbines to generate power. “Run of the river” systems, however, divert water from the river and direct it through a pipeline to a turbine.

Hydropower plants produce no air emissions but can affect water quality and wildlife habitats. Therefore, hydropower plants are now being designed and operated to minimize impacts on the river. Some of them are diverting a portion of the flow around their dams to mimic the natural flow of the river. But while this improves the wildlife's river habitat, it also reduces the power plant's output. In addition, fish ladders and other approaches, such as improved turbines, are being used to assist fish with migration and lower the number of fish killed.

Bioenergy is the energy derived from biomass (organic matter), such as plants. If you've ever burned wood in a fireplace or campfire, you've used bioenergy. But we don't get all of our biomass resources directly from trees or other plants. Many industries, such as those involved in construction or the processing of agricultural products, can create large quantities of unused or residual biomass, which can serve as a bioenergy source.

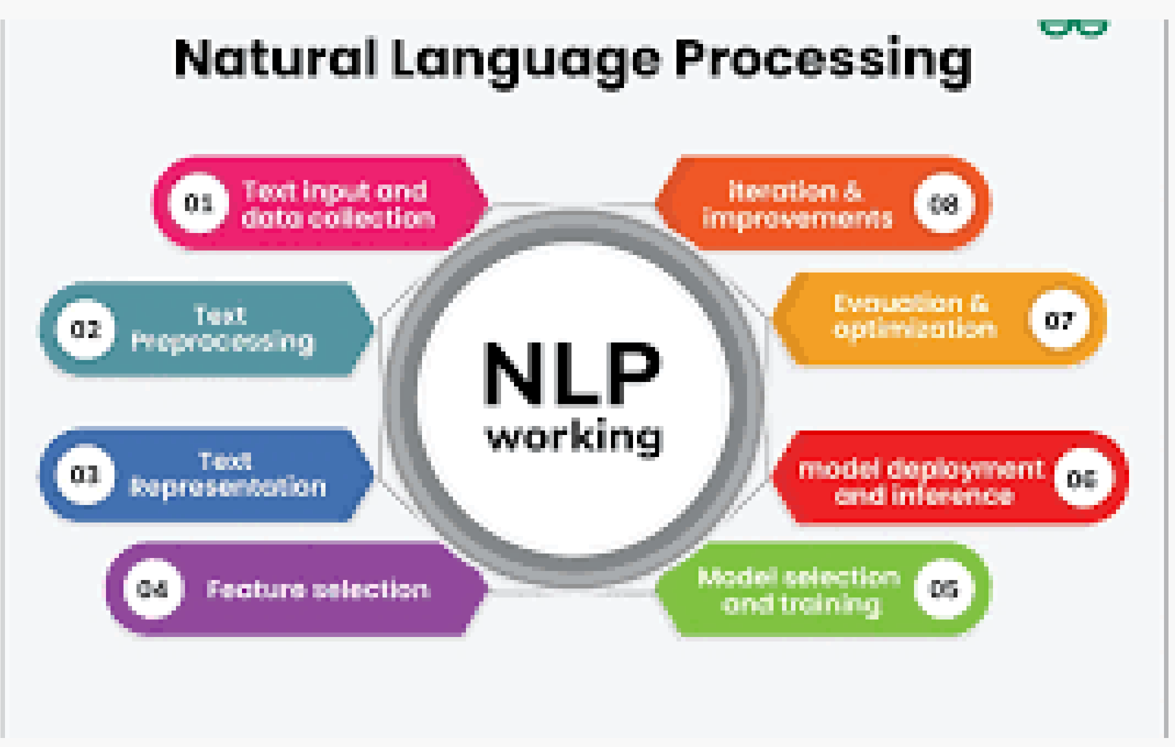
After hydropower, biomass is this country's second-leading resource of renewable energy, accounting for more than 7,000 MW of installed capacity. Some utilities and power generating companies with coal power plants have found that replacing some coal with biomass is a low-cost option to reduce undesirable emissions. As much as 15 percent of the coal may be replaced with biomass. Biomass has less sulfur than coal. Therefore, less sulfur dioxide, which contributes to acid rain, is released into the air. Additionally, using biomass in these boilers reduces nitrous oxide emissions. A process called gasification the conversion of biomass into gas, which is burned in a gas turbineis another way to generate electricity. The decay of biomass in landfills also produces gas, mostly methane, which can be burned in a boiler to produce steam for electricity generation or industrial processes. Biomass can also be heated in the absence of oxygen to chemically convert it into a type of fuel oil, called pyrolysis oil. Pyrolysis oil can be used for power generation and as a feedstock for fuels and chemical production.

