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**PROJECT REPORT**

**ON**

**SMART SURVEILLANCE WITH FACE AND**

**OBJECT DETECTION USING DRONES**

**20ECTE501- LIVE IN LAB III**

***Submitted by***

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**BONAFIDE CERTIFICATE**

Certified that this project report “**SMART SURVEILLANCE WITH FACE AND OBJECT DETECTION USING DRONE “**, is the bonafide work of **“SANJAY KUMAR Y R (412520106145), RAJA VENKATESAN P (412502106701), RAMANATHAN M (412502106128 )”** who carried out the 20ITTE501- LIVE IN LAB III Project Work under my supervision.

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Submitted for the project viva-voce examination held on \_\_\_\_\_\_\_\_\_\_\_\_

**INTERNAL EXAMINER EXTERNAL EXAMINER**

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### **ABSTRACT**

### Drones are used frequently today, from armed conflict to medication delivery. In addition to surveillance and rescue missions, drones can be deployed. We must integrate contemporary technology like Deep Learning and Artificial Intelligence into our defense systems. Drones are needed by defense Ministry organizations and institutes to find foreign soldiers, weapons, and camps. In this project, we will create a drone that can spot soldiers, drones, army camps etc. We will train models that can be deployed in real time using face detection and objection detection methods. The servers receive the video data from the drone camera. The servers will process the video or image. The output will be provided as text messages and images. It is possible to eliminate the drones and missiles of other nations by using this drone technology in anti-drone systems and anti- aircraft missiles. Autonomous drones are a possibility. For better performance, they can converse with one another. So improved surveillance is possible with the use of this technology. Finding victims of natural catastrophes like floods, tsunamis, etc. can be made easier with its assistance for local, federal, and state law enforcement personnel.

**KEYWORDS :** Drones, Deep Learning, YOLO, AUV, Artificial Intelligence

### **INTRODUCTION**

### **1.1 Objective:**

### A drone, or unmanned aerial vehicle, is a type of aircraft that travels through the air but does not contain any people. Due to the vehicle's small size, people are not present inside or on the ground, but without their assistance, it would be impossible to ensure a flawless flight. Either before takeoff or once the drone is in the air, the flight can be planned. Drones are frequently used for photography, leisure activities, entertainment purposes, or to film videos of sporting events and other activities that take place across a big area but are not visible to humans. Its capacity to soar high and offer extensive coverage is of utmost importance to mankind.

**1.2 Motivation:**

The main motive of our project is to create drones for people. Because in recent days No crimes happening in public places are increasing day by day. To avoid such cases in particular areas where immediate help is required. We are creating a drone with the added feature of live streaming; it takes video of such a disaster place. Nearly 77 rape cases are recorded, in those areas where there is need for continuous monitoring and reaching of human is difficult and time consuming. This project is mainly focused on the use of drones as an automatic system that can reach a mapped destination without the intervention of human beings after a planned mission is loaded in its microcontroller.

**1.3 Benefit of The Project:**

To perform a literature review on the existing similar systems in order to gain some knowledge that will be applied in implementing this project To design and construct a Quadcopter that can successfully take off, the quadcopter should fly unaided and smoothly. Carry out tests on the designed quadcopter for maximum flight time, maximum height it can fly and the total range of lateral distance it can fly. To implement the actual quadcopter and that will completely carry out instructions and commands given.

