

INT404 – Artificial Intelligence

CA1 – Seminar Report

Artificial Intelligence on Robotics

School of Computer Science & Engineering
LOVELY PROFESSIONAL UNIVERSITY

March 2023



L OVELY
P ROFESSIONAL
U NIVERSITY

SUBMITTED TO – Dr. Suma Kamalesh Gandhimathi

Name (Project Head)	- Gautam Sunuwar and Amit Kumar
Registration Number	- 12111066
Mail Id	- sunofwar23@gmail.com
Name	- Gautam Sunuwar
Registration Number	- 12111066
Name	- Amit Kumar Dansena
Registration Number	- 12111643
CLASS NAME	- K21DP
TEAM NUMBER	-

TABLE OF CONTENTS

[illegible]

4	Hand Gesture Control Car The Bot 4.1 Introduction 4.2 About The Bot 4.3 Components Required for Building The Bot	21-25
5	Machine Learning requirement for Bot	26-27
6	How Does the Bot Work	28
7	Future Scope 7.1 Healthcare 7.2 Transportation 7.3 Finance 7.4 Manufacturing 7.5 Education 7.6 Agriculture 7.7 Entertainment Future of AI in Robotics..... 1. Autonomous Navigation 2. Intelligent Automation 3. Human-Robot Collaboration 4. Personalized Service 5. Industrial Robotics 6. Entertainment Robotics 7. Medical Robotics	29-33
8	Conclusion Conclusion of The proposed System	34-35
	References	36

LIST OF FIGURES

Figure Names	Page No.
Artificially Intelligent Machines Figure1	09
Robotics in Image Recognition Figure2	11
Robotics in Speech and Language Recognition Figure 3	12
Robotics in Autonomous Operation Figure 4	13
Robotics in Machine Learning Figure 5	14
Robotics in Vision System Figure 6	15
Number of parameters in notable Artificial System Table 1 Figure 7	20
Market usage of Robots in Japan Table 2 Figure 8	20
Survey Report of future of market share of AI Table 3 Figure 9	22
Robotic Technology likely to be adopted by 2030 by various industries Table 4 Figure 10	24

LIST OF TABLES

Table Names	Page No.
Number of parameters in notable Artificial System Table 1	20
Market usage of Robots in Japan Table 2	20
Survey Report of future of market share of AI Table 3	22
Robotic Technology likely to be adopted by 2030 by various industries Table 4	24

CHAPTER 1

INTRODUCTION

Artificial Intelligence (AI) is a rapidly growing field of computer science and engineering that aims to create machines that can perform tasks that normally require human intelligence, such as perception, reasoning, and learning. AI has a wide range of applications in various fields, including healthcare, finance, transportation, and entertainment, among others.

One of the key approaches to AI is machine learning, which involves building models and algorithms that allow machines to learn from data and improve their performance over time. Machine learning algorithms are often used in image and speech recognition, natural language processing, and other applications where pattern recognition is important.

Another approach to AI is rule-based systems, which involve the use of predefined rules to make decisions. Rule-based systems are often used in expert systems, which are designed to mimic the decision-making processes of human experts in specific domains, such as medicine or finance. Deep learning is a type of machine learning that uses neural networks to simulate the human brain's processing of information. Deep learning has been particularly successful in applications such as computer vision, natural language processing, and robotics.

AI also raises ethical and societal issues that need to be addressed. One of the major concerns is the potential impact of AI on employment. As AI systems become more advanced, there is a risk of job displacement, particularly in industries such as manufacturing and transportation. Another ethical issue is bias in algorithms, which can lead to discrimination and other negative consequences. There is also a risk of misuse of AI systems, such as the development of autonomous weapons or the use of AI for surveillance purposes.

To address these issues, there is a growing focus on developing ethical and responsible AI. This involves designing AI systems with ethical considerations in mind, such as ensuring transparency, accountability, and fairness. There is also a need for greater collaboration between technology companies, policymakers, and civil society to ensure that AI is developed and deployed in a way that benefits everyone.

AI is transforming many industries, including healthcare, finance, and transportation. In healthcare, AI is being used to develop new treatments and improve patient outcomes. In finance, AI is being used for fraud detection and risk management. In transportation, AI is being used to develop autonomous vehicles that can improve safety and reduce congestion.

1.1 Philosophy of AI

The philosophy of AI deals with the fundamental questions about the nature of intelligence, consciousness, and what it means to be human, which arise from the development and application of Artificial Intelligence (AI).

One of the central questions in the philosophy of AI is whether machines can truly be said to be intelligent or possess consciousness. Some philosophers argue that intelligence and consciousness are the result of complex biological processes that cannot be replicated by machines. Others argue that machines can possess intelligence and consciousness to some degree, depending on the complexity of the tasks they can perform.

Another area of the philosophy of AI is epistemology, which deals with the study of knowledge and how it is acquired. Questions such as how AI systems can learn and how they can acquire knowledge and understanding of the world are central to the development of AI. This raises questions about the limitations of AI systems and whether they can truly understand the world in the same way that humans do.

The ethics of AI is also a key area of the philosophy of AI. As AI systems become more advanced and are deployed in various domains, they raise ethical questions about their impact on society, such as privacy, bias, and the displacement of jobs. These issues need to be addressed to ensure that AI is developed and deployed in an ethical and responsible manner.

Additionally, the philosophy of AI is also relevant to AI's relationship with human consciousness and intelligence. The study of consciousness, the self, and free will raises questions about whether AI systems can truly be said to possess consciousness or intelligence and what the implications of this would be.

Overall, the philosophy of AI plays an important role in shaping the development and deployment of AI and in understanding its potential impact on society and the human condition. By exploring fundamental questions about intelligence, consciousness, and ethics, philosophers can help to guide the development of AI in a way that is ethical, responsible, and aligned with human values.

1.2 Goals of AI

The goals of AI are to create machines that can perform tasks that normally require human intelligence, such as perception, reasoning, and learning. The development of AI aims to create machines that can think, reason, and act like humans, and to make intelligent decisions based on data and experience.

One of the primary goals of AI is to improve efficiency and productivity in various industries by automating tasks that are repetitive, time-consuming, or dangerous for humans to perform. AI can also help to solve complex problems by processing and analyzing large amounts of data more quickly and accurately than humans can.

Another goal of AI is to improve the quality of life for humans by providing new and innovative solutions to social and environmental challenges. For example, AI can be used in healthcare to develop new treatments, improve patient outcomes, and predict disease outbreaks. It can also be used in transportation to reduce traffic congestion and improve safety, and in energy to optimize resource usage and reduce environmental impact.

AI is also being used to enhance human capabilities, such as by developing prosthetic limbs that can be controlled by the user's thoughts or by developing brain-computer interfaces that can translate human thoughts into commands for machines.

In addition to these goals, there is a growing focus on developing ethical and responsible AI. This involves designing AI systems with ethical considerations in mind, such as ensuring transparency, accountability, and fairness. There is also a need for greater collaboration between technology companies, policymakers, and civil society to ensure that AI is developed and deployed in a way that benefits everyone.

Overall, the goals of AI are to create machines that can perform tasks that are difficult, time-consuming, or dangerous for humans, and to provide innovative solutions to social and environmental challenges. The development of ethical and responsible AI is also crucial to ensure that the benefits of AI are shared equitably, and that AI is developed and deployed in a way that aligns with human values and goals.

1.3 AI in Robotics

Artificial intelligence (AI) and Robotics, together, is the augmentation and imitation of human activity and behavior to increase output or efficiency. Driven in large by technological advancements and an increase in implementation and demand, these burgeoning fields have both gained a lot of attention in the last few years. However, their underlying sciences have been in development for decades. What is most interesting today is the intersection of these two fields, where advancements in both AI and robotics feed on each other, creating a multiplier effect on this intersection.

AI plays a significant role in robotics by enabling machines to perform tasks that require intelligence, perception, and decision-making. By integrating AI technologies into robotics, robots can perform complex tasks with greater accuracy and efficiency.

One of the most important aspects of AI in robotics is perception, which involves the ability of robots to interpret sensory data and understand their environment. AI algorithms can be used to process data from sensors such as cameras, lidar, and radar, allowing robots to recognize objects, navigate environments, and avoid obstacles.