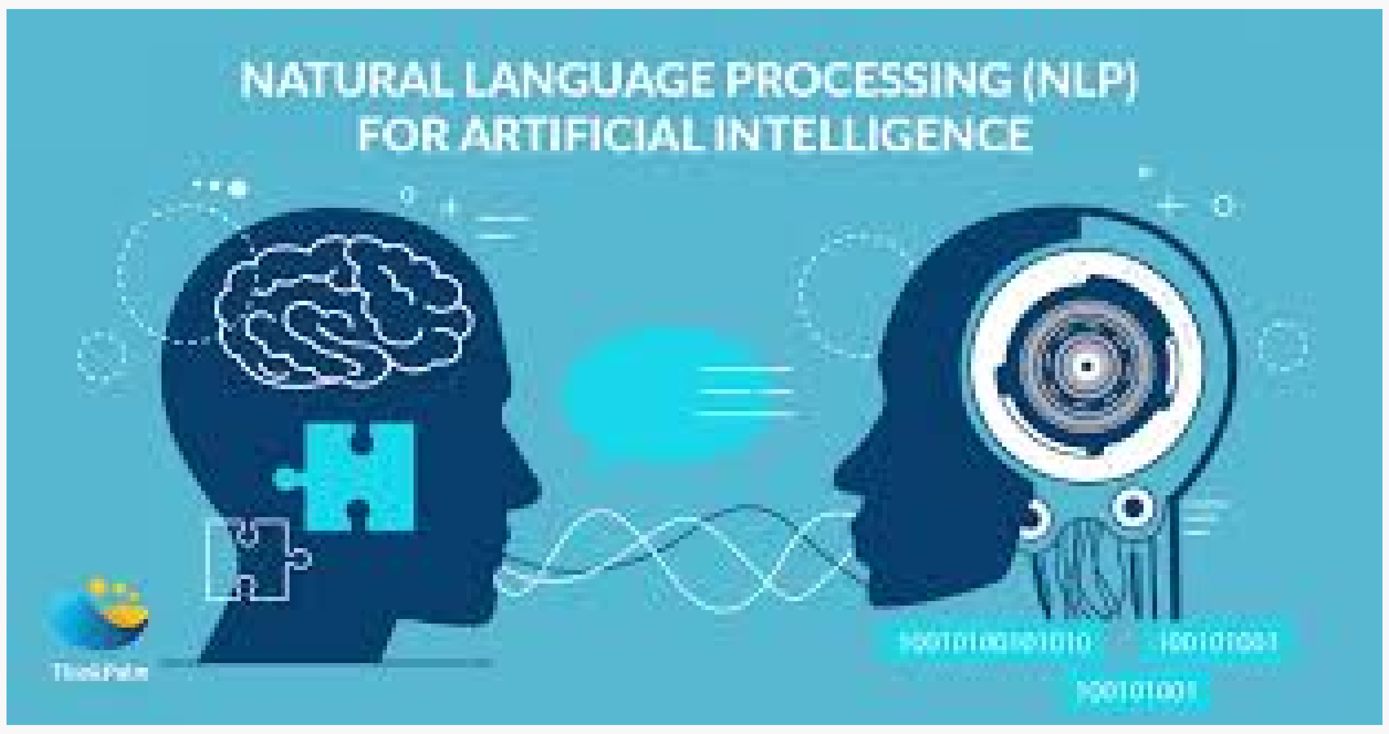


-------------------- **22BFA04331- Bojja Vamsi**

Natural Language Processing

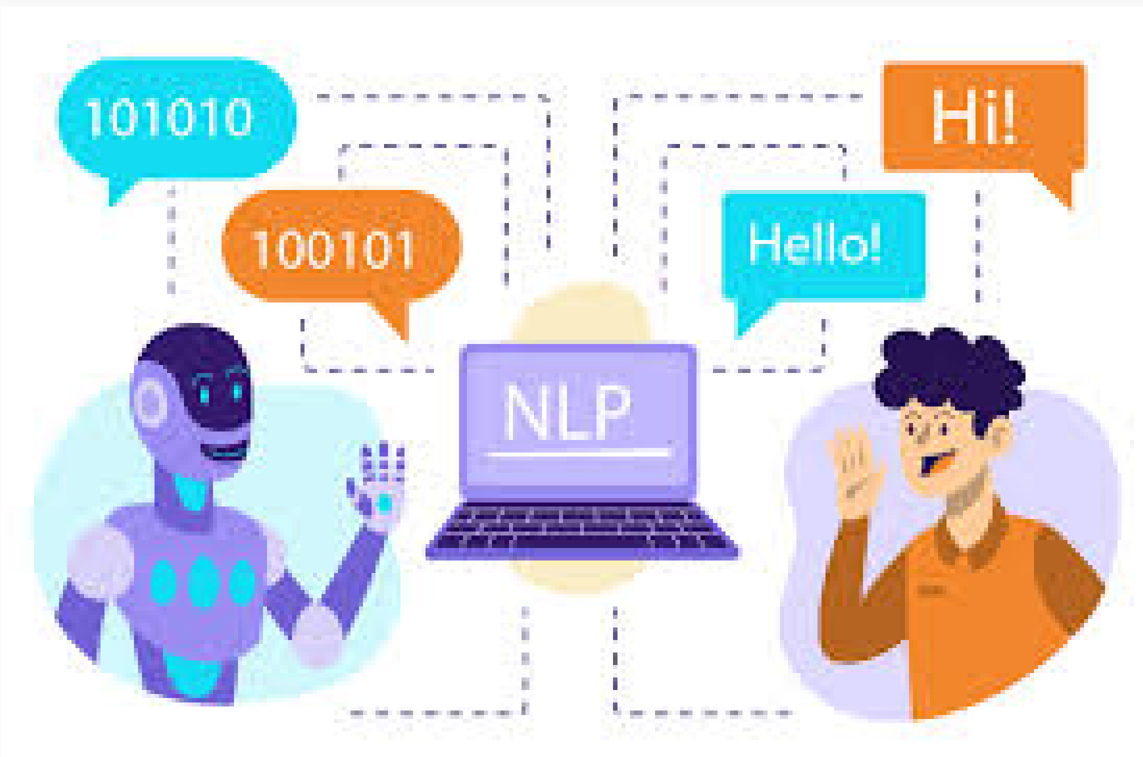
We propose a unified neural network architecture and learning algorithm that can be applied to various natural language processing tasks including part-of-speech tagging, chunking, named entity recognition, and semantic role labeling. This versatility is achieved by trying to avoid task-specific engineering and therefore disregarding a lot of prior knowledge. Instead of exploiting man-made input features carefully optimized for each task, our system learns internal representations on the basis of vast amounts of mostly unlabeled training data. This work is then used as a basis for building a freely available tagging system with good performance and minimal computational requirements.

