

IEEE 2020-21	Internet of things (IoT)
CODE	TITLE AND ABSTRACT
21ANSP_ IoT01	<p>IoT-Flock: An Open-source Framework for IoT Traffic Generation.</p> <p>Network traffic generation is one of the primary techniques that is used to design and analyze the performance of network security systems. However, due to the diversity of IoT networks in terms of devices, applications and protocols, the traditional network traffic generator tools are unable to generate the IoT specific protocols traffic. Hence, the traditional traffic generator tools cannot be used for designing and testing the performance of IoT-specific security solutions. In order to design an IoT-based traffic generation framework, two main challenges include IoT device modelling and generating the IoT normal and attack traffic simultaneously. Therefore, in this work, we propose an open-source framework for IoT traffic generation which supports the two widely used IoT application layer protocols, i.e., MQTT and CoAP. The proposed framework allows a user to create an IoT use case, add customized IoT devices into it and generate normal and malicious IoT traffic over a real-time network. Furthermore, we set up a real-time IoT smart home use case to manifest the applicability of the proposed framework for developing the security solutions for IoT smart home by emulating the real world IoT devices. The experimental results demonstrate that the proposed framework can be effectively used to develop better security solutions for IoT networks without physically deploying the real-time use case.</p>
21ANSP_ IoT02	<p>Wireless Power Transmission for the Internet of Things (IoT)</p> <p>In some cases, long battery life may be essential to IoT devices, and early failures of actuators and sensors because of the rapid discharging of battery may lead to unacceptably high replacement costs. Critical to the implementation of this Internet Of Things (IoT) is the design of energy-efficient solutions aiming toward a low consumption current and create a green society. Many IoT devices rely on small, rechargeable batteries, so charging a wireless battery is essential for several reasons. Much research and development are working on how can is powering IoT devices wirelessly. Wireless power transmission technology is the diffusion of microwave power transmission without using any physical</p>

	<p>support. The vision of future technology is the Internet of Things IoT charging device without wires. The objective of the scope of work is to combine the wireless power technology with a smart house using IoT. In this research paper, we designed and realized a wireless lighting technology using the fundamentals of microwave radiation. We will send microwave energy from (Position 1) to the receiver (Position 2) to turn up an LED lamp 10 W a distance (50 meters). So the proposed prototype takes account of all parameters above to deliver sufficient energy to turn on the LED lamp 10 W wirelessly on the distance of 50 meters at the smart house.</p>
<p>21ANSP_IoT03</p>	<p>Virtual Labs Project: A Paradigm Shift in Internet-Based Remote Experimentation</p> <p>The lack of good and up-to-date lab experiments form a major impediment in the domain of engineering education. Often, the lab experiments are outdated. The Virtual Labs project addresses the issue of lack of good lab facilities, as well as trained teachers, by making remote experimentation possible. The pedagogy is student-centric. The Virtual Labs project has also developed a novel methodology for field trials, outreach, and quality control. Virtual Labs also provide tremendous cost advantage. The Virtual Labs project is a wonderful example of an open educational resource developed by a multiinstitution multidiscipline project team. Over 100 000 students are currently using the online labs under the Virtual Labs project. Many of these labs are being accessed outside the regular lab hours.</p>
<p>21ANSP_IoT04</p>	<p>Design and Analysis of IoT-Based Intelligent Robot for Real-Time Monitoring and Control</p> <p>Nowadays development of IoT applications with robotics is an ongoing reevaluation. This paper mainly focuses on the security, remote surveillance, and monitoring of our homes done by the surveillance robots. Remote surveillance has become the most important research topic over the past decade. Through this paper we put forward a surveillance robot that can be used in domestic areas and many other places. Robots are becoming important in our day to day life activities as they reduce the human labor and probability of error. We can control robots manually or they can be automatic based on the need of people. This paper focuses on design and implementation of mobile robot for obstacle detection and avoidance in a real-time basis.</p>

21ANSP_IoT05	<p style="color: red;">Energy Harvesting Aided Multiuser Transmission in Spectrum Sharing Networks</p> <p>Multiuser transmission with shared spectrum is investigated in the presence of energy harvesting. For each user, the data generation, the harvested energy arrival, and the channel state variation are, respectively, considered as stochastic processes. Each user aims to maximize its own average throughput. Accordingly, a stochastic game is formulated at first. Next, we analyse the stochastic game in infinite stage and finite-stage scenarios, respectively. On the basis of theoretical studies, an iterated distributive algorithm with solving a linear problem in each iteration is designed for the infinite case. For the finite case, two distributed algorithms named CVPBI and GoPGA are proposed. Finally, the effectiveness of the proposed algorithms is demonstrated by simulations</p>
21ANSP_IoT06	<p style="color: red;">Low Cost IoT Sensor System for Real-time Remote Monitoring</p> <p>Over the past few years, remote monitoring based services are developing in different domains such as traffic monitoring, healthcare, emergency management and environment protection. These applications presuppose the system ability to manage a lot of data coming from different systems. In this paper, the design of a module for remote and real-time monitoring of environmental parameters is indicated. The conceived architecture is based on the micro service paradigm and adopts the 2G data communication network.</p>
21ANSP_IoT07	<p style="color: red;">Automatic Person Count Indication System using IoT in a Hotel Infrastructure</p> <p>This paper aims to provide the most efficient and automatic Power Management System with no human intervention in hotels and lodges. A passive infrared (PIR) sensor is used to detect the presence of people in the room by receiving the infrared (IR) rays emitted from the human body. The PIR sensor is connected to the microcontroller to which the relay is also connected. When the presence/motion of people has detected the relay triggers and power supply to the room is switched 'on'. And when any motion has not been detected for 5 minutes or more the main power supply to the room is switched 'off. This can prevent unwanted usage of power in hotels /lodges when no one is in the room.</p>