Another important application of AI in robotics is in decision-making. AI algorithms can be used to analyze large amounts of data, such as sensor readings and environmental data, to make intelligent decisions in real-time. This enables robots to adapt to changing environments and make decisions based on the information available to them.

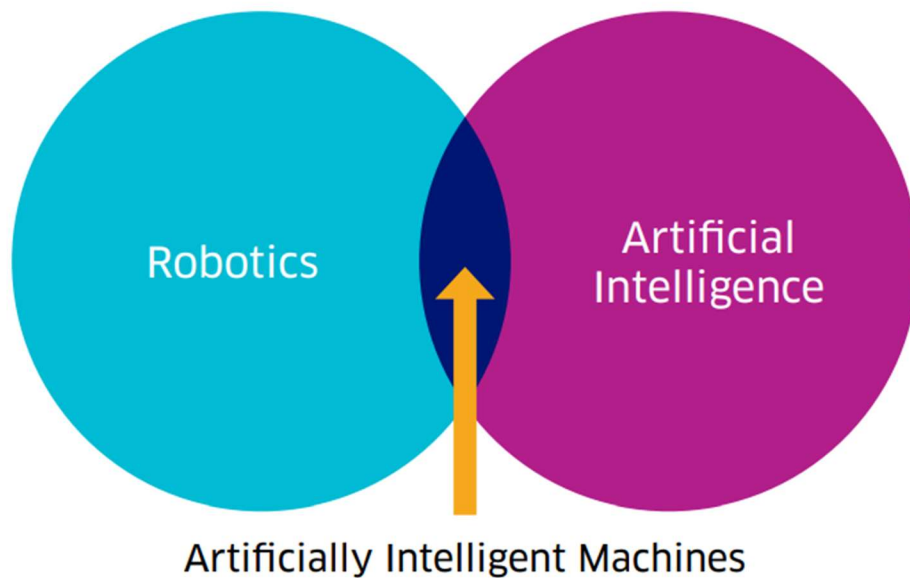
AI can also be used to improve the dexterity and precision of robots. By integrating machine learning algorithms into robotic control systems, robots can learn how to perform complex tasks with greater accuracy and precision, such as manipulating objects or assembling parts.

Furthermore, AI in robotics has also made significant advancements in areas such as autonomous vehicles, drones, and industrial automation. For example, autonomous vehicles and drones use AI to navigate environments and avoid collisions, while industrial robots use AI to optimize manufacturing processes and increase productivity.

This is a prime example of the Fourth Industrial Revolution we are in, defined by Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, as a “range of new technologies that are fusing the physical, digital and biological worlds”. The fusion and harmonization of fields allows them to grow more rapidly, and AI and robotics are an essential part of this breakthrough. This is one of the reasons why AI and robotics, together, are geared for exceptional growth.

1.4 Defining Artificial Intelligence & Robotics

Separately, AI and robotics are fundamentally different and can be used for a variety of purposes. Robots are programmable machines that can carry out routine tasks semi-or-fully autonomously. Artificial intelligence, on the other hand, is the development of computer models to complete tasks that would otherwise require human intelligence. In other words, artificial intelligence algorithms are generally self-trained to carry out tasks with some level of human behavior (e.g. language understanding capabilities). This shows that the two branches are fundamentally different, in that robots carry out pre-defined and routine tasks while artificial intelligence attempts to mimic “intelligence”. There is, however, an intersection of these two branches, which is artificially intelligent machines¹. Artificially intelligent robots or machines are the bridge between artificial intelligence and robotics. They are machines which are controlled by artificial intelligence programs. This allows robots to not only complete routine tasks but also more complex tasks requiring more “intelligence”. These two branches can be summarized with the Venn diagram below.



(Figure 1)

CHAPTER 2

DIFFERENT APPLICATIONS OF AI IN ROBOTICS

AI robotics in navigation refers to the use of Artificial Intelligence (AI) in robotic navigation systems, such as autonomous vehicles, drones, and other robots that move in physical environments. AI-powered robotic navigation systems use sensors, such as cameras, lidar, and radar, to detect and analyze the surrounding environment, and use AI algorithms to make intelligent decisions about how to move within it.

2.1 AI robotics in navigation

1. Autonomous vehicles: AI robotics is used to power the navigation systems in autonomous vehicles, enabling them to safely navigate roads and highways without human intervention. These systems use machine learning algorithms to recognize and respond to road signs, traffic signals, and other objects in the environment, and make intelligent decisions about how to drive.
2. Drones: AI robotics is used in drone navigation systems to enable them to fly autonomously and perform complex tasks, such as aerial surveys, inspections, and deliveries. These systems use sensors to detect and avoid obstacles and use machine learning algorithms to make intelligent decisions about how to fly.
3. Mobile robots: AI robotics is used in mobile robot navigation systems to enable them to move autonomously in complex environments, such as factories, warehouses, and hospitals. These systems use sensors to detect obstacles, analyze the environment, and make intelligent decisions about how to move.
4. Navigation planning: AI robotics is used to plan and optimize navigation routes for robotic systems, taking into account factors such as traffic, obstacles, and terrain. These systems use machine learning algorithms to analyze data from sensors and other sources and make intelligent decisions about the best path to take.

Overall, AI robotics is playing an increasingly important role in navigation systems, enabling robotic systems to navigate more efficiently and safely. As AI and robotics continue to advance, we can expect to see even more innovative applications of this technology in the field of navigation.

2.2 AI Robotics in Object Recognition

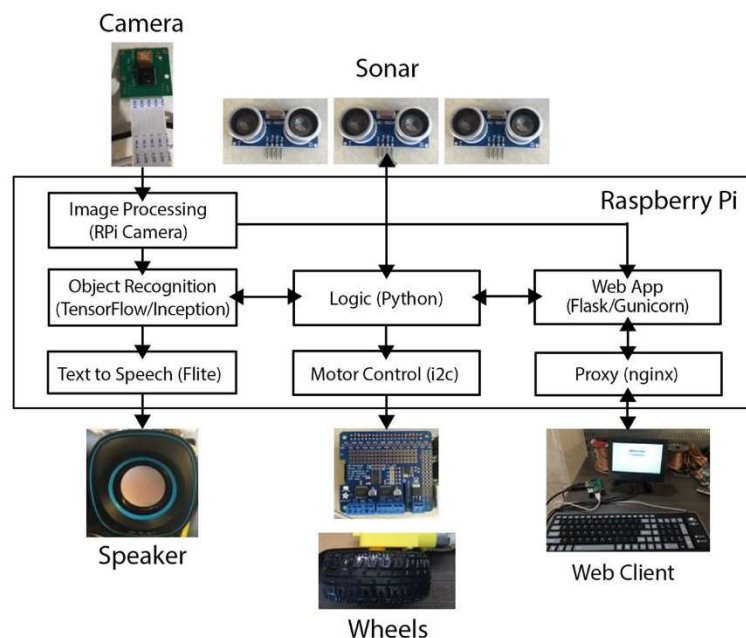
AI robotics have made significant advancements in the area of object recognition. Object recognition is the ability of a machine or robot to recognize and identify different objects within an image or video.

There are various techniques that AI robotics use for object recognition, including deep learning, computer vision, and neural networks. These techniques allow the robot to learn and recognize objects through training on large datasets of labeled images.

One popular method used in AI robotics for object recognition is convolutional neural networks (CNNs). CNNs are a type of neural network that can learn features in an image by processing it through a series of convolutional layers. These layers can learn specific patterns and features of the object and then use this information to recognize and classify the object.

Another technique used in AI robotics for object recognition is the use of lidar and radar sensors. These sensors use lasers and radio waves to detect the position and movement of objects in the robot's environment. The data from these sensors can be processed using machine learning algorithms to recognize and classify objects.

Overall, the use of AI robotics in object recognition has the potential to greatly enhance the capabilities of robots and enable them to perform complex tasks in various industries, including manufacturing, healthcare, and transportation.