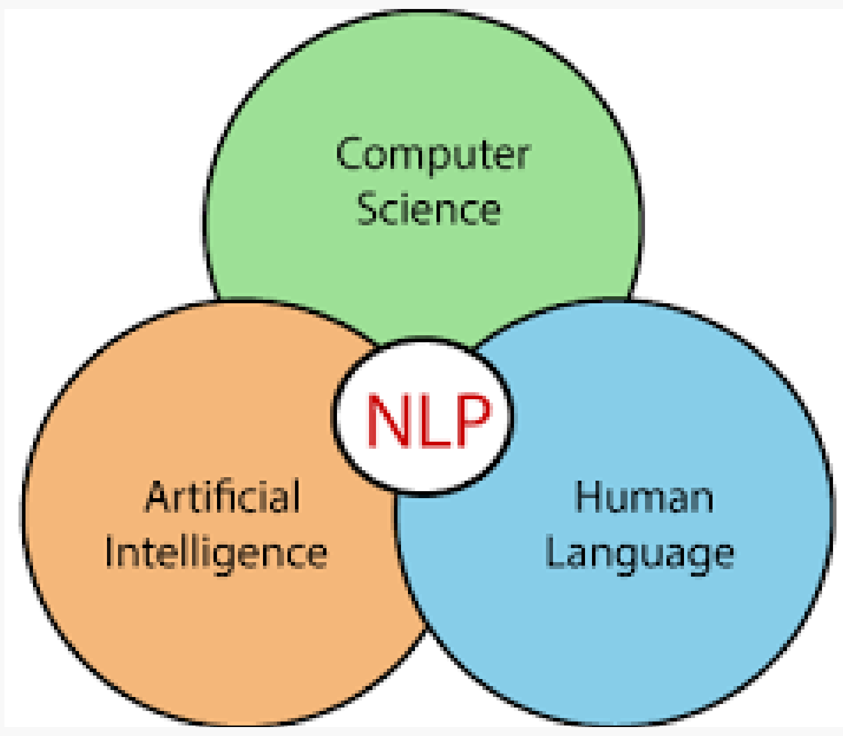


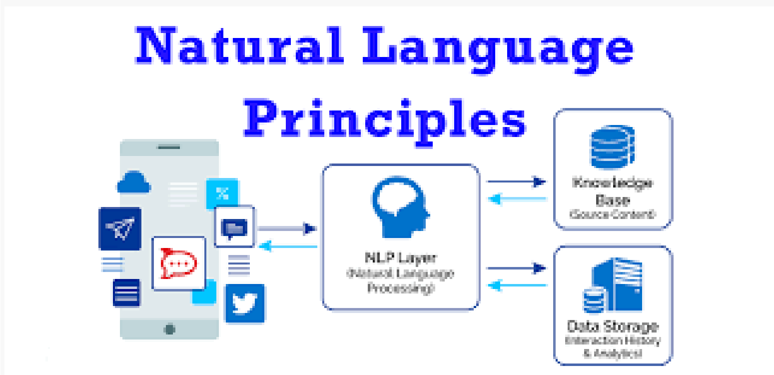


Will a computer program ever be able to convert a piece of English text into a programmer friendly data structure that describes the meaning of the natural language text? Unfortunately, no consensus has emerged about the form or the existence of such a data structure. Until such fundamental Articial Intelligence problems are resolved, computer scientists must settle for the reduced objective of extracting simpler representations that describe limited aspects of the textual information. These simpler representations are often motivated by specific applications (for instance, bagof-words variants for information retrieval), or by our belief that they capture something more general about natural language. They can describe syntactic information (e.g., part-of-speech tagging, chunking, and parsing) or semantic information (e.g., word-sense disambiguation, semantic role labeling, named entity extraction, and anaphora resolution). Text corpora have been manually annotated with such data structures in order to compare the performance of various systems. The availability of standard benchmarks has stimulated research in Natural Language Processing (NLP) and effective systems have been designed for all these tasks. Such systems are often viewed as software components for constructing real-world NLP solutions.

Although we believe that this contribution represents a step towards the "NLP from scratch" objective, we are keenly aware that both our goal and our means can be criticized. The main criticism of our goal can be summarized as follows. Over the years, the NLP community has developed a considerable expertise in engineering effective NLP features. Why should they forget this painfully acquired expertise and instead painfully acquire the skills required to train large neural networks? As mentioned in our introduction, we observe that no single NLP task really covers the goals of NLP. Therefore we believe that task-specific engineering (i.e., that does not generalize to other tasks) is not desirable. But we also recognize how much our neural networks owe to previous NLP task-specific research. The main criticism of our means is easier to address. Why did we choose to rely on a twenty year old technology, namely multilayer neural networks? We were simply attracted by their ability to discover hidden representations using a stochastic learning algorithm that scales linearly with the number of examples. Most of the neural network technology necessary for our work has been described ten years ago (e.g., Le Cun et al., 1998). However, if we had decided ten years ago to train the language model network LM2 using a vintage computer, training would only be nearing completion today. Training algorithms that scale linearly are most able to benefit from such tremendous progress in computer hardware.