**2. LITERATURE SURVEY**

| **S.NO** | **TITLE** | **JOURNAL NAME** | **PUBLISHED IN** | **INFERENCE** |
| --- | --- | --- | --- | --- |
| **1** | Drones along Borders : Borders Security UAV in the united states and the european union | The International Studies Association |  |  |
| **2** | Border surveillance monitoring using Quadcopter UAV-Aided Wireless Sensor Networks | Journal of communications software and systems |  |  |
| **3** | Aerial surveillance system using UAV | Thirteenth International conference on Wireless and optical communications Networks(WOCN) |  |  |
| **4** | Powering Aerial Surveillance Drones | International Symposium on advanced topics in electrical engineering |  |  |

### 

### **3. EXISTING AND PROPOSED SYSTEM**

### **3.1 EXISTING WORK:**

### Theory and operation of quadcopters. Manned and large unmanned aircraft of the same type generally have recognizably similar physical components, the main exceptions being the [cockpit](https://en.wikipedia.org/wiki/Cockpit) and [environmental control system](https://en.wikipedia.org/wiki/Environmental_control_system_%28aircraft%29) or life [support systems.](https://en.wikipedia.org/wiki/Life_support_system) Some UAVs carry payloads (such as a camera), which aid in taking videos and pictures. Small civilian UAVs have no [life-critical systems,](https://en.wikipedia.org/wiki/Life-critical_system) and can thus be built out of lighter but less sturdy materials and shapes, and can use less robustly tested electronic control systems. For small UAVs, the [quadcopter](https://en.wikipedia.org/wiki/Quadcopter) design has become popular, though this layout is rarely used for manned aircraft. Miniaturization also means that less-powerful propulsion technologies can be used which are not feasible for manned aircraft, such as small electric motors and batteries. Control systems for UAVs are often different from manned craft. For remote human control, a camera and video link are almost always a necessary replacement for the cockpit windows; instead of physical cockpit controls, commands are received by radio. Both manned and unmanned aircraft can have sophisticated autopilot software, though the features for autonomous drone operation are often different from those for large aircraft such as civilian passenger airliners. The general physical structure of an UAV is as shown below in fig2.1 (“Unmanned Aerial Vehicle” 2016a)

### **Power Supply And Platform:-**

### 

### Small UAVs rely mostly at present on [lithium-polymer batteries](https://en.wikipedia.org/wiki/Lithium_polymer_battery) (Li-Po), while larger vehicles often use [fuel](https://en.wikipedia.org/wiki/Fuel) or even [solar power.](https://en.wikipedia.org/wiki/Solar_power) [Battery elimination circuit](https://en.wikipedia.org/wiki/Battery_eliminator_circuit) (BEC) is used to centralize power distribution and often harbors a [microcontroller unit](https://en.wikipedia.org/wiki/Microcontroller) (MCU). Costlier switching BECs diminish heating on the platform.

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### **Computing Power**

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### Early large UAVs could carry high computational capabilities due to their extended available [payload](https://en.wikipedia.org/wiki/Payload) and they did not urge engineers into miniaturization as they allowed complex- [instruction-set](https://en.wikipedia.org/wiki/Instruction_set) chips. Processing power of civil-and-medium-domestic UAVs mostly leans toward [reduced-instruction-set](https://en.wikipedia.org/wiki/Reduced_instruction_set_computing) computer design. Common [processor families](https://en.wikipedia.org/wiki/Comparison_of_instruction_set_architectures) there are AVR, PIC, [ARM](https://en.wikipedia.org/wiki/ARM_architecture), with a current predominance of ARM‟s 32-bit memory-address-register processors. Thus, small UAV [embedded systems](https://en.wikipedia.org/wiki/Embedded_system) evolved from the blending terms of microcontrollers, to [system-on-a-chip](https://en.wikipedia.org/wiki/System_on_a_chip) (SOC), and as far as [single-board computers](https://en.wikipedia.org/wiki/Single-board_computer) (SBC) at present. UAV hardware is likely to specialize, with increasing numbers of operation per second and [hardware acceleration](https://en.wikipedia.org/wiki/Hardware_acceleration) as a background, between, on one hand, calculus speed in exchange for low processing power (time-critical applications), and high-computational-capacity, able to support full [operating systems,](https://en.wikipedia.org/wiki/Operating_system) trading with higher weight on the other hand. Small UAV control system hardware is often called, especially in hobbyists groups, the Flight Controller (FC), Flight Controller Board (FCB), or Autopilot. (“Unmanned Aerial Vehicle'' 2016b)

