1.3.4

Supporting Documents- Electronics & Communication Engineering

List of Students Undertaking Field Projects / Research Projects / Internship Program and Completion Certificates

List of Students Undertaking Field Project/Research Projects/Internships (Batch 2017-21)

Sr No.	Program	University Roll No.	Name of Student	Project title	Place of Training
1	B Tech ECE	1731887	Achintya Shrotriya	Machine Learning	Stanford University (Online)
2	B Tech ECE	1731889	Gagandeep Kaur	Internet of Things (IoT)and Embedded Systems	University of California (Online)
3	B Tech ECE	1731892	Harshit	An Introduction to Programming the IoT	Online
4	B Tech ECE	1731893	Kunal	An Introduction to Programming the IoT	Online
5	B Tech ECE	1731894	Lovekaran Verma	Artificial Intelligence and Machine Learning	NIELIT-Chandigarh(online)
6	B Tech ECE	1731895	Lovish	IoT (Wireless) and Cloud Computing Emerging Technologies	Yonsei University (Online)
7	B Tech ECE	1731896	Nancy Banwal	Internet of Things (IoT)and Embedded Systems	University of California (Online)
8	B Tech ECE	1731898	Palak Bhangotra	Artificial Intelligence and Machine Learning	NIELIT-Chandigarh(online)
9	B Tech ECE	1731899	Ranbir Singh	Artificial Intelligence and Machine Learning	NIELIT-Chandigarh(online)
10	B Tech ECE	1731900	Ranbir Yadav	Raspberry Pi Platform and Python Programming for Raspberry Pi	University of California (Online)
11	B Tech ECE	1731902	Raviranjan Kumar		Method Media Computer Academy
12	B Tech ECE	1731903	Ritu Raj	Introduction to Programming the IoT	Online

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

1.3.4 Percentage of students undertaking field projects / research projects / internships (Data for the latest completed academic year)(5)

1.3.4.1:Number of students undertaking field project or research projects or internships: 12

Programme name	Program Code	List of students undertaking field projects /research projects / internships
B Tech	B Tech	Achintya Shrotriya
B Tech	B Tech	Gagandeep Kaur
B Tech	B Tech	Harshit
B Tech	B Tech	Kunal
B Tech	B Tech	Lovekaran Verma
B Tech	B Tech	Lovish
B Tech	B Tech	Nancy Banwal
B Tech	B Tech	Palak Bhangotra
B Tech	B Tech	Ranbir Singh
B Tech	B Tech	Ranbir Yadav
B Tech	B Tech	Raviranjan Kumar
B Tech	B Tech	Ritu Raj

YONSEI UNIVERSITY

Sep 21, 2020

Lovish Arora

has successfully completed

IoT (Internet of Things) Wireless & Cloud Computing Emerging Technologies

an online non-credit course authorized by Yonsei University and offered through Coursera

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COURSE CERTIFICATE

Jong-Moon Chung
Professor, School of Electrical & Electronic Engineering
Director, Communications & Networking Laboratory

Verify at coursera.org/verify/KVS2Y72DL5JH

Coursera has confirmed the identity of this individual and their participation in the course.

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6 Courses

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Feb 27, 2021

RITU RAJ

has successfully completed the online, non-credit Specialization

An Introduction to Programming the Internet of Things (IOT)

Design, create, and deploy a fun IoT device using Arduino and Raspberry Pi platforms. In this Specialization covers embedded systems, the Raspberry Pi Platform, and the Arduino environment for building devices that can control the physical world. In the final Capstone Project, you'll apply the skills you learned by designing, building, and testing a microcontroller-based embedded system, producing a unique final project suitable for showcasing to future employers.

Ian Harris
Professor
Department of
Computer Science

Introduction to the Internet of Things and Embedded Systems

The Arduino Platform and C Programming

Interfacing with the Arduino

The Raspberry Pi Platform and Python Programming for the Raspberry Pi

Interfacing with the Raspberry Pi

Programming for the Internet of Things Project

Verify this certificate at:
coursera.org/verify/specialization/NWP9YWTHSU2

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The Arduino Platform and C Programming

Interfacing with the Arduino

The Raspberry Pi Platform and Python Programming for the Raspberry Pi

Interfacing with the Raspberry Pi

Programming for the Internet of Things Project

UCI

22.09.2020

KUNAL

has successfully completed the online, non-credit Specialization

An Introduction to Programming the Internet of Things (IOT)

Design, create, and deploy a fun IoT device using Arduino and Raspberry Pi platforms. In this Specialization covers embedded systems, the Raspberry Pi Platform, and the Arduino environment for building devices that can control the physical world. In the final Capstone Project, you'll apply the skills you learned by designing, building, and testing a microcontroller-based embedded system, producing a unique final project suitable for showcasing to future employers.

Ian Harris
Professor
Department of
Computer Science

Verify this certificate at:
coursera.org/verify/specialization/RL4MJUXLGSUB

Stanford | ONLINE

08/31/2020

Achintya shrotriya

has successfully completed

Machine Learning

an online non-credit course authorized by Stanford University and offered through
Coursera

Associate Professor Andrew Ng
Computer Science Department
Stanford University

Verify at coursera.org/verify/SX4MGA2U7Y3Y
Coursera has confirmed the identity of this individual and
their participation in the course.