	<p>The hotel management can also remotely monitor the availability of people in the room by monitoring the output of the Sensors through IoT.</p>
21ANSP_IoT08	<p>IoT Based Smart Billing and Direction Controlled Trolley</p> <p>The smart shopping trolley system helps customers while shopping. The trolley has an automatic billing system and it follows the movement commands provided by the user by using an android application that was installed in customers mobile. The products purchased by the customer and their cost will be automatically updated to the android application through the local area network (LAN) created using Bluetooth and that bill will automatically send to the administrative system in the shop through the Internet of Things(IoT). This helps customer by replacing tedious process of pulling and pushing the trolley and saves time spent in the billing counter. The automatic billing process can be achieved through radio frequency identification (RFID) tag and reader and to enhance efficient movement of trolley the obstacle avoidance has also been implemented.</p>
21ANSP_IoT09	<p>Design and Development of River Cleaning Robot Using IoT Technology</p> <p>The issue of water logging due to plastic, thermocole and metal is prompting bother development and it favors ailments like intestinal sickness, typhoid and so on. Cleaning the wastes by utilizing manual procedures would be insufficient as it regularly covers immense territory of works and endeavors with plausibility to getting influenced by different sicknesses from the irresistible microorganisms present in the sewage while cleaning manually. This study features a proposed plan of garbage gathering system viable and effective for tidying up waste from rivers, channels and lakes. The trash gathering system is explicitly coordinated to application for getting up a wide assortment of debris, including gliding litter, trash, logs, disposed tires and others. The integrated system incorporates the usage of IoT technology that has the ability to monitor and control the entire process. From the interest and need of cleaning contaminations in the conduits territory, the vessel has been created to suit the prerequisite of working at places other than seaward zone, giving more decisions for the utilization of cleaning garbage and waste from the water environment.</p>

21ANSP_IoT10	<p style="text-align: center;">Cloud-based Internet of things for Smart Water Consumption Monitoring System</p> <p>The levels at which groundwater is depleting around the world is alarming and there is an impending necessity to be judicious with water usage. This led to the formulation of a consolidated architecture to monitor water consumption at the household level. Internet of Things (IoT) is combined with the Thingspeak Cloud Computing platform and Android Studio to facilitate an efficient dashboard for consumers. The proposed model aims at imbuing a sense of responsibility in the citizens as it helps keep a track of water usage periodically using visually appealing charts, lays down the monthly water utility costs as well as provides tips with all in the form of a compact android application in their phones that is needed to be proactive and conserve resources. This paper presents a tested prototype and the pipeline connecting the hardware and software components responsible for streamlining the process of data transfer from IoT to cloud and from cloud to the android application. An overview of the promising technologies and frameworks that have been orchestrated in the development of the system as well as results obtained are thus provided.</p>
21ANSP_IoT11	<p style="text-align: center;">Internet of Things and Fuzzy logic based hybrid approach for the Prediction of Smart Farming System</p> <p>Intelligent connectivity plays a vital role in improving the crop irrigation, crop yield, and crop quality as well as enhanced crop monitoring, weather prediction, and animal care. In this paper, Fuzzy logic and the Internet of Things (IoT) are integrated to improve the accuracy and power consumption of the farming system. Fuzzy rules are applied to control valve of motor for water irrigation. Firebase real time database is also employed to monitor the field remotely through the Internet. Moreover, XGboost is applied to predict the condition of farming. The results demonstrate that our proposed system is better in terms of accuracy, power consumption, error rate as compared to the conventional farming system.</p>

<p>21ANSP_IoT12</p>	<p style="color: red;">Internet of Things (IoT) Based Fire Alert Monitoring System for Car Parking</p> <p>Safety is one of the important factors that should be considered either in the parking area, workplace, home area and so forth. In the university parking area, the students are unable to receive any information regarding a fire smoke or an accident near their vehicle. In addition, the parking safety also not assured due to the shortage of car superintendence and there is no any strict parking management by the security officer. Therefore, a fire smoke alert monitoring system in the university parking area is necessary in order to prevent any accidents that may cause property breakdown and loss of life as happens inside the university area. This system should be introduced since the existing parking is unsystematic and less efficient as it unable to response the complications that are regularly happen to the students because they do not receive any information regarding a fire smoke or an accident near their vehicle in the parking area. With this new system, a few advancements are implemented in order to help the students in various aspects by using multiple and distinct Arduino devices. Moreover, an android application is developed to facilitate the security officer in order to identify the car information that are involved in the accident that might be occur in the university parking area.</p>
<p>21ANSP_IoT13</p>	<p style="color: red;">Gesture Controlled Home Automation using CNN</p> <p>As technology is rising, more advancements are made in making the life of people easier, by providing methods for easy monitoring and managing. In this paper, a Home Automation model is designed to provide ease of control of home appliances, using an android application. The elderly and physically challenged people can perform their day-to-day activities efficiently. In previous methods, accelerometers are used to monitor the activity, which are accurate but are not flexible and portable. The proposed system detects the gestures given as input by the user and controls the home appliance. The client interface is responsible for capturing the input gesture from the user, using an android application and uploading it on the raspberry pi server. Raspberry pi acts as an important pre-processor. Backend Processing involves image pre-processing, training the CNN model, and prediction of image class category of input gesture image. Based on this predicted class of image, the respectively assigned action takes place at the home interface.</p>