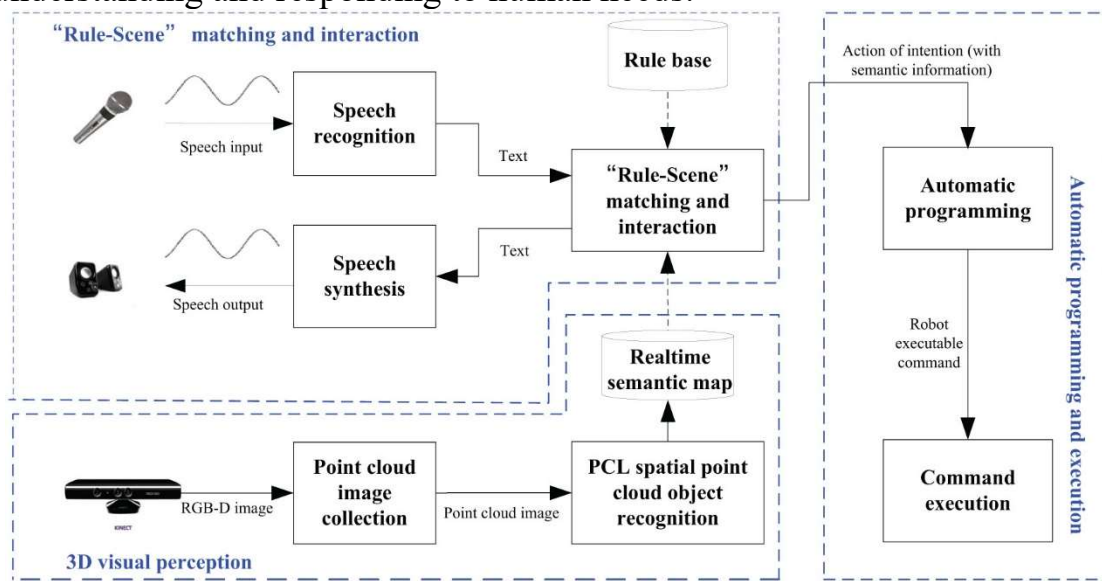
Robotics in image recognition (Figure 2)

2.3 AI Robotics in Speech and Language Recognition

AI robotics can use speech and language recognition to understand and interact with humans more effectively. Speech recognition involves the ability to convert spoken words into text, while language recognition refers to the ability to understand the meaning behind those words. There are many applications of speech and language recognition in AI robotics, including:

1. Personal assistants: AI robots can use speech recognition to understand voice commands and respond with appropriate actions. For example, an AI robot can respond to a command like "play music" by starting a music playlist.
2. Language translation: AI robots can use language recognition to translate speech from one language to another, enabling communication between people who speak different languages.
3. Customer service: AI robots can use speech and language recognition to understand customer queries and provide appropriate responses. This can help businesses save time and money by automating customer service tasks.
4. Healthcare: AI robots can use speech and language recognition to interact with patients and understand their medical needs. For example, an AI robot can ask patients about their symptoms and recommend appropriate treatments.

Overall, speech and language recognition can help AI robotics to become more efficient and effective in understanding and responding to human needs.



Robotics in Speech and Language recognition (Figure 3)

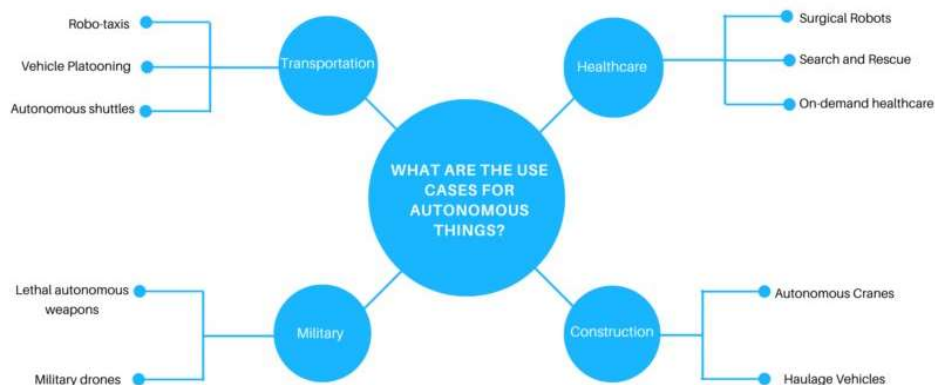
2.4 AI Robotics in Autonomous Operation

AI robotics in autonomous operation refers to the use of artificial intelligence and robotics technology to enable machines to operate without human intervention. This involves programming machines to make decisions based on real-time data and environmental inputs, allowing them to navigate and perform tasks on their own.

There are several areas where AI robotics are being used in autonomous operation, including:

1. **Manufacturing:** Robots are used in manufacturing to automate assembly lines, improve production efficiency, and reduce errors.
2. **Agriculture:** Autonomous robots are used for planting, harvesting, and monitoring crops. They can also analyze soil conditions and provide information on the health of plants.
3. **Transportation:** Self-driving cars and trucks are being developed and tested to improve road safety and reduce traffic congestion.
4. **Healthcare:** Robots are used in hospitals and other healthcare facilities to perform surgeries, deliver medication, and provide assistance to patients.
5. **Logistics:** Autonomous robots are being developed to deliver packages, sort and organize warehouse inventory, and perform other logistics tasks.

AI robotics in autonomous operation has the potential to revolutionize many industries and improve efficiency, safety, and productivity. However, it also raises concerns about the potential impact on employment and the need for ethical guidelines to ensure that machines operate in a safe and responsible manner.



Robotics in Autonomous Operation (Figure 4)

2.5 AI Robotics in Machine Learning

AI robotics and machine learning are closely related fields, as machine learning is a critical component in enabling robots to learn and make decisions on their own. Machine learning involves training algorithms on large amounts of data, allowing the algorithm to recognize patterns and make predictions based on that data.

In the context of AI robotics, machine learning is used to train robots to recognize objects, navigate environments, and make decisions based on real-time data inputs. For example, a robot may be trained to recognize and avoid obstacles in its path, or to identify and sort objects in a warehouse.

There are several types of machine learning algorithms used in AI robotics, including:

1. Supervised learning: This involves training a model on labeled data, with the goal of predicting future outcomes based on that data.
2. Unsupervised learning: This involves training a model on unlabeled data, with the goal of identifying patterns and relationships within the data.
3. Reinforcement learning: This involves training a model through trial and error, where the model receives feedback in the form of rewards or penalties based on its actions.

AI robotics and machine learning have numerous applications in various industries, including manufacturing, healthcare, transportation, and logistics. However, the development of AI robotics also raises concerns about the potential impact on employment and the need for ethical guidelines to ensure that machines operate in a safe and responsible manner.



Robotics in Machine Learning (Figure 5)

2.6 AI Robotics in Vision System

AI robotics in vision systems refers to the use of artificial intelligence and computer vision technology to enable robots to see and interpret their environment. Vision systems involve capturing visual data, processing it, and extracting meaningful information from it to enable robots to make decisions and take actions.

There are several ways in which AI robotics are being used in vision systems, including:

Object recognition: Robots can be trained to recognize and identify objects in their environment, allowing them to perform tasks such as sorting, assembly, and quality control.

Navigation: Vision systems can help robots navigate through complex environments, avoid obstacles, and locate specific objects or locations.

Inspection: Robots can be equipped with vision systems to inspect and analyze products for defects, ensuring that they meet quality standards.

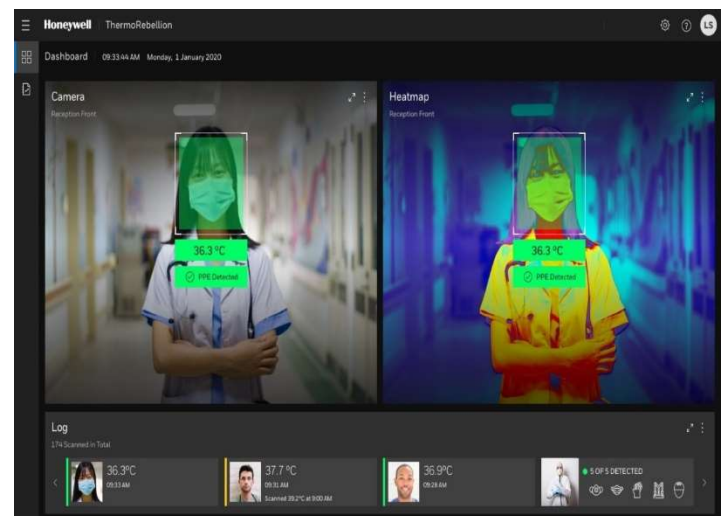
Surveillance: Vision systems can be used for security and surveillance purposes, allowing robots to monitor and detect unusual activity in real-time.