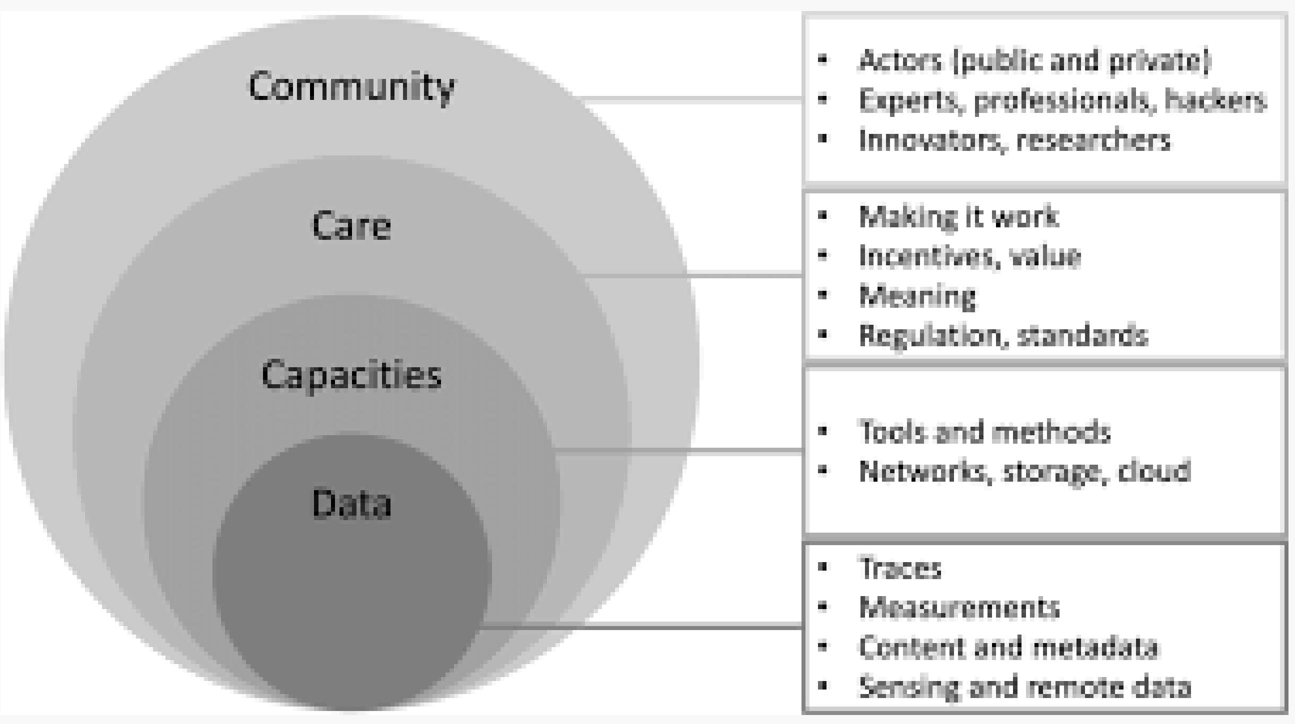


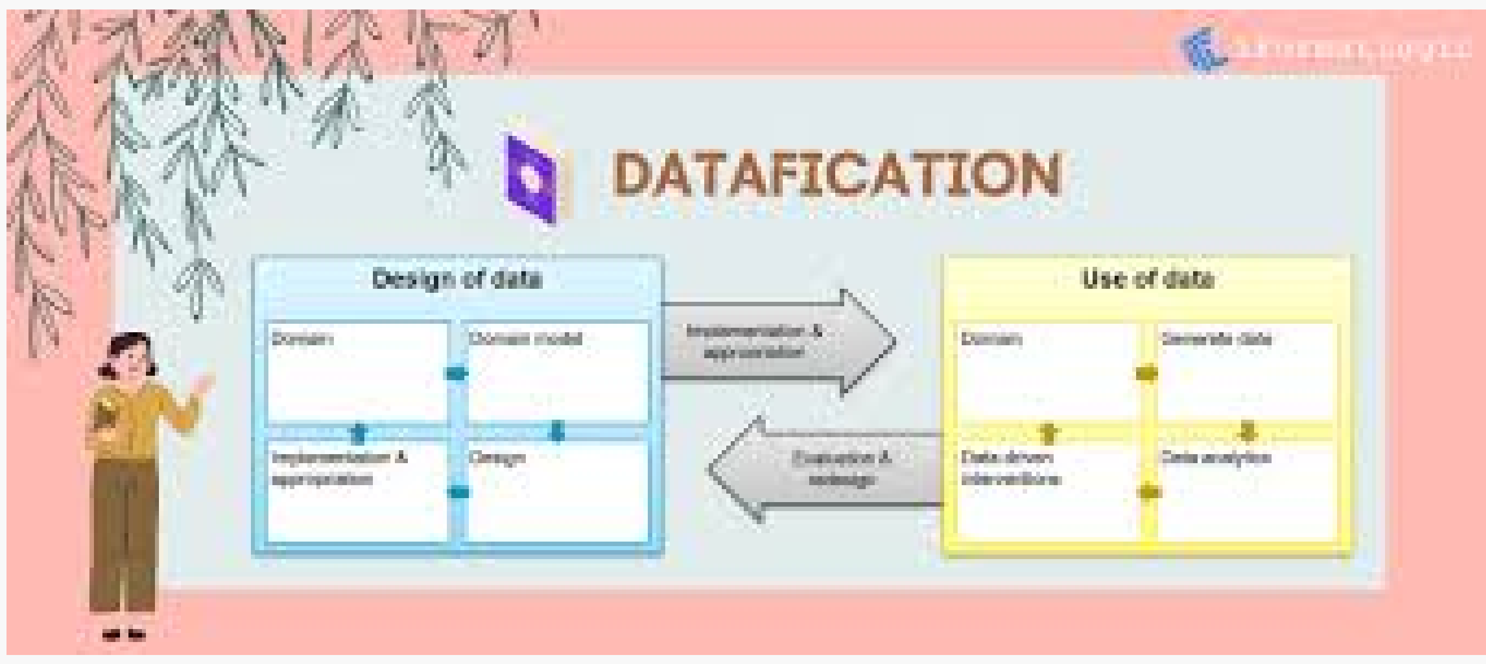
We have presented a multilayer neural network architecture that can handle a number of NLP tasks with both speed and accuracy. The design of this system was determined by our desire to avoid task-specific engineering as much as possible. Instead we rely on large unlabeled data sets and let the training algorithm discover internal representations that prove useful for all the tasks of interest. Using this strong basis, we have engineered a fast and efficient "all purpose" NLP tagger that we hope will prove useful to the community.