Certificate No. : **10515**

Roll No. : **PJ127/2**

राʼइʼसूʼप्रौʼसं
NIELIT

NATIONAL INSTITUTE OF ELECTRONICS & INFORMATION TECHNOLOGY, CHANDIGARH

An Autonomous Scientific Society of Ministry of Electronics & Information Technology, Govt of India

Ropar : Birla Farms, Bada Phull, Rupnagar

Chandigarh : Plot No. M925, IETE Building, Sector 30-B, Chandigarh

Certificate

This is to certify that **Mr. Lovekaran Verma S/o Shri Sanjeev Kumar Verma**

has successfully completed a course of **26** *week (s) duration from* **17.08.2020** *to* **12.02.2021**

on **Artificial Intelligence and Machine Learning (Project: Air Quality Prediction System)**

conducted **xx** **in Live Online Mode**

securing **80** *marks out of* **100** *marks and has been awarded grade ** **S**

Course Curriculum

Python, Numpy, Pandas, Data Analytics, EDA, Visualisation, Machine Learning, Implementing Models and their Evaluation, NLTK, Basics of Deep Learning & Neural Networks, Flask, SQLite, Transfer Learning

Training Head

Date of Issue : **16.04.2021**

Director

*GRADING SCHEME : S-80% and above, A-70% to <80%, B-60% to <70%, C-50% to <60%, D-40% to <50%

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)

Certificate No. : 10514   Roll No. : PJ127/1

राष्ट्रीय इलेक्ट्रॉनिकी तथा सूचना प्रौद्योगिकी संस्थान
NIELIT

NATIONAL INSTITUTE OF ELECTRONICS & INFORMATION TECHNOLOGY, CHANDIGARH

An Autonomous Scientific Society of Ministry of Electronics & Information Technology, Govt of India

Ropar : Birla Farms, Bada Phull, Rupnagar

Chandigarh : Plot No. M925, IETE Building, Sector 30-B, Chandigarh

Certificate

This is to certify that __Ms. Palak Bhangotra D/o Shri Kewal Krishan__

has successfully completed a course of ____26____ week (s) duration from __17.08.2020__ to __12.02.2021__

on __Artificial Intelligence and Machine Learning (Project: Air Quality Prediction System)__

conducted **xx** __in Live Online Mode__

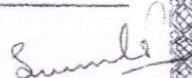securing ____83____ marks out of ____100____ marks and has been awarded grade * ____S____

Course Curriculum

Python, Numpy, Pandas, Data Analytics, EDA, Visualisation, Machine Learning, Implementing Models and their Evaluation, NLTK, Basics of Deep Learning & Neural Networks, Flask, SQLite, Transfer Learning

Training Head

Date of Issue : 16.04.2021

Director

*GRADING SCHEME : S-80% and above, A-70% to <80%, B-60% to <70%, C-50% to <60%, D-40% to <50%

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

UCI University of California, Irvine

Gagandeep Kaur

Introduction to the Internet of Things and
Embedded Systems

coursera

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An ISO 9001 : 2015 Certified Company

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Sr. No. 10783

Certificate / Diploma

THIS CERTIFICATE / DIPLOMA IS AWARDED TO
RAVIRANJAN KUMAR

S/o - Ravindra Kumar Rahul, Reg No. 911031010009 on successfully completion

of Diploma in Computer Programming (Duration - 6 Months) Course and secured

85.00 % with Grade A* from our authorised Study Centre **A-Set Computer** ,

Tekari, Gaya,Bihar,

Centre Code 91103101

On the recommendation of the board of examination

Date of Issue : 11-Sep-2020

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

Certified by –
Method Media Computer Academy

Registered office : Professor Colony, Garhpar, Bihar Sharif, Nalanda-803101
Corporate office : Harimohan Gali, Salempur, Chapra, Saran, Bihar - 841301

Visit Our Website : www.methodmedia.in

Authorised Signature

UCI University of California, Irvine

COURSE CERTIFICATE

05.10.2020

Ranveer Yadav

has successfully completed

The Raspberry Pi Platform and Python Programming for the Raspberry Pi

an online non-credit course authorized by University of California, Irvine and offered through Coursera

Ian Harris
Professor
Department of Computer Science

Introduction to the Internet of Things and Embedded Systems

The Arduino Platform and C Programming

Interfacing with the Arduino

The Raspberry Pi Platform and Python Programming for the Raspberry Pi

Interfacing with the Raspberry Pi

Programming for the Internet of Things Project

UCI

Oct 4, 2020

HARSHIT KUMAR

has successfully completed the online, non-credit Specialization

An Introduction to Programming the Internet of Things (IOT)

Design, create, and deploy a fun IoT device using Arduino and Raspberry Pi platforms. In this Specialization covers embedded systems, the Raspberry Pi Platform, and the Arduino environment for building devices that can control the physical world. In the final Capstone Project, you'll apply the skills you learned by designing, building, and testing a microcontroller-based embedded system, producing a unique final project suitable for showcasing to future employers.

Ian Harris
Professor
Department of
Computer Science

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Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

UCI University of California, Irvine

Oct 11, 2020

Nancy Bhanwal Bhanwal

has successfully completed

Introduction to the Internet of Things and Embedded Systems

an online non-credit course authorized by University of California, Irvine and offered through Coursera

coursera

Verify at coursera.org/verify/QYWW5X3PQ5J5
Coursera has confirmed the identity of this individual and their participation in the course.