AI robotics in vision systems is revolutionizing many industries, including manufacturing, healthcare, and logistics. However, it also raises concerns about privacy and the potential for misuse, highlighting the importance of ethical guidelines and responsible use of this technology.



adenocarcinoma_left.lower.lobe_T2_N0_M0_Ib

adenocarcinoma_left.lower.lobe_T2_N0_M0_Ib	96%
normal	4%
large.cell.carcinoma_left.hilum_T2_N2_M0_IIIa	0%
squamous.cell.carcinoma_left.hilum_T1_N2_M0_IIIa	0%



Robotics in Vision System (Figure 6)

CHAPTER 3

IMPACT OF AI IN ROBOTICS

Artificial intelligence (AI) has had a significant impact on robotics in recent years. Here are a few ways AI has influenced robotics:

3.1 Improved perception:

AI has enabled robots to perceive their environment in more detail and make better decisions. For example, computer vision algorithms can identify objects and people, while machine learning models can help robots recognize patterns in data to make predictions about their environment. AI robotics has the potential to significantly improve perception, enabling robots to better interpret and interact with their environment. Perception refers to the ability of a robot to sense and interpret its surroundings, including visual, auditory, and tactile inputs.

Some ways in which AI robotics can improve perception include:

- 3.1.1 Computer vision: AI robotics can use computer vision algorithms to recognize and interpret visual data, allowing robots to identify objects, navigate through complex environments, and perform tasks such as sorting and assembly.
- 3.1.2 Speech recognition: AI robotics can use speech recognition technology to understand and interpret spoken commands, enabling robots to interact with humans more effectively.
- 3.1.3 Tactile sensing: AI robotics can be equipped with sensors that allow them to sense and interpret touch, enabling them to perform tasks that require dexterity and precision.
- 3.1.4 Sensor fusion: AI robotics can combine multiple sensors to improve perception, allowing robots to better understand their environment and make more informed decisions.

Improved perception through AI robotics has numerous applications in various industries, including manufacturing, healthcare, and transportation. It can lead to increased efficiency, safety, and productivity, as well as improved quality and consistency of output. However, it also raises concerns about the potential impact on employment and the need for responsible development and use of this technology.

3.2 Enhanced decision-making:

AI has enabled robots to make more informed decisions by analyzing large amounts of data and learning from past experiences. This has made robots more adaptable to changing situations and has improved their ability to perform complex tasks. AI robotics can significantly impact industries by enhancing decision-making, enabling robots to make more informed and accurate decisions. Enhanced decision-making through AI robotics involves the use of advanced algorithms and machine learning to analyze data and make predictions, allowing robots to make decisions that are faster and more accurate than those made by humans.

Some impacts of enhanced decision-making through AI robotics include:

- 3.2.1 Increased efficiency and productivity: AI robotics with enhanced decision-making can make faster and more informed decisions, leading to increased productivity and efficiency in various industries. For example, robots in a warehouse can use algorithms to optimize their routes and make real-time decisions based on changing conditions, leading to faster and more efficient order fulfillment.
- 3.2.2. Improvised safety: Robots with enhanced decision-making can make decisions that reduce the risk of injury or harm to human workers. For example, robots in a manufacturing plant can use algorithms to detect and respond to potential safety hazards, reducing the risk of accidents.
- 3.2.2 Cost savings: By automating decision-making processes, AI robotics with enhanced decision-making can reduce labor costs and improve supply chain efficiency, leading to cost savings for businesses. For example, robots in a logistics center.
- 3.2.4 Improved quality: AI robotics with enhanced decision-making can help ensure consistent and high-quality output, reducing the risk of errors and defects in products or services. For example, robots in a quality control department can use algorithms to detect and correct defects in real-time, leading to higher-quality products.
- 3.2.5 New job creation: While there are concerns about the potential impact of AI robotics on employment, this technology also has the potential to create new jobs in areas such as data analysis, algorithm development, and robot maintenance.

However, the development of AI robotics with enhanced decision-making also raises concerns about the potential impact on employment, privacy, and ethics. There is a need for responsible use of this technology and the development of ethical guidelines to ensure that AI robotics operate in a safe and responsible manner.

3.3 Increased autonomy:

With the help of AI, robots are becoming increasingly autonomous. They can learn from their environment and make decisions on their own, without the need for human intervention. This has led to the development of autonomous drones, self-driving cars, and other intelligent machines. Increased autonomy in AI refers to the ability of machines to perform tasks without human intervention. This technology has been made possible by advancements in machine learning, deep learning, and robotics.

Some ways in which increased autonomy in AI is being applied include:

- 3.3.1 **Autonomous Vehicles:** Self-driving cars and drones are examples of machines that can operate with increased autonomy. They use sensors, cameras, and machine learning algorithms to navigate their surroundings and make driving decisions without human intervention.
- 3.3.2 **Robotics:** Robots with increased autonomy can perform tasks in manufacturing, logistics, and healthcare with minimal human input. For example, robots can be programmed to pick and pack items in warehouses or assist surgeons in performing minimally invasive procedures.
- 3.3.3 **Natural Language Processing:** Natural language processing (NLP) allows machines to understand and interpret human language. This technology has been used to develop virtual assistants and chatbots that can interact with users and provide assistance without human intervention.
- 3.3.4 **Smart Homes and Buildings:** Smart homes and buildings are equipped with sensors and automation systems that allow them to operate with increased autonomy. For example, a smart thermostat can learn a homeowner's preferences and adjust the temperature accordingly, while a smart lighting system can adjust the brightness and color of lights based on the time of day and the activities in the room.

Increased autonomy in AI has the potential to significantly impact various industries by enabling machines to perform tasks faster, more accurately, and with greater safety. This can lead to increased efficiency, improved productivity, and cost savings. However, there are also concerns about the potential impact of AI on employment, privacy, and ethics, and the need for responsible development and use of this technology.

3.4 Improved safety:

AI has made robots safer to work with, as they can detect potential hazards and take appropriate action to avoid accidents. This is particularly important in manufacturing and other industrial settings, where robots work alongside human operators. Improved safety in AI refers to the development and use of AI technologies that prioritize safety and minimize risks to humans and the environment. This is a critical area of focus as AI becomes more prevalent in industries like healthcare, transportation, and manufacturing.

Some ways in which improved safety in AI is being applied include:

- 3.4.1 Predictive Maintenance: Machines can be equipped with sensors that monitor their performance and detect potential issues before they become serious. This allows for maintenance to be performed before a failure occurs, reducing the risk of accidents and downtime.
- 3.4.2 Autonomous Vehicles: Self-driving cars and drones are equipped with sensors and machine learning algorithms that allow them to navigate their surroundings and make driving decisions. This technology is being developed with a focus on safety, with the goal of reducing accidents caused by human error.
- 3.4.3 Healthcare: AI is being used in healthcare to improve patient safety by identifying patients at risk of developing certain conditions, predicting adverse events, and assisting with clinical decision making.
- 3.4.4 Environmental Monitoring: AI is being used to monitor and predict natural disasters, such as hurricanes, earthquakes, and floods. This technology can help to reduce the impact of these events by providing early warning systems and guiding emergency response efforts.

Improved safety in AI has the potential to save lives and prevent accidents in various industries. However, there are also concerns about the potential risks associated with AI, such as algorithmic bias and the potential for AI systems to malfunction. It is important for developers and users of AI technologies to prioritize safety and adhere to ethical guidelines to ensure that AI is developed and used in a responsible and safe manner.