------------- 22BFA04350- Palem Teja

Datafication

Datafication has become an increasingly prevalent trend in the digital age, transforming the way we interact with technology and consume media. One industry that has been heavily impacted by datafication is Over-the-Top (OTT) services, which leverage user data to generate personalized content recommendations. While these recommendations have improved the viewing experience for many users, there are also concerns around privacy and security risks associated with datafication. This research paper examines the impact of datafication on OTT services and the experiences and perceptions of users towards personalized content recommendations. A survey and interviews were conducted with OTT users to gather insights into their usage habits, level of comfort with data collection, trust in algorithms, and more. The findings suggest that while users generally appreciate the benefits of personalized recommendations, they also desire more transparency and control over their data. This paper contributes to the growing literature on datafication and its impact on user privacy, offering insights into the ethical implications of data-driven technologies in the context of OTT services.





Datafication is the process of collecting, analyzing, and utilizing vast amounts of data to drive insights and decision-making. It has had a significant impact on various industries, including the Over-The-Top (OTT) industry. With the rise of datafication, OTT providers have been able to provide personalized recommendations to users, increasing user engagement and satisfaction. However, datafication has also presented several challenges for OTT providers, including privacy concerns, bias, and a lack of diversity. To study the impact of datafication on OTT, a mixed-methods research approach was used. Surveys and interviews were conducted with OTT users to understand their experiences and perceptions of datafication and recommendation engines.

Data analytics was also used to analyse user data such as viewing history, clickstream data, and user feedback. Survey Methodology: The survey methodology is a quantitative research method that uses structured questionnaires to collect data from a sample of participants. The following are the steps involved in conducting a survey:

a. Define the research question and hypothesis.

b. Identify the target population and the sampling method.

c. Develop a questionnaire with closed-ended questions.

d. Pilot test the questionnaire to ensure it is clear and concise.

e. Administer the questionnaire to the sample.

f. Analyse the data using statistical software.

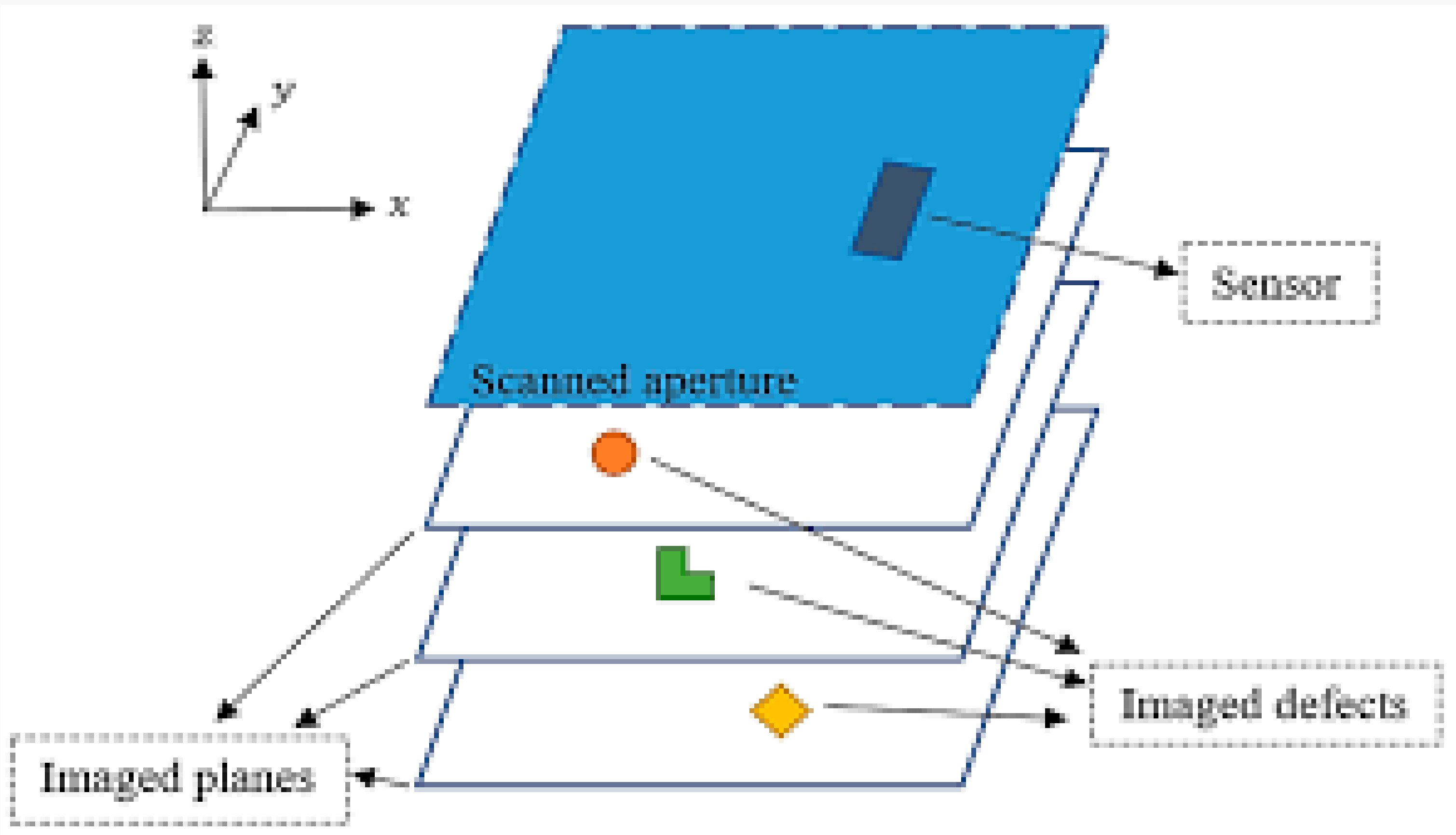
g. Draw conclusions and report the findings.