### 

### **Sensors**

### **Main sensors:**

### Proprioceptive: IMU (gyroscope, accelerometer), compass, altimeter, GPS module,payload measurement.Exteroceptive: camera (CMOS, infrared), range sensors (radar, sonar,)Proprioceptive: internal/external thermometer, gimballed camera... Degrees of freedom (DOF) refer to both the amount and quality of sensors on-board: OF stands for 3-axis gyroscopes and accelerometers (a typical [inertial measurement unit](https://en.wikipedia.org/wiki/Inertial_measurement_unit) – IMU), 9 DOF refers to an IMU plus a compass, 10 DOF adds a barometer and 11 DOF usually combine a GPS receiver.(“Unmanned Aerial Vehicle” 2016a)

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### **Actuators:-**

Actuators found in UAVs depend heavily on the aircraft type: [digital electronic speed controllers](https://en.wikipedia.org/wiki/Electronic_speed_control)(which control the [RPM](https://en.wikipedia.org/wiki/Revolutions_per_minute) of the motors) linked to motors/[engines](https://en.wikipedia.org/wiki/Engine) and [propellers](https://en.wikipedia.org/wiki/Propeller), [servo motors](https://en.wikipedia.org/wiki/Servomotor) (for planes and helicopters mostly), weapons, payload actuators, LEDs, speakers.

**Loop Principle:-**

What may differentiate an UAV from a RC model aircraft is the ability to offer sensing, computing power and [automation](https://en.wikipedia.org/wiki/Automation). The aircraft control falls under the relevance of [control theory,](https://en.wikipedia.org/wiki/Control_theory) with its associated notions. Indeed, an UAV can make use of different automatic controls, mainly designed with [loops](https://en.wikipedia.org/wiki/Control_system):

* [Open loops](https://en.wikipedia.org/wiki/Open-loop_controller) – The simplest design consists of open loops, typically for motors of small UAVs, which are actuated with sheer input, assuming they will perform as expected (though, for many larger aircraft, including UAVs, engine control relies on closed-loops).
* [Closed loops](https://en.wikipedia.org/wiki/Closed-loop_transfer_function) – [Negative feedback](https://en.wikipedia.org/wiki/Negative_feedback) loops use sensors to measure the state of the [dynamical system,](https://en.wikipedia.org/wiki/Dynamical_system) they are the most commonly used for flight control in UAVs. May use [PID control.](https://en.wikipedia.org/wiki/PID_controller) Sometimes, [feed-forward](https://en.wikipedia.org/wiki/Feed_forward_%28control%29) is also employed, transferring the need to close the loop further.

**2.2 Flight Controls:-**

Flight control is one of the low-layer systems, and is not much different from manned aviation: [plane flight dynamics,](https://en.wikipedia.org/wiki/Flight_dynamics_%28fixed-wing_aircraft%29) [control](https://en.wikipedia.org/wiki/Aircraft_flight_control_system) and [automation,](https://en.wikipedia.org/wiki/Autopilot) [helicopter flight dynamics](https://en.wikipedia.org/wiki/Helicopter_dynamics) and [controls,](https://en.wikipedia.org/wiki/Helicopter_flight_controls) and [multi-rotor flight dynamics](https://en.wikipedia.org/wiki/Quadcopter#Flight_dynamics) were in-depth researched long before the rise of UAVs. The automatic flight control is itself layered in multiple levels of priority. UAVs can be programmed to perform aggressive maneuvers or landing/perching on inclined surfaces, even able afterward to climb toward better communication spots, as recently demonstrated by Stanford college. UAVs can also control flight with varying flight modification, such as VTOL designs.