Certificate No.: 10519

Roll No: PJ127/6

रा.इ.सू.प्रौ.सं

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An Autonomous Scientific Society of Ministry of Electronics & Information Technology, Govt of India

Ropar : Birla Farms, Bada Phull, Rupnagar

Chandigarh : Plot No. M925, IETE Building, Sector 30-B, Chandigarh

Certificate

This is to certify that **Mr. Ranbeer Singh S/o Shri Harjinder Singh**

has successfully completed a course of **26** week (s) duration from **17.08.2020** to **12.02.2021**

on **Artificial Intelligence and Machine Learning (Project: Air Quality Prediction System)**

conducted **xx** **in Live Online Mode**

securing **70** marks out of **100** marks and has been awarded grade * **A**

Course Curriculum

Python, Numpy, Pandas, Data Analytics, EDA, Visualisation, Machine Learning, Implementing Models and their Evaluation, NLTK, Basics of Deep Learning & Neural Networks, Flask, SQLite, Transfer Learning

Training Head

Date of Issue : **16.04.2021**

Director

*GRADING SCHEME : S-80% and above, A-70% to <80%, B-60% to <70%, C-50% to <60%, D-40% to <50%

I.K. Gujral Punjab Technical University

Main Campus

Department Electronics and Communication Engineering

IKGPTU/ECE/ 1035

Dated. 17/02/2020

Subject: Approval for the Industrial Training as per the request of student

Sr No.	Program	University Roll No.	Name of Student	Place of Training
1	B TechECE	1731889	Gagandeep Kaur	University of California(Online)
2	B TechECE	1731894	Lovekaran Verma	NIELIT-Chandigarh(online)
3	B TechECE	1731898	Palak Bhangotra	NIELIT-Chandigarh(online)
4	B TechECE	1731899	Ranbir Singh	NIELIT-Chandigarh(online)
5	B TechECE	1731903	Ritu Raj	University of California(Online)

Coordinator (T&P-ECE)

HOD(ECE)

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

I.K. Gujral Punjab Technical University

Main Campus

Department Electronics and Communication Engineering
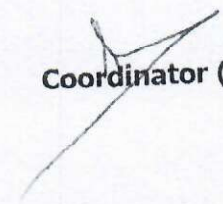
IKGPTU/ECE/1098

Dated. 14/08/2020

Subject: Approval for the Industrial Training as per the request of student

Sr No.	Program	UniversityRoll No.	Name of Student	Place of Training
1	B TechECE	1731887	Achintya Shrotriya	Stanford University(Online)
2	B TechECE	1731892	Harshit	University of California (Online)
3	B TechECE	1731893	Kunal	University of California (Online)
4	B TechECE	1731895	Lovish	Yonsei University (Online)
5	B TechECE	1731896	Nancy Banwal	University of California (Online)
6	B TechECE	1731899	Ranbir Singh	NIELIT-Chandigarh (Online)
7	B TechECE	1731902	Raviranjan Kumar	Method Media ComputerAcademy

Coordinator (T&P-ECE)

HOD(ECE)

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

TRAINING REPORT
7th Semester
INTERNET OF THINGS (I.O.T)

submitted in partial fulfillment of the requirements for the Award of Degree of

BACHELOR OF TECHNOLOGY
In
ELECTRONICS & COMMUNICATION ENGINEERING

Department of Electronics & Communication Engineering

I.K. Gujral Punjab Technical University main campus, Kapurthala, Jalandhar, Punjab- 144603

Submitted by :-

HARSHIT KUMAR
(1731892) B.Tech E.C.E

Submitted to :-

Dr. Amit Gupta
Associate Professor,
Department of E.C.E

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
Main Campus, Kapurthala (Punjab)-144603

DECLARATION

I, HARSHIT KUMAR, hereby declare that the work presented in this training Report has been carried out by me after the completion six months of training course of **Internet of Things** at Coursera (University of California).

I also confirm that the report is only prepared for my academic requirement, not for any other purpose.

Date : 20 -01- 2021   **HARSHIT KUMAR**

                                                                    1731892

CERTIFICATION

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6 Courses

Introduction to the Internet of Things and Embedded Systems

The Arduino Platform and C Programming

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Interfacing with the Raspberry Pi

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Oct 4, 2020

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Ian Harris
Professor
Department of
Computer Science

The online specialization named in this certificate may draw on material from courses taught on-campus, but the included courses are not equivalent to on-campus courses. Participation in this online specialization does not constitute enrollment at this university. This certificate does not confer a University grade, course credit or degree, and it does not verify the identity of the learner.

Verify this certificate at:
coursera.org/verify/specialization/NSNJH6UD2LV7

iii

Head
Department of Electronics & Communication Engineering
IK Gujral Punjab Technical University
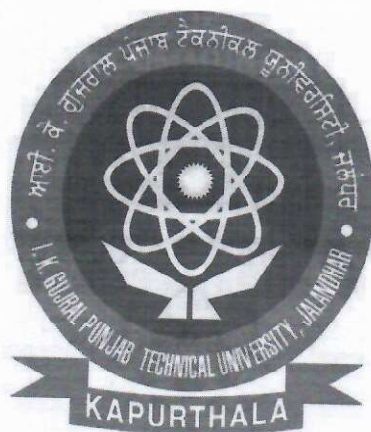Main Campus, Kapurthala (Punjab)-144603

ACKNOWLEDGEMENT

First, I would like to thank our Professor Dr. Amit Gupta for providing us the opportunity to do a training with Coursera. I got lots of opportunities to enhance our knowledge.

I also would like all the participant of this course or training that worked along with me in (Internet of things) coursera course with their patience and Kindness & helping nature. they created an enjoyable learning environment.

It is indeed with a great sense of pleasure and immense sense of gratitude that I acknowledge the help of these individuals.

I would like to thank Head of Department of E.C.E   Dr. Satvir Singh for his constructive efforts throughout my training.

I would like to thank Dr. Ian Harris training coordinator of Department of CSE (University of California, Irvine) for their support and advices to get and complete internship in above said organization.