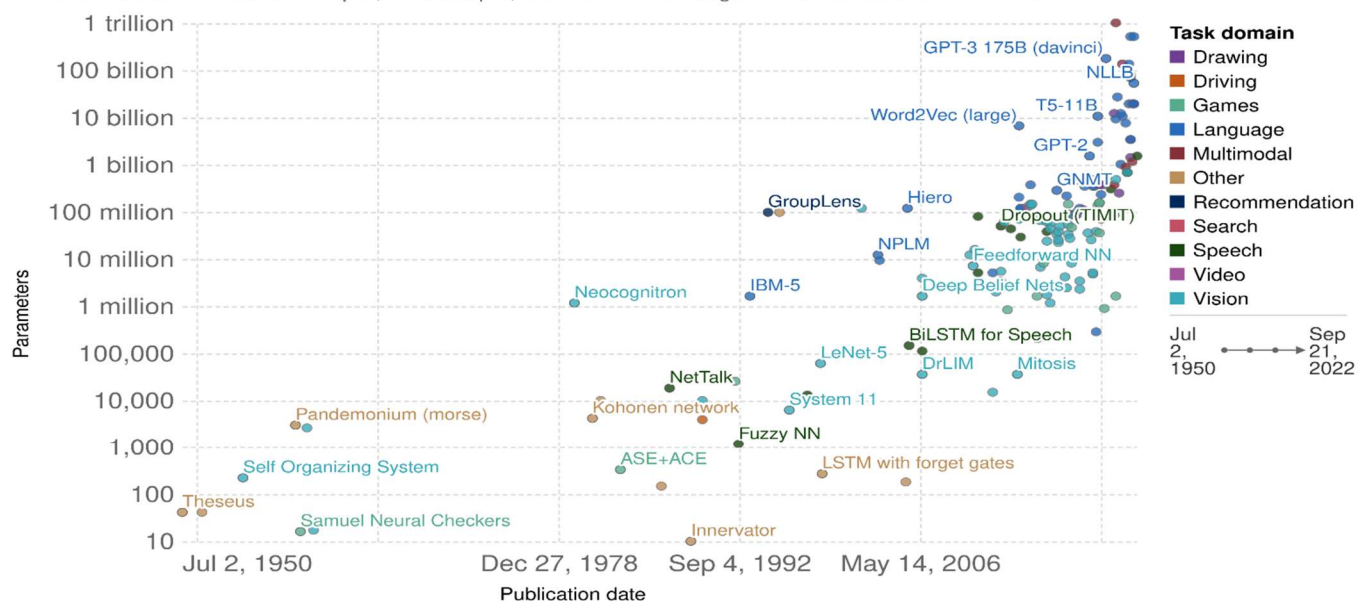
Overall, AI has transformed robotics by enabling robots to perceive, learn, and make decisions in ways that were previously impossible. As AI technology continues to improve, we can expect to see even more advanced and capable robots in the future.

Number of parameters in notable Artificial Intelligence Systems (Table 1)

Number of parameters in notable artificial intelligence systems

Parameters are variables in an AI system whose values are adjusted during training to establish how input data gets transformed into the desired output; for example, the connection weights in an artificial neural network.

Our World
in Data



Source: Sevilla et al. (2022)

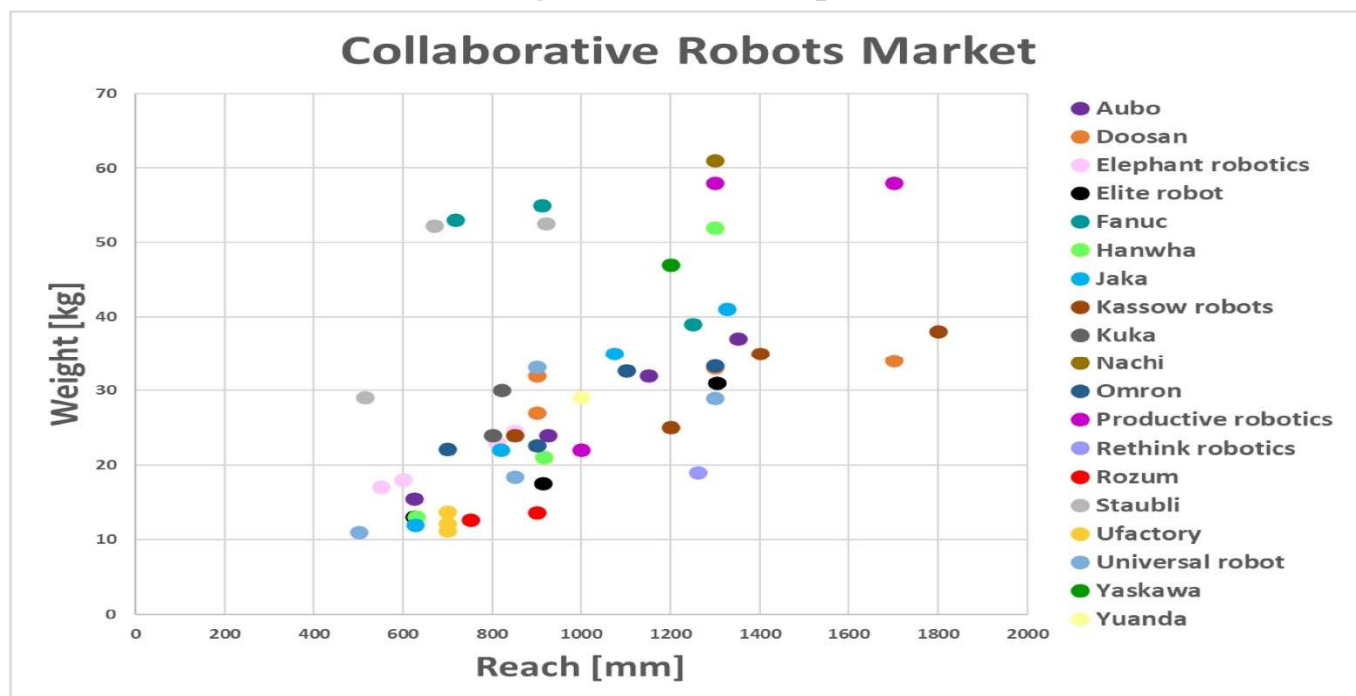
OurWorldInData.org/artificial-intelligence • CC BY

Note: Parameters are estimated based on published results in the AI literature and come with some uncertainty. The authors expect the estimates to be correct within a factor of 10.

(Figure 7)

Market usage of Robots in Japan (Table 2)

Collaborative Robots Market



(Figure 8)

CHAPTER 4

The Bot

(Hand Gesture Controlled Wireless Car)

Introduction:

Hand Gesture control wireless car is a revolutionary technology that allows users to control a vehicle's movements through hand gestures without the need for physical controls. The system operates using a combination of hardware and software to interpret hand movements and translate them into commands that the car can understand. This technology has been developed for various applications such as automotive, robotics, and entertainment.

The hand gesture control wireless car is made up of several components, including sensors, microcontrollers, and actuators. The sensors are responsible for detecting hand movements and transmitting the data to the microcontroller, which then processes the information and translates it into instructions that the car can follow. The actuators then receive the instructions and execute the desired movements.

The hand gesture control wireless car system offers a range of benefits. For one, it enhances the user experience by providing a more intuitive and natural way of controlling a vehicle. It also eliminates the need for physical buttons and switches, reducing clutter on the dashboard and making the car's interior more visually appealing. Additionally, the technology can be used to improve accessibility for people with disabilities or those who have limited mobility.

The system operates using various hand gestures, which are interpreted as commands by the car. For example, a swipe of the hand to the left or right could cause the car to turn in that direction, while a clenched fist could signal for the car to stop. Other gestures could be used to control the car's speed, switch gears, or activate other features such as the radio or air conditioning.

The development of hand gesture control wireless car technology has been a significant advancement in the field of automotive engineering. While the technology is still relatively new, it has the potential to become a standard feature in future car models, offering drivers a safer, more intuitive, and more enjoyable way of driving. Additionally, as technology continues to evolve, it could have applications beyond the automotive industry, such as in robotics, gaming, and virtual reality.

About The Bot:

The wireless Wi-Fi hand gesture car is essentially a bot that is controlled using hand gestures. The bot consists of several key components, including:

ESP module: The ESP module is the brain of the bot. It is responsible for processing the hand gestures and sending commands to the motor driver.

Motor driver: The motor driver is responsible for controlling the motors that drive the car's wheels. It receives commands from the ESP module and translates them into signals that control the motors.

Hand gesture sensors: The hand gesture sensors are responsible for detecting the hand gestures made by the user. They are typically placed on the bot's chassis or near the user's hands.

Power supply: The bot requires a power supply to operate. This can be a battery or an external power supply.

Overall, the wireless Wi-Fi hand gesture car is an exciting and innovative project that involves using modern technology and creativity to create a unique and enjoyable experience. The bot's ability to recognize hand gestures and translate them into commands opens a wide range of possibilities for future development and applications.