**2.3 Telecommunication System**

Most UAVs use an old-fashioned [radio frequency front-end](https://en.wikipedia.org/wiki/RF_front_end), that connects the [antenna](https://en.wikipedia.org/wiki/Antenna_%28radio%29) to the [analog-to-digital converter](https://en.wikipedia.org/wiki/Analog-to-digital_converter) and a flight computer which controls avionics (and which may be capable of autonomous or semi-autonomous operation). Transmission allows remote control of the aircraft and [exchange of other data.](https://en.wikipedia.org/wiki/Data_link) Early UAVs had only a control uplink, but with progress in embedded electronics, downlinks have been added.(“Unmanned Aerial Vehicle” 2016b) In military systems, which drove the duplex communications, and high-end domestic applications, downlink may also convey payload management status and other advanced features. In the domestic- UAV field, the tele-transmission pattern still usually remains as control commands issued from the operator's transmitter (TX) toward the UAV receiver (RX), downstream consisting mainly in analog video content, from the UAV video emitter (VTX) to the operator's video receiver (VRX). [Telemetry](https://en.wikipedia.org/wiki/Telemetry) is another kind of downstream link, transmitting status about the aircraft systems to the remote operator. UAVs also use satellite "uplink" to access [satellite navigation](https://en.wikipedia.org/wiki/Satellite_navigation).

The radio signal from the operator side can be issued from either:

* Ground control – a human operating a [radio transmitter](https://en.wikipedia.org/wiki/Transmitter)/receiver, a smartphone, a tablet, a computer, or the original meaning of a [military ground control station (GCS)](https://en.wikipedia.org/wiki/Ground_control_station). Recently control from [wearable devices,](https://en.wikipedia.org/wiki/Wearable_technology) human movement recognition, [and human brain waves](https://en.wikipedia.org/wiki/Electroencephalography) was also demonstrated.
* A remote network system, like satellite duplex data links for some major [military powers](https://en.wikipedia.org/wiki/Armed_forces). Downstream digital video over mobile networks has also entered the consumer market recently, while direct UAV control uplink over the cellular mesh is being researched.

**3.1 PROPOSED SYSTEM DRONE**

A drone is an unmanned aircraft. Drones are more formally known as unmanned aerial vehicles (UAVs) or unmanned aircraft systems. Essentially, a drone is a flying robot that can be remotely controlled or fly autonomously using software- controlled flight plans in its [embedded systems that](https://internetofthingsagenda.techtarget.com/definition/embedded-system) work in conjunction with onboard [sensor](https://www.techtarget.com/whatis/definition/sensor)s and a global positioning system ([GPS](https://www.techtarget.com/searchmobilecomputing/definition/Global-Positioning-System)).UAVs were most often associated with the military. They were initially used for anti-aircraft target practice, intelligence gathering and, more controversially, as weapons platforms. Drones are now also used in a range of civilian roles, including the following:

* search and rescue
* Surveillance
* traffic monitoring
* weather monitoring
* Firefighting
* personal use
* drone-based photography
* Videography
* Agriculture
* delivery services

To fly, drones must have a power source, such as battery or fuel. They also have rotors, propellers and a frame. The frame of a drone is typically made of a lightweight, composite material to reduce weight and increase maneuverability. Drones require a controller, which lets the operator use remote controls to launch, navigate and land the aircraft. Controllers communicate with the drone using radio waves, such as [Wi-Fi](https://www.techtarget.com/searchmobilecomputing/definition/Wi-Fi).

**QUARDCOPTER**

Quadcopter is an unmanned aerial vehicle (UAV) or drone with four rotors, each with a motor and propeller. A quadcopter can be manually controlled or can be autonomous. It's also called *quadrotor helicopter* or *quadrotor*. It belongs to a more general class of aerial vehicles called multicopter or multirotor. Small quadcopters are easy to build because of low cost, low inertial force and simple flight control system. Quadcopters provide stable flight performance, making them ideal for surveillance and aerial photography. Other application areas include delivery, land surveys, crop assessment, weather broadcasting, and more. Quadcopters exist in many sizes, from palm-sized ones to those that can carry passengers or heavy cargo. Civilian use of quadcopters is subject to regulations, which are not mature in many countries. However, quadcopters are an important part of future transportation called Advanced Air Mobility (AAM)