I am extremely great full to my department staff members and friends who helped me in successful completion of this internship.

<div align="right">

HARSHIT KUMAR
1731892

</div>

ABSTRACT

Internet of Things (IoT) conceptualizes the idea of remotely connecting and monitoring real world objects (things) through the Internet [1]. When it comes to our house, this concept can be aptly incorporated to make it smarter, safer and automated. This IoT project focuses on building a "SMART PARKING SYSTEM" which is mainly concerned to design a system that allows users, upon authentication, to remotely control and monitor multiple home appliances using a cell-phone based interface. The leverage obtained by preferring this system over the similar kinds of existing systems is that the alerts and the status sent by the wifi connected microcontroller managed system can be received by the user on his phone from any distance irrespective of whether his mobile phone is connected to the internet. The microcontroller used in the current prototype is the TICC3200 Launchpad board which comes with an embedded micro-controller and an onboard Wi-Fi shield making use of which all the electrical appliances inside the home can be controlled and managed.

Internet of things has been governing the electronics era with cloud services dominating the ever-increasing electronics product segment. By using this we can switch on or off the lights or fans automatically when we are outside. This proposes a smart home automation system based on Open source cloud server "things speak.com" and a low cost esp8266 Wi-Fi module.

The System transmits an alert signal to the Open-source cloud which provides a alert signal on the users mobile phone. The system employs a second esp8266 module which is programmed to act as a web server, which allows the user to activate or deactivate the security system by means of any device with internet.

Smart connectivity with existing networks and context-aware computation using network resources is an indispensable part of IoT. With the growing presence of Wi-Fi and 4G-LTE wireless Internet access, the evolution towards ubiquitous information and communication networks is already evident. However, for the Internet of Things vision to successfully emerge, the computing paradigm will need to go beyond traditional mobile computing scenarios that use smart phones and portables, and evolve into connecting everyday existing objects and embedding intelligence into our environment. For technology to disappear from the consciousness of the user, the Internet of Things demands: a shared understanding of the situation of its users and their appliances, software architectures and pervasive communication networks to process and convey the

contextual information to where it is relevant, and the analytics tools in the Internet of Things that aim for

autonomous and smart behavior. With these three fundamental grounds in place, smart connectivity and context-aware computation can be accomplished.

A radical evolution of the current Internet into a Network of interconnected objects that not only harvests information from the environment (sensing) and interacts with the physical world (actuation/ command/control), but also uses existing Internet standards to provide services for information transfer, analytics, applications, and communications. Fueled by the prevalence of devices enabled by open wireless technology such as Bluetooth, radio frequency identification (RFID), Wi-Fi, and telephonic data services as well asembedded sensor and actuator nodes, IoT has stepped out of its infancyand is on the verge of transforming the current static Internet into a fully integrated Future Internet.

Methodology:

Our project aims to control or operate various equipment, machinery, industrial processes and other applications using various control systems with less or no human intervention. By using components of Power supply Board, Node MCU, 2 Channel Relay and alerting the user or the owner with a notification in the Blynk app so that the user can be able to operate if the lights or fans are left switched on.

Programmes and opportunities:

The Institute combines pioneering research with top class education. An innovative curriculum allows the student flexibility in selecting courses and projects. Students, even at the undergraduate level, get to participate in ongoing research and technology development - an opportunity unprecedented in India. As a result, a vibrant undergraduate programme co-exists with a strong postgraduate programme.

Organization Information

Coursera is an American massive open online course (MOOC) provider founded in 2012 by Stanford University's computer science professors Andrew Ng and Daphne Koller that offers massive open online courses (MOOC), specializations, degrees, professional and master track courses.

Coursera works with universities and other organizations to offer online courses, certifications, and degrees in a variety of subjects.

Coursera was founded in 2012[6] by Stanford University computer science professors Andrew Ng and Daphne Koller. Ng and Koller started offering their Stanford courses online in fall 2011,[9] and soon after left Stanford to launch Coursera. Princeton, Stanford, the University of Michigan and the University of Pennsylvania were the first universities to offer content on the platform.[10] Offerings have since expanded to include Specializations – collections of courses that build skills in a specific subject – as well as degrees and a workforce development product for businesses and government organizations.

Coursera courses last approximately four to twelve weeks, with one to two hours of video lectures a week. These courses provide quizzes, weekly exercises, peer-graded and reviewed assignments, an optional Honors assignment and sometimes a final project or exam to complete the course.[21] Courses are also provided on-demand, in which case users can take their time in completing the course with all of the material available at once. As of May 2015, Coursera offered 104 on-demand courses it also provides guided projects which are short 2-3 hour projects that can be done. And it can be done at home. As of 2017, Coursera offers full master's degrees. They first started with Master's in Innovation and Entrepreneurship (OMIE) from HEC Paris and Master's of Accounting (iMSA) from the University of Illinois, but have moved on to offer Master of Computer Science in Data Science and Master of Business Administration (iMBA),

In 2020, in response to the COVID-19 pandemic, Coursera launched a course by the Jameel Institute at Imperial College London.[23] Called "Science Matters: Let's Talk About COVID-19", the course was the most popular launched on Coursera in 2020, with over 130,000 enrolled learners that year.[24] The course was presented by Jameel Institute research lead Professor Helen Ward and deputy director Dr Katharina Hauck, with specific modules in collaboration with other researchers from across Imperial.