21ANSP_IoT14	<p style="text-align: center;">Smart Agriculture Based on IoT and Cloud Computing</p> <p>The improvement in new technologies in this modern era has resulted to miniaturization of sensors and the attempts to utilize them in various areas are getting succeeded. Also, adoption of Internet of Things (IoT) and Cloud Computing in any area are leading them to a notion of "Smart" like Smart Health Care systems, Smart Cities, Smart Mobility, Smart Grid, Smart Home and Smart Metering etc. One such area of research that has also seen this adoption is agriculture and thus making it a Smart Agriculture. Agriculture is one of the major source for any of the largest population countries like India, China etc. to earn money and carry out the livelihood. Involvement of IoT and Cloud Computing in the agricultural sector would result in the better production of crops by controlling the cost, monitoring performance and maintenance, thereby benefiting the farmers and the overall nation. This paper focuses on introduction of a Smart Drone for crop management where the real-time Drone data coupled with IoT and Cloud Computing technologies help in building a sustainable Smart Agriculture.</p>
21ANSP_IoT15	<p style="text-align: center;">e-Poultry: An IoT Poultry Management System for Small Farms</p> <p>Chicken or poultry farms increase its production as the population in the Philippines demanded more supply of food resources. The livestock production is a billion-peso industry where many Filipinos are depending on. The researchers pursued this delving to address the need in providing an updated technology, to help poultry farmers. This study tackles Poultry Management System, an IOT system that automates the process of giving feeds and water to poultry animals. An Android application was developed to set the time, in which the user intends to give food to the chicken. Water is constantly provided to the poultry once the sensor detects that the water container is empty. As the feed and water tank gets low, a notification system is in place to inform the user about it. A solar panel is used to charge the battery that powers the microcontroller and motors. This technology provided a relevant result in upgrading poultry businesses that saves time and effort.</p>
21ANSP_IoT16	<p style="text-align: center;">Android Application for Advanced Security System based on Voice Recognition, Biometric Authentication, and Internet of Things</p> <p>Nowadays, the smart home automation system has a significant role in makes daily work easier and efficient. Keeping room keys is an obstacle. Therefore many research has been proposed however the lack</p>

	<p>of a security system makes the automation systems less trustworthy and unreliable, as well as limited control distances. This paper purposes speech recognition to control the door and only registered people can access it. The proposed system uses microcontroller NodeMCU ESP8266 with a wifi connection to control actuators. The android application has features tracking history control menu, real-time monitoring menu, registration menu, and speech recognition control. The system security consists of a login system, biometric authentication, and specific speech command. The system also uses restful API technology and a java programming language for conducting data transactions either android or microcontroller with a database server. The results show a stable response time of 2 seconds for the microcontroller to control the smart home locally and distantly in one city. The system also proves the registration menu, tracking history control and real-time monitoring perform well with 100% success. The 3 levels of security system also have 100% success with each level must have a value true before doing control of the smart home. This level of security proves the application system is not easy to hack by anyone, very reliable and trustworthy.</p>
21ANSP_IoT17	<p style="color: red;">GPS-based Mobile Cross-platform Cargo Tracking System with Web-based Application</p> <p>Cross-platform development is becoming widely used by developers, and writing for separate platforms is being replaced by developing a single code base that will work across multiple platforms simultaneously, while reducing cost and time. The purpose of this paper is to demonstrate cross-platform development by creating a cargo tracking system that will work on multiple platforms with web application by tracking cargo using Global Positioning System (GPS), since the transport business has played a vital role in the evolution of human civilization. In this system, Google Flutter technology is used to create a mobile application that works on both Android and iOS platforms at the same time, by providing maps to clients showing their cargo location using Google Map API, as well as providing a web-based application.</p>

<p>21ANSP_IoT18</p>	<p style="color: red;">Internet of Things (IoT) and Machine Learning based Leaching Requirements Estimation for Saline Soils</p> <p>Soil salinity is a soil degradation phenomenon with severe impact on crop production. Internet of Things (IoT) assisted solution is proposed to determine soil salinity level and environment conditions to recommend irrigation water, with a purpose to leach down the salts from the root zone of crops in saline soils. Internet of Things (IoT) and Machine Learning (ML), based leaching water requirements estimation for saline soils is made using the in-situ monitoring of the salinity level and crop field temperature. Food and Agricultural Organization (FAO) proposed method of leaching requirement is implemented for efficient leaching water estimation. These estimations are used to train and test the Naive Bays classifier for machine learning, to predict leaching requirements in future while using only temperature and soil salinity level. The performance of machine learning is judged in terms of accuracy, f-measures, precision, and recall. Proposed solution implemented on a cotton crop in salt affected area, to test the agronomic impact of the proposed solution.</p>
<p>21ANSP_IoT19</p>	<p style="color: red;">A Partition-Based Node Deployment Strategy in Solar Insecticide Lamp Internet of Things</p> <p>Solar Insecticide Lamp (SIL) is a green prevention and control technology for pests. As the development of Wireless Sensor Networks (WSNs), the combination of SILs and WSNs forms a novel agricultural Internet of Things - Solar Insecticide Lamp Internet of Things (SIL-IoT). However, the complex geographical characteristic of actual farmland has a great impact on SIL deployment. In this paper, we study the SIL Deployment Problem (SILD) with characteristics of full coverage, penetrable obstacles, irregular boundary and partition structure. According to partition structure caused by natural physiognomy feature, the actual farmland is divided into many subareas by ridges, and each subarea can be considered as a separate partition. Then, we formulate the SILD in the scenario with partition structure as the quadratic assignment problem. After that, we propose two deployment methods based on genetic algorithm to address the SILD. These two methods are the same in optimization objectives, but different in deployment sequence. Experimental results show that the proposed deployment methods equips better performance in terms of deployment cost compared with the other six peer algorithms.</p>