**PRINCIPLE OF QUADCOPTER**

The main principle behind the flight of a quadcopter is Newton's Third Law of motion, which states that for every action there's an equal and opposite reaction. A quadcopter's propellers push air downwards. This causes an opposite reaction called *thrust* that pushes the quadcopter upwards against gravity. Air movement comes from Bernoulli's Principle, with larger propeller blades and faster rotation creating more thrust. When the propellers rotate (for example clockwise), the quadcopter will tend to rotate anti-clockwise. Rotational force is called *torque*. Helicopters solve this by using a tail rotor. Quadcopters solve this by driving two diagonal propellers clockwise and the other two anti-clockwise. Thus, torque from one pair cancels that of the other. When each diagonal pair of propellers rotate in opposite directions, their thrusts will be in opposite directions. The quadcopter will not be able to lift up or fly. This is solved by having the blades of each diagonal pair of propellers shaped as mirror images of the other pair. Effectively, all propellers will push air downwards regardless of the direction of rotation.

## COMPONENTS FOR DRONE MAKING

## **Motors**

## **Propellers**

## **Electronic Speed Controllers (ESCs)**

## **Flight Controller (FC)**

## **RC Remote**

## **Radio Transmitter**

## **Radio Receiver**

## **Video Transmitter**

## **Video Receiver**

## **Battery**

## 

## **MOTOR**

## 

## A2212 BLDC Motor is a 3-phase out-runner type popular brushless DC motor commonly used in Drones and other multirotor applications. The motor is rated for 1000KV and has an efficiency of 80%. The A2212 motor requires an ESC (Electronic speed controller) to control its speed. The motor can easily be controlled with our [30A ESC](https://quartzcomponents.com/products/bldc-30a-esc-brushless-dc-motor-electronic-speed-controller) and when coupled with our 1045 Propeller Blades it can provide thrust up to 800gm. Four of these A2212 Motors can be easily mounted on the [F450 Quadcopter Frame](https://quartzcomponents.com/products/f450-quadcopter-frame-with-integrated-pcb-wiring) to provide a total thrust of 3.2kgs enabling you to build powerful drones.

**SPECIFICATIONS OF A2212 1000KV BLDC MOTOR**

18A (min) / 30A (recommended)

No Load Current: 500mA @10V

Nominal Current: 12A/60s

No. of Cells: 2S or 3S Li-Po

Thrust with 3S: 800gm (with 1045 propeller)

## **PROPELLER**

## Propellers are devices that transform rotary motion into linear thrust. Drone propellers provide lift for the aircraft by spinning and creating an airflow, which results in a pressure difference between the top and bottom surfaces of the propeller. This accelerates a mass of air in one direction, providing lift which counteracts the force of gravity. Propellers for multirotor drones such as hexacopter, octocopter and quadcopter propellers, are arranged in pairs, spinning either clockwise or anti-clockwise to create a balance. Varying the speed of these propellers allows the drone to hover, ascend, descend, or affect its yaw, pitch and roll. propeller’s motor, a process that is handled by an Electronic Speed Controller (ESC). The correct signal is fed to the ESC by the drone’s flight controller, which relies on inputs from either the human pilot’s controller or an autopilot, and may also take into account information from an IMU (Inertial Measurement System), GPS and other sensors.

## **ELECTRONIC SPEED CONTROLLER (ESCs)**

## 

## Electronic speed controllers (ESCs) are devices that allow drone flight controllers to control and adjust the speed of the aircraft’s electric motors. A signal from the flight controller causes the ESC to raise or lower the voltage to the motor as required, thus changing the speed of the propeller. Due to the differences in motor technology, different ESCs are required for drones with brushed motors and those with brushless motors. Multirotor drones may have an ESC for each rotor, or an integrated device that handles all the rotors with one system. Many drone ECSs are designed as a system- on-chip (SoC), which means that all components, such as the microcontroller and power management unit, are integrated into a single module. This saves space and weight, making it an ideal solution for SWaP (size, weight and power) constrained UAVs.