Learning Objectives/Internship Objectives

o Internships are generally thought of to be reserved for college students looking to gain experience in a particular field. However, a wide array of people can benefit from Training Internships in order to receive real world experience and develop their skills.

o An objective for this position should emphasize the skills you already possess in the area and your interest in learning more

o Internships are utilized in a number of different career fields, including architecture, engineering, healthcare, economics, advertising and many more.

o Some internships are used to allow individuals to perform scientific research while others are specifically designed to allow people to gain first-hand experience working.

o Utilizing internships is a great way to build your resume and develop skills that can be emphasized in your resume for future jobs. When you are applying for a Training Internship, make sure to highlight any special skills or talents that can make you stand apart from the rest of the applicants so that you have an improved chance of landing the position.

INDEX

1. INTRODCTION TO INTERNET OF THINGS (IoT)

Anyone who says that the Internet has fundamentally changed society may be right, but at the same time, the greatest transformation actually still lies ahead of us. Several new technologies are now converging in a way that means the Internet is on the brink of a substantial expansion as objects large and small get connected and assume their own web identity.

Following on from the Internet of computers, when our servers and personal computers were connected to a global network, and the Internet of mobile telephones, when it was the turn of telephones and other mobile units, the next phase of development is the Internet of things, when more or less anything will be connected and managed in the virtual world.

This revolution will be the Net's largest enlargement ever and will have sweeping effects on every industry — and all of our every day lives.

Smart connectivity with existing networks and context-aware computation using network resources is an indispensable part of IoT. With the growing presence of Wi-Fi and 4G-LTE wireless Internet access, the evolution towards ubiquitous information and communication networks is already evident. However, for the Internet of Things vision to successfully emerge, the computing paradigm will need to go beyond traditional mobile computing scenarios that use smart phones and portables, and evolve into connecting everyday existing objects and embedding intelligence into our environment. For technology to disappear from the consciousness of the user, the Internet of Things demands: a shared understanding of the situation of its users and their appliances, software architectures and pervasive communication networks to process and convey the contextual information to where it is relevant, and the analytics tools in the Internet of Things that aim for autonomous and smart behavior. With these three fundamental grounds in place, smart connectivity and context-aware computation can be accomplished.

A radical evolution of the current Internet into a Network of interconnected objects that not only harvests information from the environment (sensing) and interacts with the physical world (actuation/ command/control), but also uses existing Internet standards to provide services for information transfer, analytics, applications, and communications. Fueled by the prevalence of devices enabled by open wireless technology such as Bluetooth, radio frequency identification (RFID), Wi-Fi, and telephonic data services as well as embedded sensor and actuator nodes, IoT has stepped out of its infancy and is on the verge of transforming the current static Internet into a fully integrated Future Internet.

1

2. HISTORY

In early 1982 the concept of the network of smart devices was discussed, with a modified Coke machine. This coke machine is modified at "Carnegie Mellon University" and becoming the first Internet-connected appliance. This machine was able to report its inventory and whether newly loaded drinks were cold.

In 1994 Reza Raji explained the idea of IoT as "small packets of data to a large set of nodes, so as to integrate and automate everything from home appliances to entire factories". After that many companies proposed various solutions like Microsoft's at Work or Novell's Nest. Bill Joy proposed Device to Device (D2D) communication as a part of his "Six Webs" frameworks at the World Economic Forum at Davos in 1999.

The thought of Internet of Things first became popular in 1999. British entrepreneur Kevin Ashton first used the term Internet of Things in 1999 while working at Auto-ID labs. Besides that near field communication, barcode scanners, QR code scanners and digital watermarking are the various devices which are working on IoT in the present scenario.

3. DEFINITION

"Today computers and the Internet are almost wholly dependent on human beings for information. Nearly all of the roughly 50 petabytes (1 petabyte=1015 bytes) of data available on the Internet were first captured and created by human beings by typing, pressing a record button, taking a digital picture, or scanning a bar code. Conventional diagrams of the Internet leave out the most numerous and important routers of all - people. The problem is, people have limited time, attention and accuracy all of which means they are not very good at capturing data about things in the real world. And that's a big deal. We're physical, and so is our environment … You can't eat bits, burn them to stay warm or put them in your gas tank. Ideas and information are important, but things matter much more. Yet today's information technology is so dependent on data originated by people that our computers know more about ideas than things. If we had computers that knew everything there was to know about things using

2

data they gathered without any help from us we would be able to track and count everything, and greatly reduce waste, loss and cost. We would know when things needed replacing, repairing or recalling, and whether they were fresh or past their best. The Internet of Things has the potential to change the world, just as the Internet did or even more.

4. ARCHITECTURE OF INTERNET OF THINGS

Architecture of internet Of Things contains basically 4 layers:

- Application Layer
- Gateway and the network layer
- Management Service layer
- Sensor layer

APPLICATION LAYER:

- Lowest Abstraction Layer
- With sensors we are creating digital nervous system.
- Incorporated to measure physical quantities
- Interconnects the physical and digital world
- Collects and process the real time information

GATEWAY AND THE NETWORK LAYER:

- Robust and High performance network infrastructure

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- ✦ Supports the communication requirements for latency, bandwidth or security
- ✦ Allows multiple organizations to share and use the same network independently

MANAGEMENT LAYER:

- ✦ Capturing of periodic sensory data
- ✦ Data Analytics (Extracts relevant information from massive amount of raw data) ▪ Streaming Analytics (Process real time data) ▪ Ensures security and privacy of data.