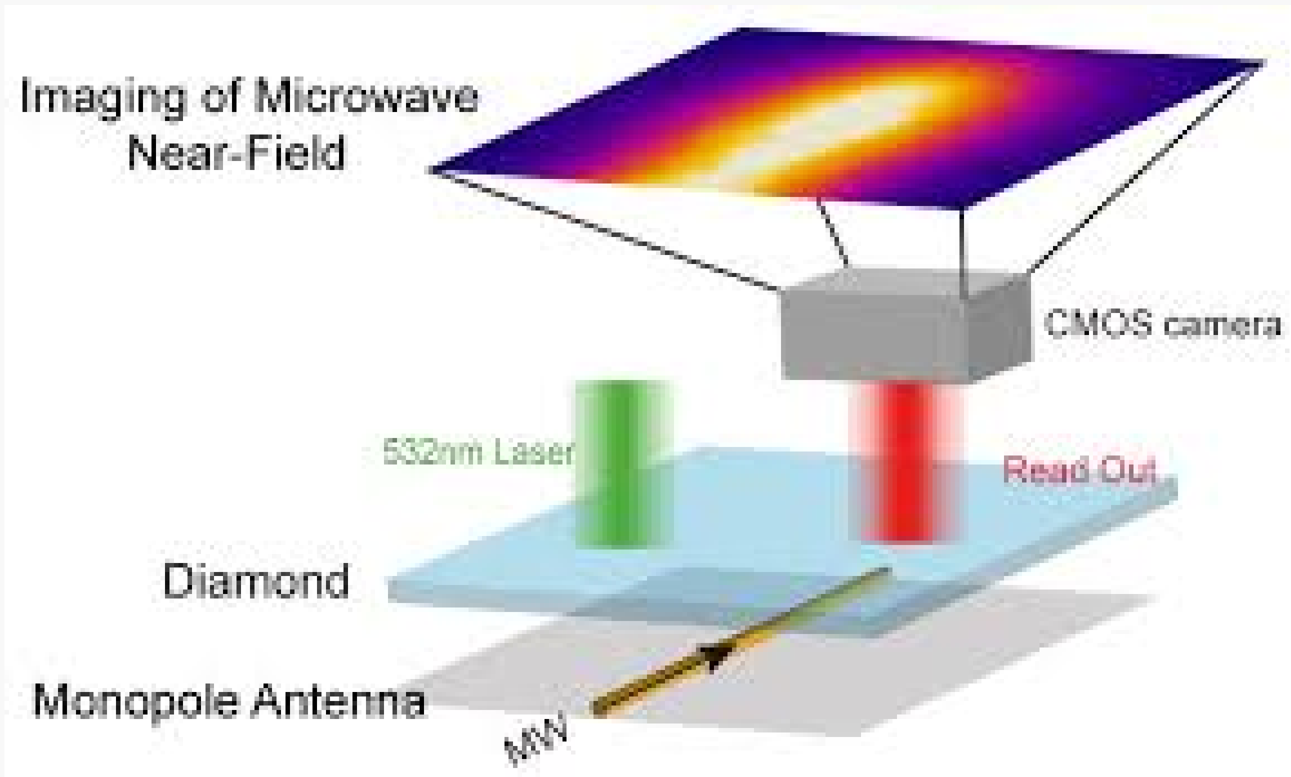
The research findings indicate that datafication has had a significant impact on the OTT industry. Users have come to expect personalized recommendations based on their viewing history, and OTT providers have responded by developing sophisticated algorithms to deliver these recommendations. However, users also have concerns about privacy and data security, with some feeling uncomfortable with the amount of data being collected and the lack of transparency around data usage. The research also found that recommendation engines can be biased and lack diversity. The algorithms may rely too heavily on user data, leading to a lack of diversity in the content suggested to users. Additionally, the algorithms may not always have a complete understanding of the context in which users are watching content, leading to recommendations that are not relevant or appropriate.

-------------- 22BFA04373- P Sai Eswari

Near-Field Imaging of Dielectric Components Using an Array of Microwave Sensors

Microwave imaging is a high-resolution, noninvasive, and noncontact method for detecting hidden defects, cracks, and objects with applications for testing nonmetallic components such as printed circuit boards, biomedical diagnosis, aerospace components inspection, etc. In this paper, an array of microwave sensors designed based on complementary split ring resonators (CSRR) are used to evaluate the hidden features in dielectric media with applications in nondestructive testing and biomedical diagnosis. In this array, each element resonates at a different frequency in the range of 1 GHz to 10 GHz. Even though the operating frequencies are not that high, the acquisition of evanescent waves in extreme proximity to the imaged object and processing them using near-field holographic imaging allows for obtaining high-resolution images. The performance of the proposed method is demonstrated through simulation and experimental results.