21ANSP_IoT20	<p style="color: red;">Collaborate Edge and Cloud Computing with Distributed Deep Learning for Smart City Internet of Things</p> <p>City Internet of Things (IoT) applications are becoming increasingly complicated and thus require large amounts of computational resources and strict latency requirements. Mobile Cloud Computing (MCC) is an effective way to alleviate the limitation of computation capacity by offloading complex tasks from mobile devices to central clouds. Besides, Mobile Edge Computing (MEC) is a promising technology to reduce latency during data transmission and save energy by providing services in a timely manner. However, it is still difficult to solve the task offloading challenges in heterogeneous cloud computing environments, where edge clouds and central clouds work collaboratively to satisfy requirements of city IoT applications. In this paper, we consider the heterogeneity of edge and central cloud servers in the offloading destination selection. To jointly optimize the system utility and the bandwidth allocation for each mobile device, we establish a hybrid offloading model including the collaboration of MCC and MEC. A Distributed Deep learning-driven Task Offloading (DDTO) algorithm is proposed to generate near-optimal offloading decisions over the mobile devices, edge cloud server and central cloud server. Experimental results demonstrate the accuracy of the DDTO algorithm, which can effectively and efficiently generate near-optimal offloading decisions in edge and cloud computing environments. Furthermore, it achieves high performance and greatly reduces the computational complexity when compared with other offloading schemes that neglect the collaboration of heterogeneous clouds. More precisely, the DDTO scheme can improve the computational performance by 63%, compared with the local-only scheme.</p>
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21ANSP_IoT21	<p style="color: red;">The Internet of Battlefield Things (IoBT) based Enemy Localization using Soldiers Location and Gunshot Direction</p> <p>The real-time information of enemy locations is capable to transform the outcome of combat operations. Such information gathered using</p>
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	<p>connected soldiers on the Internet of Battlefield Things (IoBT) is highly beneficial to create Situational Awareness (SA) and to plan an effective war strategy. The paper presents the novel enemy localization method that uses the soldier's own locations and their gunshot direction. The hardware prototype has been developed that uses a triangulation for an enemy localization in two soldiers and a single enemy scenario. 4.24 ± 1.77 meter of average localization error and $\pm 4^\circ$ of gunshot direction error has been observed during this prototype testing. This basic model is further extended using three-stage software simulation for multiple soldiers and multiple enemy scenarios with the necessary assumptions. The effective algorithm has been proposed, which differentiates between the ghost and true predictions by analysing the groups of subsequent shooting intents (i.e frames). Four different complex scenarios are tested in the first stage of the simulation, around 3 to 6 frames are required for the accurate enemy localization in the relatively simple cases and 9 frames are required for the complex cases. The random error within $\pm 4^\circ$ in gunshot direction is included in the second stage of the simulation which required almost double the number of frames for similar four cases. As the number of frames increases, the accuracy of the proposed algorithm improves and better ghost point elimination is observed. In the third stage, two conventional clustering algorithms are implemented to validate the presented work. The comparative analysis shows that the proposed algorithm is faster, computationally simple, consistent and reliable compared with others. Detailed analysis of hardware and software results for various scenarios has been discussed in this paper.</p>
21ANSP_IoT22	<p>Behavioural Biometrics for Continuous Authentication in the Internet of Things Era: An Artificial Intelligence Perspective</p> <p>In the Internet of things (IoT) era, user authentication is an essential to ensure the security of connected devices and the customization of passive services. However, conventional knowledge-based and physiological biometric-based authentication systems (e.g., password, face recognition, and fingerprints) are susceptible to shoulder surfing attacks, smudge attacks and heat attacks. The powerful sensing capabilities of IoT devices including smartphones, wearables, robots and autonomous vehicles enable the continuous authentication (CA) based on behavioral biometrics. Artificial Intelligence (AI) approaches hold significant promise in sifting through large volumes of heterogeneous biometrics data to offer unprecedented user authentication and user identification capabilities. In this survey paper, we outline the nature of</p>

	<p>continuous authentication in IoT applications, highlight the key behavioral signals, and summarize the extant solutions from an AI perspective. Based on our systematic and comprehensive analysis, we discuss the challenges and promising future directions to guide the next generation of AI-based continuous authentication research.</p>
21ANSP_IoT23	<p>A Trusted Attestation Scheme for Data Source of Internet of Things in Smart City Based on Dynamic Trust Classification</p> <p>The Internet of Things (IoTs) in Smart Cities collects and transmits a large amount of time-space sensitive information to realize feedback control. It bridges the gap between the information world and the real world. With the data-based feature, the security and credibility of the Internet of Things mainly depends on whether the source of the data is trusted. Therefore, as the data collection and transmission entity, sensing nodes should be classified and proved the trustworthiness. However, existing works failed to classify and measure the credibility of sensing nodes multi-dimensional in real-time. The previous trust proof methods also cannot effectively protect the key information. To address these problems, this paper first proposes a multi-dimensional and fine-grained dynamic measurement method in a trusted computing environment. Then, a trust classification model of sensing nodes is presented, and a grouping mechanism of different trust levels is designed to identify malicious nodes. Finally, a threshold ring signature-based trust certification scheme is proposed for data source authentication. It can adequately protect the privacy information of the attestation node and has complete anonymity and traceability. Besides, the scheme has a shorter signature and high computational efficiency, which makes it also suitable for sensing nodes with limited computing resources. Simulation results show that the scheme has better dynamic adaptability, and can effectively ensure the credibility of data sources under the premise of various attacks with accessible impact on the system.</p>
21ANSP_IoT24	<p>Design and Operation of a Lightweight Educational Testbed for Internet of Things Applications</p> <p>In this paper, we present the design and operation process of AssIoT-IoT testbed; an educational and remotely accessible testbed for internet of things applications. The testbed adopts the Experiment as a Service (EaaS) model in which users are able to access the testbeds and reserve/use the available resources remotely over the internet. Also, the testbed is federated with other ones distributed among different locations</p>