SENSOR LAYER:

- ✦ Provides a user interface for using IoT.
- ✦ Different applications for various sectors like Transportation, Healthcare, Agriculture, Supply chains, Government, Retail etc.
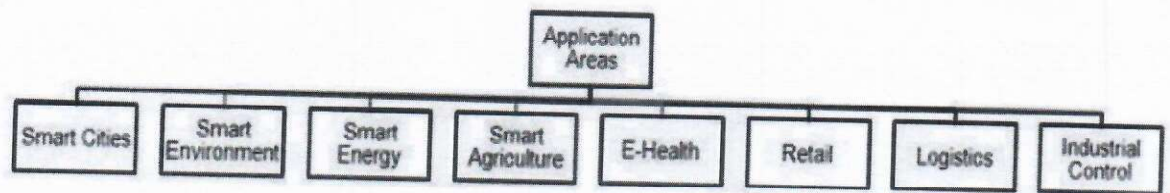
APPLICATIONS

There are several application domains which will be impacted by the emerging Internet of Things. The applications can be classified based on the type of network availability, coverage, scale, heterogeneity, repeatability, user involvement and impact.

We categorize the applications into four application domains:

(1) Personal and Home

(2) Enterprise

(3) Utilities

(4) Mobile

There is a huge crossover in applications and the use of data between domains. For instance, the Personal and Home IoT produces electricity usage data in the house and

makes it available to the electricity (utility) company which can in turn optimize the supply and demand in the Utility IoT. The internet enables sharing of data between different service providers in a seamless manner creating multiple business opportunities.

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6.PROJECT

Purpose of project

Internet of Things (IOT) plays a vital role in connecting the surrounding environmental things to the network and made easy to access those un-internet things from any remote location. It's inevitable for the people to update with the growing technology. And generally people are facing problems on parking vehicles in parking slots in a city. In this study we have designed a Smart Parking System (SPS) which enables the user to find the nearest parking area and gives availability of parking slots in that respective parking area. And it mainly focus on reducing the time in finding the parking lots and also it avoids the unnecessary travelling through filled parking lots in a parking area. Thus it reduces the fuel consumption which in turn reduces carbon footprints in an atmosphere. The electronic device that you build can assist the drivers in selecting the suitable parking spot for them. The data that the system collects will be sent to the cloud and anyone across the globe can access the data to do some analysis.

The device that we build will get the data of the parking slot status (whether it is occupied or not) from the digital IR sensors or the pi cams that are present over there. These sensors send the data to the microcontroller and in turn the data will be processed and the status of parking slots will be displayed to the user. If we are using pi cam, then the image captured will have the data about the availability of parking slots. The data will also be sent to the cloud which can be integrated onto an Android App, so that the user can see the slots available directly from their mobile phone.

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6. Components Used

6.1 Arduino Uno

Arduino is an open source, PC paraphernalia and programming organization, endeavour, and client group that plans and produce microcontroller packs for constructing programmed devices and intelligent object that can detect and control questions in the real world. The inception of the Arduino extend began at the Interaction Design Institute in Ivrea, Italy. The equipment reference plans are appropriated under a Creative Commons Attribution Share.
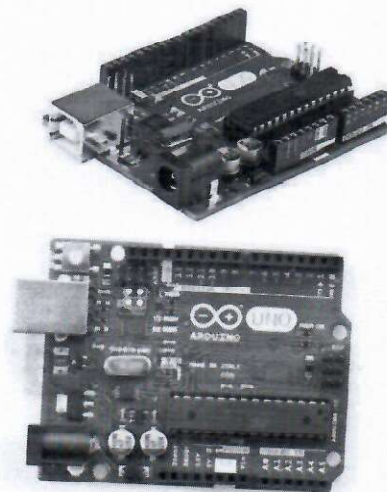

6.2 ESP8266 (WiFi Module)

The ESP8266 is an ease Wi-Fi chip with full TCP/IP stack and MCU (Micro Controller Unit) capacity created by Chinese . These are the primary arrangement of modules made with the ESP8266 by the outsider producer AI-Thinker and remain the most generally available. They

are large alluded to as "ESP-xx modules". To shape a workable advancement framework they require extra parts, particularly a serial TTL-to-USB connector and an outside 3.3 volt control supply.
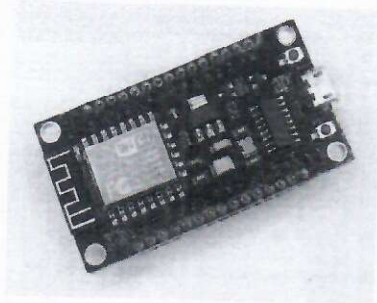

6.3 Bread board and Jump wires

A breadboard is utilized to build and test circuits expeditiously afore finalizing any circuit design. The breadboard has many apertures into which route components like ICs and resistors can be connected. The apertures are generally spaced 0.1" apart to put up standard DIP machinery. A typical breadboard that includes top and bottom power distribution rails. Jump wires are generally used to establish connectivity with bread board.
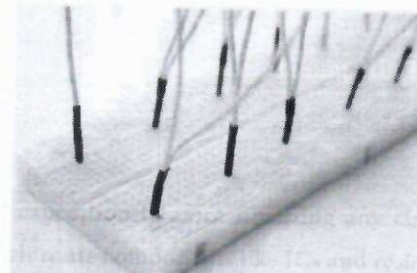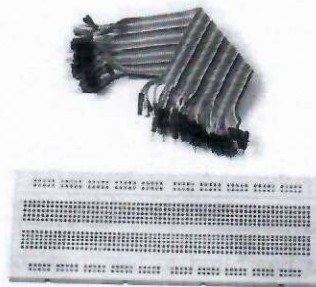

6.4 Power Supply Board

Modern Arduino Uno boards allow the board to have more than one source of power to be connected simultaneously. An intelligent switching circuitry ensures that the highest available voltage is selected and sent to the onboard voltage regulator and eventually powers up the board.