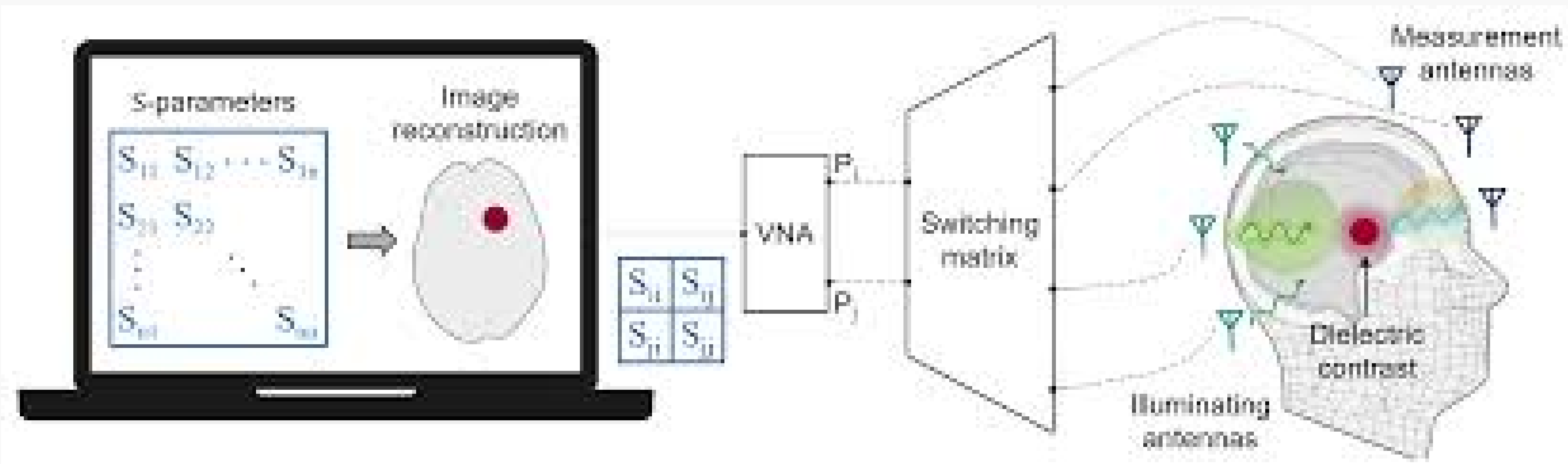




Nonmetallic and dielectric components are highly in demand throughout various industries due to advantages such as low-cost, light weight, resistance to corrosion, durability, and more. Material technology has produced lighter, stiffer, stronger, and more durable electrically insulating composites which are replacing metallic components in various applications. For instance, the use of certain types of composites allows commercial airplanes to operate with higher pressure and humidity while being lightweight.

To resolve this problem, microwave imaging and sensing for nonmetallic and dielectric components have been popular among all nondestructive testing (NDT) techniques due to their promising results. Microwave NDT features advantages such as being noncontact, low power, compact, robust, and able to obtain images with high resolutions. Therefore, microwave NDT has been applied to different applications. For example, the electronic industry is concerned with delamination in composite materials that are used for PCB substrates. This leads to strength deterioration and results in structural failure. To address this problem, an electromagnetic band gap (EBG) planar microwave microstrip sensor has been proposed in to detect delamination in fiber-reinforced epoxy-based PCB laminates. Similarly, an automatic crack detection technique for the quality check of FR4 has been proposed in where a microwave planar sensing probe has been designed. Furthermore, in, the capability of near-field microwave NDT methods for detecting and evaluating corrosion under paint has been shown. Another application of high-resolution imaging of dielectric media is in estimating the size of tumors in early-stage malignant melanoma skin cancer.