	<p>to allow sharing of resources, user accounts, and policies. The federated testbeds form an educational consortium that facilitates students' access to hardware resources available at different locations. AssIoT-IoT testbed consists of a control server and a set of IoT nodes (hardware resources) supported with different wireless communication capabilities. We present the design, operation, and performance details of the testbed in terms of the hardware and software components. We describe the steps needed to complete experiments using our testbed, and we provide some examples. Moreover, we evaluate the testbed and the IoT networks performance. Finally, we present the internet of things students' competition as one of the activities where the testbed has been used.</p>
21ANSP_IoT25	<p style="color: red;">Secured IoT Based Smart Greenhouse System with Image Inspection</p> <p>Automated Greenhouse System helps the farmers by controlling the environmental parameters through Internet of Things (IoT), including crop health inspection using image analysis. The Greenhouse is generally affected by two factors: plant disease and weather condition, which leads to the fall in production. The weather condition can be controlled through Microcontroller Unit (MCU) and the plant disease can be monitored using image inspection system. The research recommends a cheaper image evaluation framework for the plant disease analysis and fully automated Greenhouse with data security. The prototype of the proposed system consists of Raspberry pi, MSP432, Temperature sensor, Moisture sensor, Humidity sensor and OpenCV Image Inspection System. The actuators and motors are controlled by MCU MSP432 through relays upon reaching predetermined threshold values. The proposed architecture is equipped with embedded data security by implementing Extended Tiny Encryption Algorithm (XTEA). Lastly, the agriculturists can familiarize with the recommended framework through the cloud-centered application. The autonomous framework permits the agriculturists to evaluate and control their greenhouse ecology remotely.</p>
21ANSP_IoT26	<p style="color: red;">Scalable Adaptive Networking for the Internet of Underwater Things</p> <p>Internet of Underwater Things (IoUT) systems comprising tens or hundreds of underwater acoustic communication nodes will become feasible in the near future. The development of scalable networking protocols is a key enabling technology for such IoUT systems, but this task is challenging due to the fundamental limitations of the underwater acoustic communication channel: extremely slow propagation and limited bandwidth. The aim of this paper is to propose the JOIN protocol</p>

	<p>to enable the integration of new nodes into an existing IoUT network without the control overhead of typical state-of-the-art solutions. The proposed solution is based on the capability of a joining node to incorporate local topology and schedule information into a probabilistic model that allows it to choose when to join the network to minimize the expected number of collisions. The proposed approach is tested in numerical simulations and validated in two sea trials. The simulations show that the JOIN protocol achieves fast convergence to a collision-free solution, fast network adaptation to new nodes, and negligible network disruption due to collisions caused by a joining node. The sea trials demonstrate the practical feasibility of this protocol in real UAN deployments and provide valuable insight for future work on the trade-off between control overhead and reliability of the JOIN protocol in a harsh acoustic communication environment.</p>
21ANSP_IoT27	<p style="color: red;">Monitoring Systems for Transportation of Perishable Products based Internet of Things (IoT) Technology</p> <p>For the past decade, one of the most important challenges for human societies has been the impact of food on human health. European countries, and in particular the European Union, have established laws and standards to address this challenge by allowing them to track and monitor foodstuffs in during the production chain until consumption. By enforcing these rules, the European Union has obliged food and feed operators to set up tracking and monitoring systems for their products. One of the most important parts of these systems is the transportation chain. The transportation of food from origin of production to consumption destination is very important. And must provide traceability for food quality control and health. One of the new technologies that has enabled human societies to make food products traceable to humans is the Internet of Things (IoT). That has brought together manufacturers, transport systems, retailers and consumers of food. In this paper, we propose a cost effective way to enable real-time food tracking and monitoring.</p>
21ANSP_IoT28	<p style="color: red;">Charging Buddy – A Secured Charging Station Using Internet of Things</p> <p>Currently, when a user’s cell phone runs out of battery and there is no charging outlet nearby there is very little or nothing that the user can do about it. Even if a charging outlet is available nearby one would have to stay close to the charging outlet until the phone is charged. Our system</p>

	<p>would provide such users with a solution that would enable them to do other things while the cell phone is being charged without worrying about the safety of their phones. Our charging stations would be located at various public places which would be available for all the registered users. These Secured Charging Stations would be like vending machines i.e. fully automated using the Internet of Things (IoT). These charging stations, when placed in stores, would attract more customers and increase their dwell time which would consequently increase sales. These mobile devices are our means to remain connected. With the progress in microprocessor technology phones have become more powerful than ever. Unfortunately, batteries in these phones have not been growing at a comparable pace. Hence, there is a need to frequently charge these mobile devices. People find it difficult to charge their beloved mobile devices when they run out of battery and they are outdoors. Most people at some point have experienced having their mobile devices run out of battery when they are not near a charging outlet. This project is an excellent example of Ubiquitous computing that uses Cloud computing for solving this widespread problem.</p>
21ANSP_IoT29	<p>Social Pal: A Combined Platform for Internet of Things and Social Networks</p> <p>Social Internet of Things (SIoT) is a new model that has integrated into two technologies, Internet of Things (IoT) and Social Networks. The SIoT defines as a social network of objects that are not only smarter but also socially conscious. The major issues related to IoT are; communication between the objects, service composition and service discovery. To address the after-mentioned needs, this paper proposes a possible approach named social pal. The social pal collects and provides the information to the IoT, and hence our proposed social network provides glue to allow the human to device interaction. This study leverages the social relationships among the participants (devices and users) in the system for delivering the required services to the users. By using this platform the capability to select and find the devices, discover the services in the IoT paradigm is augmented. Briefly, the main features of social pal are; create an object, define the relationship, find and discover the pairs of objects that can offer services, etc.</p>
21ANSP_IoT30	<p>A Framework for Securing EHR Management in the Era of Internet of Things</p>