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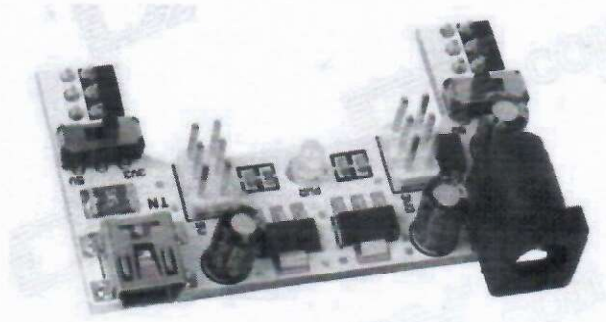
6.5 2- Channel Relay

A relay is an electrically operated switch and is frequently used in automatic control circuit. Relays are used where it is necessary to control a circuit by a low-power signal. Relays protect electrical circuits from overload or faults.

This module is designed to be integrated with 2 relays that it is capable of control 2 relays. The relay shield use one QIANJI JQC-3F high-quality relay with rated load 7A/240VAC,10A/125VAC,10A/28VDC.The relay output state is individually indicated by a light-emitting diode.
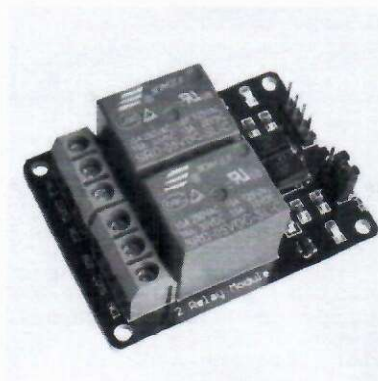
The parking system is designed in such a way that it is applicable for covered parks, open parks and street side parking. The fig. shows the cloud based IOT architecture for smart parking system which contains cloud service provider which provides cloud storage to store information about status of parking slots in a parking area and etc.The centralized server which manages to store entire smart parking systems information such as number of slots, availability of vehicles etc. and these information will be accessed through some secured gateways through network.

This smart parking system which consists of several components. And theirs functionality includes:

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- Centralized server: maintains databases which contain information about parking spaces present in the city.

- Raspberry pi: the microcontroller which is used to implement our parking system and it is attached with raspberry pi camera.

- Image capture: Pi-camera is used to capture the picture of parking area continuously to validate the slots which either filled or empty.

- Navigation system: signals the availability of parking slots to the users and navigates to the exact location of nearest parking area from current location.

- Display device: a monitor or tab is used to display the admin side interface and he is capable of modifying the parking lots by observing the device.

- User device: user can connect with the smart parking system with their smart phones or with some browsers.

The SPS which incorporates the features of raspberry pi 2 and which is attached with pi camera. Where pi camera is mounted on the top of street light lamp posts or at the ceiling of indoor parks. Thus camera is capable of making survey on each parking slots in parking lots continuously to check whether the particular slot is filled or empty. The presents the structure of smart parking system and it contains some control points on each parking slots which will be used as reference points for the camera. The central

server presents information about multiple slots in a single parking area and multiple parking areas in a single city and it is accessed through some protocols such as HTTP, CoAP etc. from any browsers, by which the website is built with basic JSON interface.

Architecture of proposed system:

The Structure of Smart Parking System:-
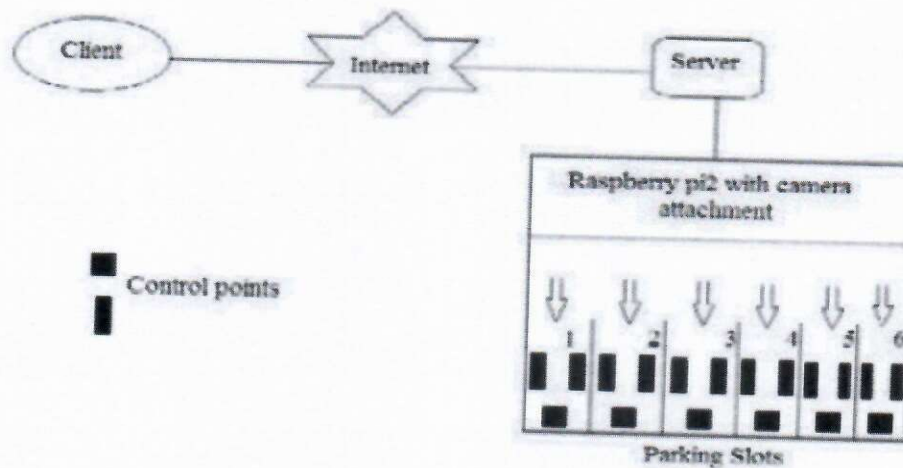
IOT (Internet of Things) plays a major role in connecting the surrounding environmental things to the network and makes easy to access those un-internet things from any remote location.

•Automated car parking system allows users to find the nearest parking areas. It also gives availability of parking slots in the respective parking area.

•It mainly focuses on reducing the time in finding the parking lots in the parking area. It also lessens the fuel consumption, which in turn reduces the carbon footprints in an atmosphere.

•It also helps people to search parking space accessible with the ease of IOT (Internet of Things) automation by supplying the parking slot information.

•The user can book in advance the parking slots and update the information to the server.

•Every user has a unique ID and password. In case, the car is stolen and enter the parking IOT, then the server checks automatically from the database and informs the police.