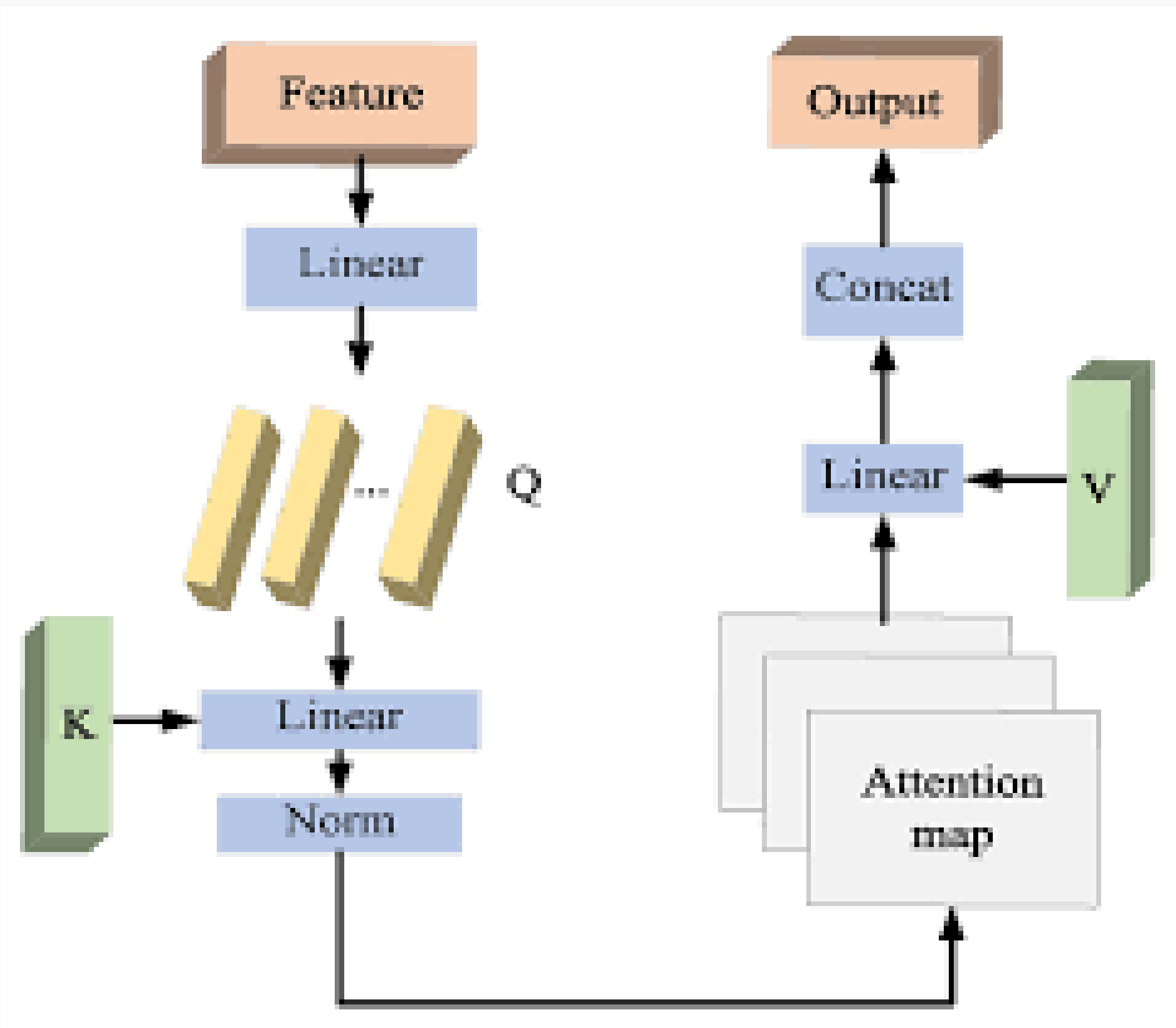
Various configurations of microwave sensors have been utilized depending on the targeted applications. For example, in, a spiral resonator excited by an electrically small loop is employed for microwave near-field imaging of various defects. Furthermore, a splitring resonator sensor has been designed for near-field microwave imaging of composites through edge coupling. Noninvasive measurements of thickness and permittivity in multilayered dielectric structures using complementary split ring resonator (CSRR) sensors have been proposed. Furthermore, different types of CSRR sensors have also been designed and used for microwave imaging of subsurface flaws in coated metallic structures and composite structures.



-------------- 19BF1A04L4 Pravallika Siddavatam

HTC-Grasp: A Hybrid Transformer-CNN Architecture for Robotic Grasp Detection

Accurately detecting suitable grasp areas for unknown objects through visual information remains a challenging task. Drawing inspiration from the success of the Vision Transformer in vision detection, the hybrid Transformer-CNN architecture for robotic grasp detection, known as HTC-Grasp, is developed to improve the accuracy of grasping unknown objects. The architecture employs an external attention-based hierarchical Transformer as an encoder to effectively capture global context and correlation features across the entire dataset. Furthermore, a channel-wise attentionbased CNN decoder is presented to adaptively adjust the weight of the channels in the approach, resulting in more efficient feature aggregation. The proposed method is validated on the Cornell and the Jacquard dataset, achieving an image-wise detection accuracy of 98.3% and 95.8% on each dataset, respectively. Additionally, the object-wise detection accuracy of 96.9% and 92.4% on the same datasets are achieved based on this method. A physical experiment is also performed using the Elite 6Dof robot, with a grasping accuracy rate of 93.3%, demonstrating the proposed method's ability to grasp unknown objects in real scenarios. The results of this study indicate that the proposed method outperforms other state-of-the-art methods. In the most recent decade, the advancement of artificial intelligence has made smart robots increasingly important in industries such as smart factories and healthcare. Among the tasks performed by these robots, grasping objects is a fundamental ability that enables them to carry out more complex operations.



Vision-based automated grasping, where the robot uses visual sensors to identify the best gripping position for an object, is crucial for their intelligence and automation. However, despite the advancements in the field, most of the current methods are still limited to models of known objects or trained for known scenes, making the task of grasping unknown objects, with high accuracy, a significant challenge. Currently, most grasp detection methods for vision robots rely on convolutional neural networks (CNNs). Despite their popularity, CNNs have limitations in handling grasping tasks. They are designed to process local information through their small convolutional kernels and have difficulty capturing global information due to limited filter channels and convolution kernel sizes. The convolutional computation method used by CNNs also makes it challenging to capture long-distance dependency information during information processing. Transformer architecture has seen great success in the field of vision lately. The Transformer's self-attention mechanism provides a more comprehensive understanding of image features compared to CNNs. The Transformer has the ability to effectively.

capture global information through its self-attentive mechanism, which makes it a more representative model. While the self-attention mechanism of the Transformer is useful for capturing information within a single sample, it may not fully leverage the potential connections between different samples. In the task of grasping, the features of the grasping target are often correlated, and the background features of similar scenes are consistent. Thus, considering the potential connections between different samples can lead to a more robust feature representation. To address this challenge, the proposed HTC-Grasp incorporates external attention in the transformer block to enhance the representation of correlations between different images. Moreover, the multi-scale feature fusion mechanism introduces a significant amount of noisy features, which can negatively impact grasp detection performance. To mitigate this issue and improve the role of effective features, the proposed framework incorporates a residual connection-based channel attention block in the decoder. This approach enables efficient learning of discriminative channel-wise features.

------------- 19BF1A04F7 Sahithi Muppala