	<p>Nowadays the internet of things (IoT) is one of the most arising obvious technologies which plays an important role in healthcare systems. Healthcare systems including stored Electronic healthcare records (EHR), which are vulnerable to intentional and unintentional security threats. Therefore; the need for strong EHR security protection is essential. In this paper we display and analyze some of the proposed IoT-based security solutions for healthcare, and also outline a new platform that secures and enhances the process of accessing and managing EHR in hospitals databases.</p>
21ANSP_IoT31	<p>Time-aware Smart Object Recommendation in Social Internet of Things</p> <p>With large numbers of possible smart objects in Social Internet of Things (SIoT), a recommendation system is of great necessity to help users find smart objects they need. However, traditional recommendation techniques usually exploit user's rating or feedback information, which are impractical as such kind of user preference information is difficult to collect in SIoT environment. In addition, temporal context plays an important role in smart object recommendation since most users tend to utilize different objects at different time slots in a day, e.g., making coffee at morning and playing game on weekends. In this work, we propose a time-aware smart object recommendation model by jointly considering user's preference over time and smart object's social similarity. We firstly learn user's preference over time from his/her object usage events with a latent probabilistic model. Then, we estimate smart object's social similarity by embedding their heterogeneous social relationships into a shared lower dimensional space. Finally, we generate the recommendation list with an item-based collaborative filtering. We conduct a comprehensive experimental study based on two real-world datasets, and the experimental results show our method outperforms all baselines significantly in terms of recommendation effectiveness.</p>
21ANSP_IoT32	<p>HAC: Enable High Efficient Access Control for Information-Centric Internet of Things</p> <p>Information-Centric Networking (ICN) is regarded as a promising architecture for Internet of Things (ICN-IoT) and access control is one of the critical problems to enable secure ICN-IoT. This paper proposes HAC, a high efficient access control system for ICN-IoT. Specifically, HAC enables access control via an elaborate designed Hierarchical Key Tree (HKT) mechanism based on the hierarchical naming scheme of</p>

	<p>ICN. The proposed HKT contains the hierarchical authority information and allow users to locally derive the key according to their needs, thus greatly decreasing the overhead in IoT's many-to-many communication scenario. To ensure the security and efficiency of HKT, we further propose a Level Oriented Ciphertext Policy Attribute-Based Encryption (LOCP-ABE) algorithm such that users can only obtain the authority level according to their attributes, and also utilize ICN's receiver driven model and in-network caching mechanism to speed up the distribution efficiency. Moreover, an attribute-based command verification mechanism is used to improve the efficiency of command verification for resource-constrained and isolated IoT edge. We evaluate the proposed HAC by the theoretical security analysis and real-world experiments. The theoretical analysis proves that the proposed HAC is secure and experiment results show that HAC can greatly improve the access control efficiency in ICN-IoT compared with the state-of-art.</p>
21ANSP_IoT33	<p>Fabrication-as-a-Service: A Web-based Solution for STEM Education using Internet of Things</p> <p>Recently, Fabrication Laboratories (Fab Lab) have been shown to have a great impact on learners' academic and personal progress. As a result, an increasing effort is being put to integrate Fab Labs into schools' curricula. Yet, owing to the high cost of setting-up and maintaining Fab Labs as well as the lack of sufficient funding for most schools and universities, only a limited number of institutions can afford them. In this paper, we propose a new concept called Fabrication-as-a-Service (FaaS) that uses Internet of Things to democratize access to Fab Labs via enabling a wide learning community to remotely access these computer-controlled tools and equipment over the Internet. It employs a two-tier architecture consisting of a hub, deployed in the cloud, and a network of distributed Fab Labs. Each Fab Lab interacts with the hub and other digital labs via a Fab Lab Gateway. This is to support scalability and high availability of fabrication services as well as ensure system's security. FaaS also adopts an innovative master-slave approach that uses inexpensive external hardware to monitor and control the activity of expensive fabrication equipment. The paper also describes FaaS deployment in the context of the European Union Horizon 2020 NEWTON project. Multiple scenarios have been deployed to fully illustrate the benefits of FaaS architecture and to assess the performance of its communication protocol stack.</p>

21ANSP_IoT34	<p style="color: red;">Towards Secure and Provable Authentication for Internet of Things: Realizing Industry 4.0</p> <p>Internet of Things (IoT) has many applications, including Industry 4.0. There are a number of challenges when deploying IoT devices in the Industry 4.0 setting, partly due to the low-cost IoT devices/nodes with limited capacity to run/support security solutions. Hence, there is a need for a lightweight and efficient security solution to protect the environment. Thus, in this paper, we present a robust, lightweight, and provably secure authentication and key agreement protocol specifically for IoT environment based on a hierarchical approach. The proposed protocol relies on lightweight operations, such as elliptic curve cryptography, physically unclonable functions, hash functions, concatenation, and XOR operations. We then evaluate the security of the designed protocol, including the widely used AVISPA, and demonstrate that it supports mutual authentication between IoT nodes and server, and is resilient against a number of common security attacks (denial of service (DoS), replay, spoofing, etc). The computational and communication overhead analysis shows that the proposed protocol is comparatively less expensive than three other recently published, competing protocols</p>
21ANSP_IoT35	<p style="color: red;">Coastal Monitoring System based on Social Internet of Things Platform</p> <p>Coast erosion is a process that degrades a coastal profile and is mainly due to natural factors (e.g., related to climate change) and overcrowding (e.g., urbanization and massive tourism). While the first cause can be considered a slow process, the growing presence of humans is leading to a rapid aging of coasts. The Mediterranean Sea authorities are focusing on the necessity for a systematic and comprehensive approach to the management of littoral areas. In this context, Italy is searching a promising solution to safeguard coasts but, at the same time, to manage in an intelligent and “green” way the big amount of tourists. Research community all over the world indicated Internet of Things (IoT) as a valid technology to develop solutions in order to try solving or mitigating the coastal erosion problem. IoT-based techniques allow to manage heterogeneous and massive data for real-time monitoring and decision making and can be used for coastal environment and crowd level monitoring. This paper presents a monitoring system based on the Social IoT (SIoT), a new paradigm which defines a network where every node is an object capable of establishing social relationships with other things in an autonomous way according to specific rules. Thanks to social</p>