When the availability of parking slots changes, immediately the information is updated to the central server. Then user can access this stored information using internet from any location. And this information is used by parking operators to determine free parking areas and statistics can be measured at different times in a day on each parking space. The fig.3 shows the communication between two or more clients and SPS with server. Such that single client can access the information of many parking areas in the city. So by observing the availability of parking slots the user can choose their convenient parking area. Thus particular parking area is navigated from client's current position.

The sufficient user interface is provided to the client so that client can access the clear information about the system. The administrator is capable of creating new parking areas by providing the description or information about the parking area and also manages to add number of parking slots in any particular parking area and even further remove the existing parking slots in a parking area. The updated timing of each parking slot is shown along with unique number. And more importantly this user interface provides the navigation to their destination.

Steps involved in setting the Smart Parking System:

•   Appropriately mount the camera such that the image captured by it is clearly shows the parking slots.

•   The parking spaces are marked on to the captured image by an administrator.

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- The control points are drawn according to their convenience of parking slot.

- The setting were saved and registered with the server and finally run the system. The functionalities of the components of automated parking system project are as follows,

1. **Centralized server:** This maintains the information about the parking slots and its availability

2. **Raspberry Pi:** This will act as the microcontroller for the project and all the other sensors will connected to it

3. **Camera:** The Pi camera will be connected to the microcontroller and will be used to validate the parking slots as either empty or occupied

4. **IR sensors:** It will be used to sense the presence of vehicle in the parking slots by sending out IR radiations

5. **Navigation system:** This will give the signals that will guide the users to navigate and go to the nearest available parking slot

6. **Display device:** This will be the screen that displays the status of the parking slots and change real-time

7. **User device:** This can either be the mobile phone or a website which can be used by the user to get the availability of parking slots directly

Major steps involved:

1. The IR sensors or Pi cam should be placed in the appropriate places to clearly cover all the parking slots

2. The parking slots should be appropriately numbered to mark them on the system

3. These marked points will act as the control points and will be integrated as slots in the cloud

4. Then the setting will be saved and the microcontroller will be programmed to display the data online accordingly

Programming language used in SPS: Arduino Programming (C++), Python Programming

The system will be implemented in 3 modules

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Sensor Module: This module will be installed in the parking place, there will be a sensor node for each parking space. The sensors which will be used are IR- sensors.

Raspberry Pi Module: This module will be connected to the internet and will have connections from all sensor nodes.

Android Module: This module will be installed as an Android app in the users phones.
And will display the parking lot status.

The system architecture of SPS has been divided into following 3 modules:
1) Raspberry Pi module

2) Sensors module

3) Android module

The Hardware module is Raspberry Pi and Sensors. The Raspberry Pi will have connections from all sensor nodes. It serves the communication module with latest Database status whenever required by Users. The Raspberry Pi is a creditcard size computer. This is similar to normal computer. The operating system of the Raspberry Pi is Raspbian which is Linux based operating system. It is programmed by using Python Language. The Raspberry Pi is connected to the users through Wi-Fi by using PHP language. To access the Wi-Fi we should connect dongle to the Raspberry Pi.

Sensor module will be placed in the parking space there will be a sensor node for a each parking space. The sensors which will be used are IR-sensors. An Infrared Sensor is an electronic device which is used to sense light wavelength of its surroundings by either emitting or detecting infrared spectrum. Green LED will be glow if no object is detected and Red LED will be glow if object is detected. Using the IR sensors in each parking slot, it detects the presence or absence of a vehicle, and sends messages to user. It will always keep track of cars parked in parking lots using IR Sensors.

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Android module will display the parking status to the user in real time. An Android application is created using Androidstudio. The Android applications are developed using the JAVA code. Using the JAVA compiler the source files are converted to JAVA class files. The Parking status is commanded by the Android device having the

Android application, installed. Then checks for the parking slot for availability. If it is available then it shows green signals or if not available then shows Red signals The communication between the user and the Raspberry Pi is responsible for the overall movement of the car as per data received from the Parking lots. Designing, developing and producing a leading edge parking technology is called as Smart parking. It is a vehicle parking system that helps drivers find a vacant spot. Smart Parking system is proven as an exact.

Algorithm for SPS:

Sensor and Raspberry Pi Module:

Step 1: Initialize the System (IR Sensors and raspberry Pi)

Step 2: Read sensor status and store in the Database

Step3: Send Sensor Status to Android Application when requeste

Step 4: Continue through Step 3

Step 5: Stop

Android Application Module:

Step 1: Start Android App

Step 2: Check connectivity with Server (Raspberry Pi)

Step 3: Request Sensor Status after every time interval

Step4: Continue through Step 3

Step 5: Stop

Application for Smart Parking System:

The system after development can be used by big Shopping or Multiplex malls or Industries to automate the parking status intimation system.

Advantages:

- Save the time for searching the parking spaces. ☒ Reduces the fuel consumption and traffic congestion ☒ Avoids air pollution & global warming.

- Scalable, robust and reliable.

- Reduces the driver stress and improves the urban area.

- Provides the accurate information.

- More efficiency.

Disadvantages

* There is a greater construction cost per space (but this may be offset by the chance for lesser land costs per space and the system manufacturers say that the operating and maintenance cost will be lower as compared to a conventional ramped parking structure).

*Use of redundant systems will result in a greater cost.

* It may be a bit confusing for unfamiliar users.

* It is not recommended for high peak hour volume facilities.

* There may be a fear of breakdown (How do I get my car out?).

* There is an uncertain building department review and approval process.

* It requires a maintenance contract with the supplier.

6. BIBLIOGRAPHY

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