## **FLIGHT CONTROLLER**

## 

## The flight controller uses the data gathered by the sensors to calculate the desired speed for each of the four motors. The flight controller sends this desired speed to the Electronic Speed Controllers (ESC’s), which translates this desired speed into a signal that the motors can understand. Calculating the movements, fusing and filtering the sensory information, and estimating the safety and durability of a flight is all done by an algorithm. A fancy word that is used a lot nowadays which in essence is nothing more than a set of strict rules that every microchip on the board has to apply to. The most commonly used flight control algorithm is called PID control: Proportional Integral Derivative control. Within this area, there is a lot of research going on, which resulted in INDI: Incremental Nonlinear Dynamic Inversion. This algorithm reads out and reacts to incoming information way faster, therefore making the drone flight more stable.

## **RC REMOTE**

## A drone controller works by sending a radio signal from the remote control to the drone, which tells the drone what to do. Radio signals are sent from the radio transmitter in the drone controller and received by the drone’s receiver. This is why the drone controller is sometimes simply called the drone radio transmitter or the drone radio controller.

## **RADIO TRANSMITTER**

## In electronics and telecommunications, a radio transmitter or just transmitter is an electronic device which produces radio waves with an antenna. The transmitter itself generates a radio frequency alternating current, which is applied to the antenna. When excited by this alternating current, the antenna radiates radio waves. Transmitters are necessary component parts of all electronic devices that communicate by radio, such as radio and television broadcasting stations, cell phones, walkie-talkies, wireless computer networks, Bluetooth enabled devices, garage door openers, two-way radios in aircraft, ships, spacecraft, radar sets and navigational beacons. The term transmitter is usually limited to equipment that generates radio waves for communication purposes; or radiolocation, such as radar and navigational transmitters. Generators of radio waves for heating or industrial purposes, such as microwave ovens or diathermy equipment, are not usually called transmitters, even though they often have similar circuits.

## **RADIO Receiver**

## The function of the radio receiver is to receive the signal and perform demodulation to recover the original message signal. The radio transmitter sends the signal at the initial stage. The antenna present at the transmitter side radiates the signal, which is captured by the other antenna present at the radio receiver. We have already discussed the process of transmission using a radio transmitter. The modulation process is the main principle in radio transmitters, where the signal is transmitted through the communication channel to the receiver. The main principle of the receiver is demodulation. Let's discuss the process of signal reception and recovery in the radio receiver.

## **VIDEO TRANSMITTER**

## Video transmitter or VTX in short is the component on the drone that transmits the video from our FPV cameras wirelessly to our FPV goggles. The sole purpose of the VTX is to transmit video and is independent on the camera or the camera settings. VTX is probably one of the simplest components to buy meaning to say all VTX are capable of getting the job done aka transmitting video. Even though technology has advanced FPV transmitters are still analog TRANSMITTING AT 640x480 RESOLUTION. Analog FPV VTX’s are the limiting factor in determining the video quality, not the camera. Digital video transmitters like the Connex HD or Insight SE are an exception transmitting videos at 720p or 1080p. This capability comes at a price- digital transmitters make use of standalone HD cameras to capture video at high resolution making it relatively more expensive than analog transmitters and are usually large and bulky. Also digital cameras cannot transmit over large distances with most commercial transmitters only good for indoors or distances below 1km.

**VIDEO RECEIVER**

An audio/video receiver (AVR) is a consumer electronics component used in a [home theater](https://en.wikipedia.org/wiki/Home_cinema). Its purpose is to receive audio and video signals from a number of sources, and to process them and provide [power amplifiers](https://en.wikipedia.org/wiki/Power_amplifier) to drive loudspeakers and route the video to displays such as a television, monitor or video projector. Inputs may come from a satellite receiver, radio, DVD players, Blu-ray Disc players, VCRs or video game consoles, among others. The AVR source selection and settings such as volume, are typically set by a remote controller.