	<p>relationships, all involved devices in the monitoring system (i.e., sensors, cameras, and smartphones) are able to collect and exchange information. The proposed system, developed and installed in Cagliari (Italy), is able to evaluate the occupational state of a beach considering environmental and crowding data collected by devices and feedback sent by users.</p>
<p>21ANSP_ IoT36</p>	<p style="color: red;">Research on the Application of Electronic Technology of Internet of Things in Smart City</p> <p>In order to realize the application of the electronic technology of the Internet of things in the smart city, this paper puts forward a novel application method of the electronic technology of the Internet of things, which integrates a variety of advanced science and technology. This method is based on traditional network technology, wireless radio frequency technology and cloud computing technology, and can accurately analyze the construction process of smart city. The research results show that this method can fundamentally realize the application of the electronic technology of the Internet of things in the smart city, give full play to the advantages of the electronic technology of the Internet of things, and promote the construction process of the smart city.</p>
<p>21ANSP_ IoT37</p>	<p style="color: red;">MAN: Mutual Attention Neural Networks Model for Aspect-Level Sentiment Classification in SIoT</p> <p>Text sentiment classification is critical of importance to improve the autonomous decision making and communication ability among object peers in Social Internet of Things (SIoT). To classify sentiment polarity on a fine-grained level, aspect level sentiment classification has become a promising direction in recent years. However, the existing solutions typically ignored the mutual information between sentences and their respective aspect terms while generally performing sentiment classification by using simple attention mechanism. Thus, the relevant results seem to be unpromising. We aim to develop a novel neural-networkbased model, by relying on the NLP model for rich feature extraction, called mutual attention neural networks (abbreviated as MAN) to conduct the aspect-level sentiment classification tasks in this paper. Compared with previous work, our proposed MAN model takes advantage of the bidirectional long short-term memory (Bi-LSTM) networks to obtain semantic dependence of sentences and their respective aspect terms, while learning the sentiment polarities of aspect terms in sentences by proposing mutual attention mechanism. To evaluate the performance of MAN, we conduct our experiments on three</p>

	<p>real-world datasets, i.e., LAPTOP, REST, and TWITTER. The experimental results show that our proposed MAN model has significantly performance improvements when compared to several existing models, in terms of aspect-level sentiment classification.</p>
<p>21ANSP_IoT38</p>	<p style="color: red;">Design and Implementation of Internet of Things Information Security Transmission Based On PBFT Algorithm</p> <p>Aiming at the security problems such as data theft, fraud and tampering in the information transmission process of the Internet of things, this paper studies the decentralized and trust less technology of Internet of things information transmission based on the blockchain technology through the super ledger Fabric blockchain platform, and proposes a technology for Internet of things transmission information security that uses the PBFT algorithm. Simulation results show that the algorithm effectively utilizes the redundant computing power in the network and improves the security of information transmission and fault tolerance of the system.</p>
<p>21ANSP_IoT39</p>	<p style="color: red;">Smart and Sustainable Home Aquaponics System with Feature-Rich Internet of Things Mobile Application</p> <p>Food security has been a recurring issue for many countries in the world including Singapore. This issue is exacerbated by growing world population and climate change, which inevitably leads to an increased demand for food. In recent years, large scale aquaponics has shown efficient production of edible fish and plants. This paper further exploits the design and development of an aquaponics system for home environment, with the notion that if every household within a country can generate its own fish and plants, the overall food demand of the country will be reduced. The proposed smart and sustainable home aquaponics system consists of various sensors, actuators, and microcontroller with internet connectivity to continuously monitor, control, and record fish tank water and ambient air quality. Healthy growth of fish and plants are ensured by sending an early warning to the user in the event of any abnormal system condition via a push notification in a feature-rich internet of things (IoT) mobile application. Furthermore, appropriate actuators are automatically operated to rectify abnormalities in a timely manner. Plant grow lights and fish feeder are also automatically controlled to optimize fish and plant growth. All sensor readings and actuator statuses are intuitively displayed to the user in real time through the IoT mobile application and securely sent to an</p>