The wireless Wi-Fi hand gesture car is a fascinating project that combines various technologies to create a bot that can be controlled using hand gestures. It is an excellent example of how modern technology can be used to create a fun and interactive experience.

The car's ability to move forward and backward and turn its wheels using hand gestures is achieved by using an ESP module and a motor driver. The ESP module is responsible for processing the hand gestures and translating them into commands that the motor driver can understand. The motor driver then sends signals to the car's motors to control its movement.

Components Required for Building The Bot:

Motor Driver L298N:

The L298N is a dual H-bridge motor driver integrated circuit that allows you to easily control the speed and direction of DC motors. It can handle a maximum current of 2A per channel and has built-in protection against over-voltage, under-voltage, over-temperature, and short-circuits. To use the L298N, you will need to connect it to a microcontroller or other control circuit, and provide it with a power supply voltage between 5V and 35V. The L298N has a simple interface that allows you to control the direction and speed of your motor using just a few input pins. With its high current handling capability and built-in protection features, the L298N is a popular choice for robotics, automation, and other motor control applications.

ESP8266:

The ESP8266 is a low-cost Wi-Fi microcontroller chip that has gained popularity for its ability to connect devices to the internet. It can operate as a standalone microcontroller with its own firmware, or it can be used as a Wi-Fi module for other microcontrollers. The ESP8266 can be programmed using the Arduino IDE, which makes it easy for beginners to get started. It has a built-in TCP/IP protocol stack that allows it to connect to a Wi-Fi network and communicate with other devices over the internet. The ESP8266 has a variety of applications, including home automation, IoT projects, and wireless sensor networks. Its low cost and ease of use make it a popular choice for DIY enthusiasts and hobbyists.

Yellow Gear Motor:

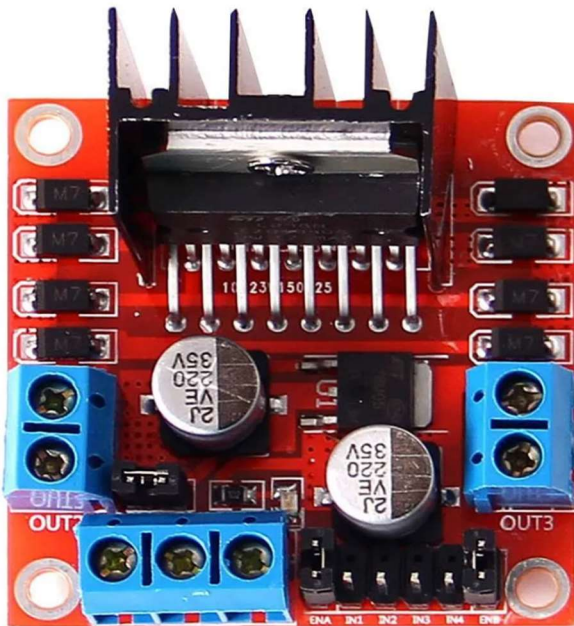
A gear motor can be used in a hand gesture control car to provide the necessary torque and speed to drive the wheels. In this type of car, a user's hand gestures are used to control the direction and speed of the car, which is achieved by processing signals from sensors attached to the user's hand. The gear motor can be connected to the wheels of the car via a gearbox, which allows for the desired speed and torque to be achieved. The motor can be controlled using a microcontroller, which receives signals from the hand gesture sensors and adjusts the speed and direction of the motor accordingly. The use of a gear motor ensures that the car can move smoothly and with enough power to operate effectively.

Rechargeable battery:

Bot's Body:



The Body of The Bot with 4 motors.



Motor Driver L298N



ESP8266 WI-FI



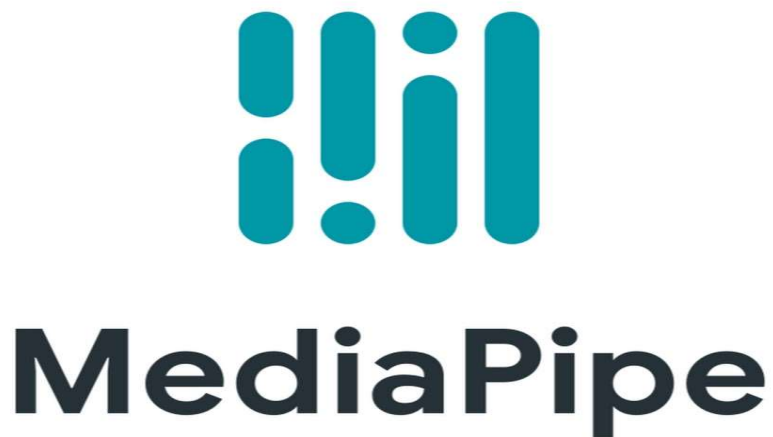
An Image of the proposed System

CHAPTER 5

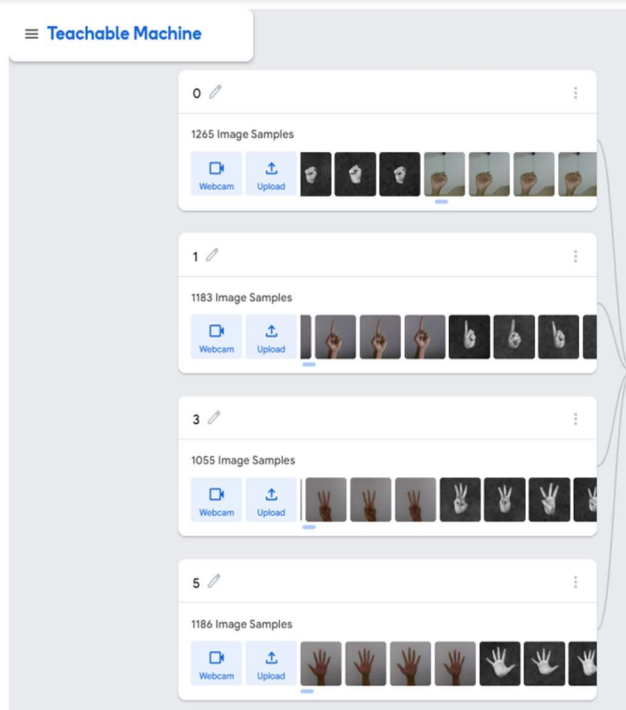
Machine Learning requirement for Bot



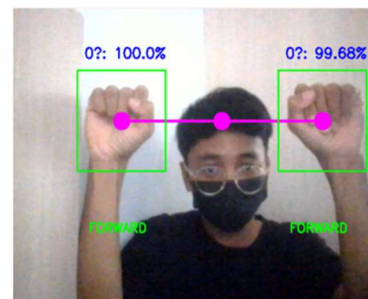
- Detect the hand
- Create picture of hand to predict



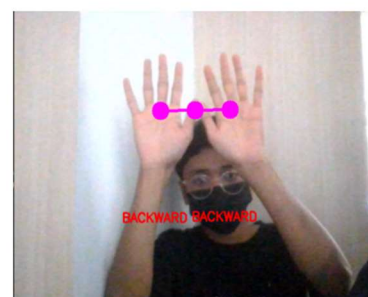
make prediction of hand gesture based on trained model



over 1000 samples of data for each set



predict the image inside green box



use mediapipe finger up prediction instead if hands are too closed

Teaching the Machine through Teachable Machine

CHAPTER 6

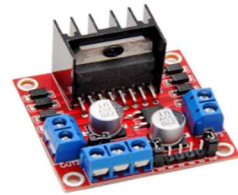
How Does The Bot Work



- Trained data set



- Receive the data set via Wi-Fi connectivity
- NodeMCU as microcontroller



- Receives command
- Control the speed and direction

Total count (Right side)==5 &
Total count (Left side)==5

?

Moveforward

with full speed

Total count(Right side)==0 &
Total count (Left side)==0

?

Stop

Total count(Right side)==0 &
Total count (Left side)==0

?

Move backward



if (left fingers < right finger) &&
left fingers != 0

?

Turn left side

slightly

if (left fingers < right finger) &&
left fingers = 0

?

Turn left side

rotate counter clockwise

CHAPTER 7

FUTURE SCOPE

Artificial Intelligence (AI) has come a long way since its inception, and its future scope is enormous. With its ability to learn from data, reason, and solve problems, AI has become a vital technology in various fields such as healthcare, finance, transportation, manufacturing, and many more. In the coming years, the future scope of AI is expected to revolutionize how we live, work, and interact with the world around us.