	<p>online spreadsheet for storage and further analysis. Measurement results successfully demonstrate the efficacy of the proposed home aquaponics system to grow healthy fish and plants, with minimal operational costs and human intervention.</p>
<p>21ANSP_IoT40</p>	<p style="text-align: center;">Smart School Lab and Participatory Citizenship</p> <p>This study is based on the question of the poor involvement of students in their respective educational community, as far as citizen science is concerned. The research takes place in a Secondary School in the central coastal region of Portugal. In order to answer the research problem - “How to develop citizen science strategies using the Internet of Things, within the scope of a SSL, aiming to enhance the participatory citizenship of students?” - Design-based research (DBR) strategies will be applied, in an iterative evolutionary approach, interchanging between action and critical thinking, with integrative activities that will fuel the project. Artefacts and guidelines will be co-constructed between researchers, teachers, students and local community - didactic kits with transdisciplinary contents, promoters of citizen science skills and supported by digital electronics and IoT - that should endure beyond the study and be subsequently adopted, adapted and used by other teachers from the institution where this study takes place. Regarding the results expected with this study, the highlights are: the production of the didactic kits “education” and “citizen” which will contribute, per se, to the common good, with the detection of environmental problems in the target city of study; the improvement of the students' citizen science skills; and the realization of the potential of the IoT by the teachers who take part in the study, mainly in what concerns the development of pedagogical - didactic and social-communicative skills.</p>
<p>21ANSP_IoT41</p>	<p style="text-align: center;">The Internet of Audio Things: state-of-the-art, vision, and challenges</p> <p>The Internet of Audio Things (IoAuT) is an emerging research field positioned at the intersection of the Internet of Things, sound and music computing, artificial intelligence, and human-computer interaction. The IoAuT refers to the networks of computing devices embedded in physical objects (Audio Things) dedicated to the production, reception, analysis and understanding of audio in distributed environments. Audio Things, such as nodes of wireless acoustic sensor networks, are connected by an infrastructure that enables multidirectional communication, both locally and remotely. In this paper, we first review the state of the art of this field, then we present a vision for the IoAuT</p>

	<p>and its motivations. In the proposed vision, the IoAuT enables the connection of digital and physical domains by means of appropriate information and communication technologies, fostering novel applications and services based on auditory information. The ecosystems associated with the IoAuT include interoperable devices and services that connect humans and machines to support human-human and human-machines interactions. We discuss challenges and implications of this field, which lead to future research directions on the topics of privacy, security, design of Audio Things, and methods for the analysis and representation of audio-related information.</p>
21ANSP_IoT42	<p>BBIL: A Bounding Based Iterative Method for IoT to Localize Things</p> <p>The “Internet of Things” has become more popular over the past decade. For the IoT to be successful, it is vital to track the location of these things (sensors or actuators). In this paper, based on a new IoT underlying architecture, a NB-IoT aided, bounding based iterative and range-free method, named BBIL, is proposed to localize things. We make use of the location information of all anchor regular nodes that can help to improve the localization accuracy as much as possible. Specifically, not only single-hop and multi-hop anchor things but also singlehop and multi-hop regular things are used for localization. In addition, the communication and computational loads of the local network are greatly decreased because the anchor things can directly access the Internet using NB-IoT modules; hence, data can be sent to the Internet through a small number of hops in the local network and processed in the cloud/edge computing facilities in a centralized way. To balance the location accuracy and energy consumption of BBIL, we propose a theory model to obtain the optimal number of the anchor things. BBIL is evaluated and compared with the existing methods. The simulation results indicate that the average localization error of BBIL is less than 11.6%. Also, it also performs well in anisotropic networks. In addition, we verified the validity of our method in real world scenario.</p>
21ANSP_IoT43	<p>Security and Privacy of Smart Home Systems Based on the Internet of Things and Stereo Matching Algorithms</p> <p>With the rapid development of the Internet of Things (IoT), security and privacy of smart home systems based on IoT is more and more popular. As the key component of IoT, wireless communication and sensor technology are prerequisites for the security and confidentiality of smart home systems. Smart home systems integrate electronic information</p>

	<p>technology and computer control. By designing and installing various sensors in the home for collecting data, and then using IoT platform for data transmission, the remote control of the home running state can be realized. The home security is guaranteed. This study designs IoT architecture of smart home, and then hardware and software are designed according to the system architecture. The hardware part is mainly analysed from the image recognition module and speech recognition module. In addition, a stereo matching algorithm for smart video surveillance is proposed to optimize the accuracy of the surveillance system. Finally, the simulation results prove that the designed smart home systems have a low cost and high accuracy. It not only optimizes the performance of smart home systems, but also improves the safety factor.</p>
<p>21ANSP_IoT44</p>	<p>Research on Optimizing Transportation of Fresh Agricultural Products by Internet of Things</p> <p>The transportation problems of fresh agricultural products is analysed, the opinion is illustrated that the internet of things technology should be used to optimize transportation of the fresh agricultural products, the key elements of the IOT for transportation of fresh agricultural products are summarized, the application mode of IOT for transportation of fresh agricultural products is established, and some strategies to strengthen the application of the internet of things technology in fresh agricultural products transportation are proposed.</p>
<p>21ANSP_IoT45</p>	<p>Deep Learning Enhanced Human Activity Recognition for Internet of Healthcare Things</p> <p>Along with the advancement of several emerging computing paradigms and technologies, such as cloud computing, mobile computing, artificial intelligence, and big data, Internet of Things (IoT) technologies have been applied in a variety of fields. In particular, the Internet of Healthcare Things (IoHT) is becoming increasingly important in Human Activity Recognition (HAR), due to the rapid development of wearable and mobile devices. In this study, we focus on the deep learning enhanced HAR in IoHT environments. A semi-supervised deep learning framework is designed and built for more accurate HAR, which efficiently use and analyze the weakly labeled sensor data to train the classifier learning model. To better solve the problem of inadequately labeled sample, an intelligent auto-labeling scheme based on Deep Q-Network (DQN) is developed with a newly designed distance-based</p>

	<p>reward rule, which can improve the learning efficiency in IoT environments. A multi-sensor based data fusion mechanism is then developed to seamlessly integrate the on body sensor data, context sensor data, and personal profile data together, and a Long Short Term Memory (LSTM)-based classification method is proposed to identify fine-grained patterns according to the high-level features contextually extracted from sequential motion data. Finally, experiments and evaluations are conducted to demonstrate the usefulness and effectiveness of the proposed method using real world data.</p>
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