7.1 Healthcare: AI is expected to play a significant role in the healthcare industry. The technology is already being used to diagnose and treat diseases, develop new drugs and therapies, and personalize patient care. With AI, doctors and researchers can analyze vast amounts of medical data and identify patterns that are not visible to the human eye. This will lead to more accurate diagnoses, better treatments, and improved patient outcomes.

7.2 Transportation: Self-driving cars and trucks are already on the roads, and the technology behind them is improving every day. In the future, AI-powered vehicles will be safer, more efficient, and more reliable than human-driven vehicles. This will not only reduce the number of accidents on the roads but also make transportation more accessible for people who are unable to drive due to physical or cognitive disabilities.

7.3 Finance: AI is already being used in the finance industry to detect fraud, automate financial analysis, and improve customer service. In the future, AI will help financial institutions make better investment decisions, manage risk more effectively, and provide personalized financial advice to customers.

7.4 Manufacturing: AI is revolutionizing the manufacturing industry by improving efficiency, reducing costs, and increasing quality. AI-powered robots can work faster and more accurately than human workers, leading to higher productivity and lower defect rates. This will also lead to a reduction in manual labor and an increase in job opportunities for people with technical skills.

7.5 Education: AI is expected to transform education by providing personalized learning experiences for students. AI-powered systems can analyze student data and provide customized learning paths based on individual strengths and weaknesses. This will make education more accessible and effective and improve student outcomes.

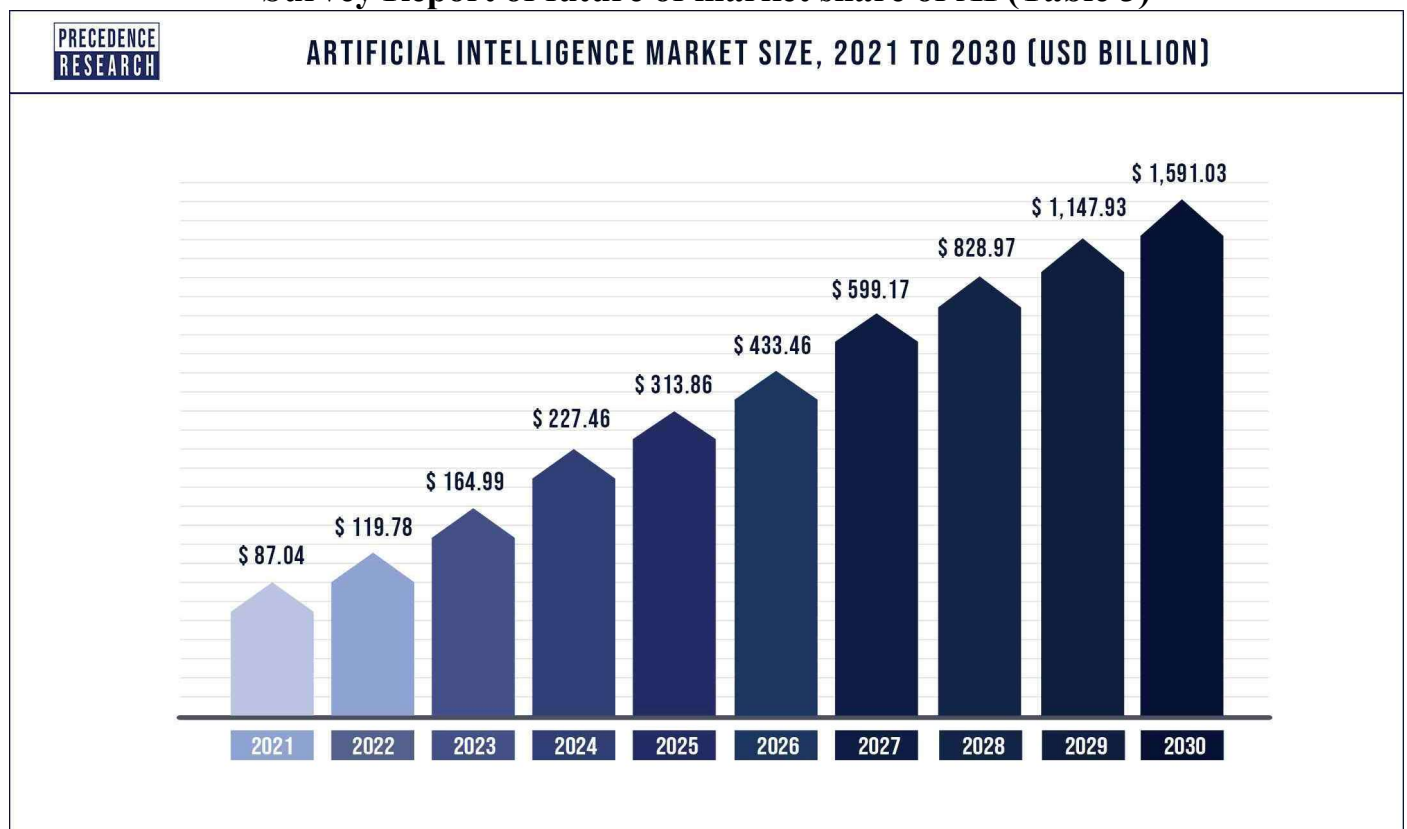
7.6 Agriculture: AI is already being used in the agricultural industry to optimize crop yields, reduce water usage, and increase food production. In the future, AI-powered systems

will help farmers make better decisions by analyzing data on weather, soil conditions, and plant health.

7.7Entertainment: AI is already being used in the entertainment industry to create personalized content for viewers. In the future, AI will help filmmakers and game developers create more immersive experiences by generating realistic characters, environments, and stories.

In conclusion, the future scope of AI is vast and varied. From healthcare to entertainment, AI is expected to transform every aspect of our lives. While the technology is still in its early stages, its potential is enormous. As AI continues to evolve and improve, we can expect to see even more innovative applications and use cases in the coming years.

Survey Report of future of market share of AI (Table 3)



(Figure 9)

Future of AI in Robotics

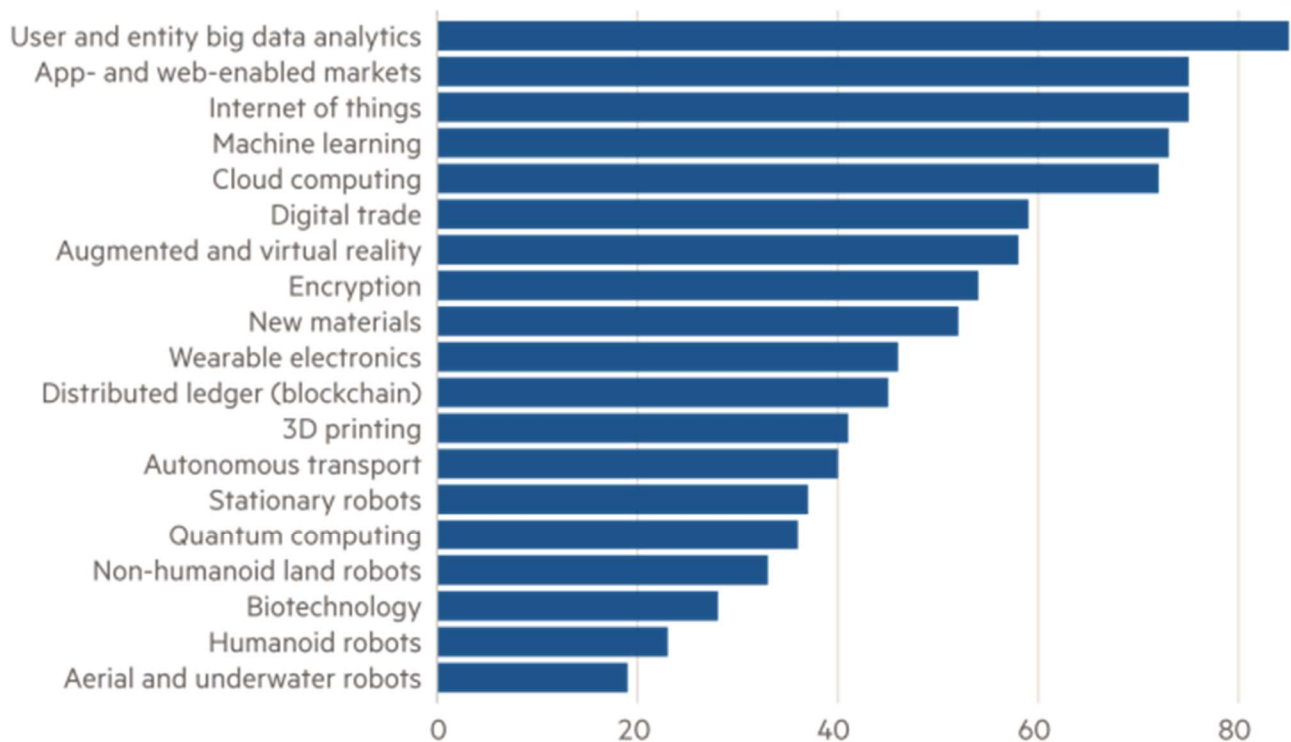
The future scope of AI in robotics is vast and promising. With the integration of AI, robots are becoming more intelligent, versatile, and efficient in their tasks. Here are some of the ways AI is expected to transform robotics in the future:

1. **Autonomous Navigation:** AI-powered robots will be able to navigate autonomously in complex environments with high precision and accuracy. With advanced computer vision and machine learning algorithms, robots can recognize and avoid obstacles, map their surroundings, and adapt to changing environments.
2. **Intelligent Automation:** AI will enable robots to perform more complex tasks autonomously, such as sorting and picking objects, assembling components, and performing quality checks. Robots will be able to learn from their mistakes and improve their performance over time.
3. **Human-Robot Collaboration:** AI-powered robots will be able to work alongside humans in a more collaborative manner. They will be able to understand and respond to human commands, anticipate human behavior, and adjust their actions accordingly.
4. **Personalized Service:** AI will enable robots to provide personalized services to individuals, such as assisting elderly or disabled individuals with daily tasks, providing customer service in retail or hospitality, and providing personalized medical care.
5. **Industrial Robotics:** AI-powered robots will revolutionize industrial automation by optimizing manufacturing processes, reducing downtime, and improving product quality. They will be able to detect and correct errors in real-time, predict maintenance needs, and optimize production schedules.
6. **Entertainment Robotics:** AI-powered robots will be able to provide more immersive entertainment experiences, such as virtual assistants, gaming, and interactive storytelling. They will be able to recognize and respond to human emotions, preferences, and behaviors.
7. **Medical Robotics:** AI-powered robots will be able to assist doctors and surgeons in performing complex procedures, such as surgeries, diagnostics, and therapies. They will be able to analyze medical data, provide real-time feedback, and assist in decision-making.

In conclusion, the future scope of AI in robotics is vast and promising. With AI, robots will become more intelligent, efficient, and versatile in their tasks. They will be able to work alongside humans in a more collaborative manner and provide personalized services in various industries. As AI continues to evolve, we can expect to see more innovative and advanced applications of robotics in the future.

Robotic technologies likely to be adopted by 2030 by various industries (Table 4)

Per cent of companies adopting ...



Source: Future of Jobs Survey 2018, World Economic Forum
© FT

(Figure10)

Future Scope of The Bot(Hand Gesture control car):

Adding more complex gestures: You can expand the range of gestures that the car recognizes. For example, you can add gestures to make the car stop, accelerate, or turn more sharply.

Integrating sensors: You can add sensors such as ultrasonic or infrared sensors to detect obstacles and avoid collisions. This would make the car more autonomous and safer to operate.

Developing a mobile app: You can develop a mobile app to control the car remotely. This would allow you to control the car from a distance and potentially add more functionality to the app, such as tracking the car's location or receiving live video feed.

Integrating with smart home devices: You can integrate the car with smart home devices such as Amazon Alexa or Google Home to enable voice control. This would allow you to control the car hands-free.

Building a larger vehicle: You can scale up your project and build a larger vehicle such as a drone or a robot. This would require more advanced hardware and software, but it would also allow you to explore new possibilities for your project.

Overall, the possibilities are endless when it comes to expanding the scope of your wireless Wi-Fi hand gesture car project. With some creativity and ingenuity, you can continue to innovate and develop new functionalities for your car.

The project has a wide range of applications, from remote control cars to robotics and automation. It is also an excellent project for students and hobbyists who are interested in electronics, programming, and engineering. The wireless wifi hand gesture car can help students learn about various technologies, including wireless connectivity, motor control, and sensor technology.

The project can be further expanded by adding more functionalities such as sensors that detect obstacles and avoid collisions or a mobile app that allows the user to control the car remotely. These additions can make the car more autonomous and safer to operate.

Overall, the wireless Wi-Fi hand gesture car is an exciting project that has great potential for future development and applications. It combines modern technology with creativity and innovation, resulting in a unique and enjoyable experience for users.

CHAPTER 8

CONCLUSION

Artificial Intelligence (AI) has revolutionized the field of robotics in recent years. AI technologies, such as machine learning, computer vision, and natural language processing, have enabled robots to perform increasingly complex tasks and interact with humans in more natural and intuitive ways.

One significant benefit of using AI in robotics is increased automation. Robots equipped with AI can perform tasks without human intervention, reducing labor costs, and improving efficiency. For instance, AI-powered robots can sort and package products in a warehouse or manufacturing facility with greater speed and accuracy than humans.

Another advantage of AI in robotics is increased safety. Robots can perform dangerous tasks that would be hazardous to humans, such as handling hazardous materials or exploring hazardous environments. By equipping robots with AI, they can detect and respond to changing conditions, ensuring their safety and minimizing the risk of accidents.

AI also allows robots to adapt to changing situations and environments. Robots can use machine learning algorithms to analyze data and learn from experience, allowing them to adjust their behavior and improve their performance over time. This ability to adapt makes robots more versatile and useful in a wide range of applications, from healthcare to manufacturing to space exploration.

However, the use of AI in robotics also raises ethical and social concerns. For instance, there are concerns about the impact of automation on employment, particularly for low-skilled workers. There are also concerns about the potential misuse of autonomous robots, particularly in military applications.

In conclusion, AI has transformed the field of robotics, enabling robots to perform increasingly complex tasks and interact with humans in more natural ways. The use of AI in robotics offers numerous benefits, including increased automation, safety, and adaptability. However, the ethical and social implications of AI in robotics must be carefully considered and addressed to ensure that the technology is used in ways that benefit society.

Conclusion For The Proposed System:

Hand gesture control technology has been rapidly gaining popularity in the automotive industry, offering drivers a new and innovative way to interact with their vehicles. This technology allows drivers to control various functions of the car through simple hand gestures, without the need to touch buttons or screens.

One of the main benefits of hand gesture control is the added safety it provides. With hand gesture control, drivers can keep their hands on the steering wheel and their eyes on the road, reducing the risk of distraction or accidents. This technology has also been found to be helpful for people with disabilities, making it easier for them to operate a car without having to rely on traditional controls.

Hand gesture control has also been praised for its ease of use and convenience. Drivers can adjust settings such as the radio volume, air conditioning, and even the sunroof with simple hand movements, making it easier to multitask while driving. It also adds an element of futuristic style to the car, making it a popular feature among tech-savvy consumers.

However, there are still some challenges that need to be addressed with hand gesture control technology. One of the main challenges is the accuracy of the sensors. Hand gesture control systems rely on sensors to detect and interpret hand movements, and the accuracy of these sensors can sometimes be compromised by factors such as lighting conditions or hand positioning. This can result in errors or delays in the system's response.

Another challenge is the need for drivers to learn and remember the specific gestures required for each function. Unlike traditional controls, which are typically labeled and easily recognizable, hand gestures require drivers to memorize specific movements for each function. This can be challenging for some drivers, especially those who are not tech-savvy or have difficulty with motor control.

Despite these challenges, hand gesture control technology for cars is a promising development that has the potential to significantly improve the driving experience for many people. As technology continues to evolve and improve, hand gesture control systems are likely to become more accurate and intuitive, making them even more user-friendly and convenient. Ultimately, hand gesture control technology has the potential to revolutionize the way we interact with our vehicles, making driving safer, easier, and more enjoyable.

REFERENCES

1. www.google.com
2. www.tutorialspoint.com
3. www.kaspersky.com
4. www.infosectrain.com
5. www.teachablemachine.com