## BATTERY

## The most common batteries used in drones are lithium polymer (LiPo) batteries. LiPo batteries are composed of a lithium-based cathode and anode separated by a polymer electrolyte. LiPo batteries differ from other lithium-ion (Li-ion) batteries in that they have a solid polymer electrolyte component rather than a liquid electrolyte. Common polymer electrolytes may be dry, porous or a gel, and include poly(methyl methacrylate) (PMMA), poly(acrylonitrile) (PAN), poly(vinylidene fluoride), and poly(ethylene oxide) (PEO). The science behind LiPo batteries is the same as in other Li-ion batteries: chemical energy is converted to electrical energy when electrons travel from the battery’s anode to its cathode, creating an electrical current. The cathode contains a lithium metal oxide (such as lithium-cobalt oxide (LiCoO2)), which provides lithium ions, whereas the anode contains a lithium carbon (such as graphite). The anode and cathode are separated by an electrolyte that interacts with the anode to generate electrons, which creates a charge gradient in the cell. As the anode becomes negatively charged, the electrons travel along a conducting wire to the cathode. The whole system thus undergoes an electrochemical redox reaction (reduction/oxidation): the anode loses electrons and becomes oxidized while the cathode gains electrons and is reduced. Lithium-based batteries have a higher energy density compared to nickel cadmium or nickel metal hydride batteries, which means they can provide more energy for less weight. LiPo batteries rival Li-Ion batteries in terms of energy density, but are especially popular because they are less likely to leak. The energy density of LiPo batteries ranges from 140 - 200+ Wh/kg in terms of weight and 250 - 350+ Wh/L for volume. Volume energy density is important to consider when building a drone so the battery fits on the frame, but for performance calculations, the energy density by weight is more relevant. With higher density comes higher cost, so your budget may also be a limiting factor. A technology that may soon rival LiPo batteries as the drone go-to are Sion Power’s Licerion batteries. These batteries boast an energy density up to 500 Wh/kg and 1000 Wh/L. They also have a 50% lower liquid electrolyte volume compared to other Li-Ion batteries. They were designed specifically for unmanned applications, notably high- altitude pseudo satellites (HAPS) and high-altitude long-endurance (HALE) drones.

SOFTWARE COMPONENTS

1. Python

2. Google Collab

3. Open CV

4. Numpy

5. Visual Studio Code

6. MediaPipe

7. Blaze Model

**PYTHON**

**GOOGLE COLLAB**

Google Colab is a free [Jupyter Notebook](https://jupyter.org/) environment that runs entirely in Google Cloud. Moreover, it has many libraries already installed to manipulate data and train Machine Learning models, even using the cloud machine’s GPU.

**OPEN CV**

OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today’s systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When it integrated with various libraries, such as NumPy, python is capable of processing the OpenCV array structure for analysis. To Identify image pattern and its various features we use vector space and perform mathematical operations on these features. The first OpenCV version was 1.0. OpenCV is released under a BSD license and hence it’s free for both academic and commercial use. It has C++, C, Python and Java interfaces and supports Windows, Linux, Mac OS, iOS and Android. When OpenCV was designed the main focus was real-time applications for computational efficiency. All things are written in optimized C/C++ to take advantage of multi-core processing.

**OPENCV FUNCTIONALITY**

* Object/feature detection (object detect, features2d, non free)
* Geometry-based monocular or stereo computer vision
* Computational photography (photo, video)
* Machine learning & clustering
* CUDA acceleration
* Image/video I/O, processing, display

## **NUMPY**

## NumPy is the fundamental package for scientific computing in Python. It is a Python library that provides a multidimensional array object, various derived objects (such as masked arrays and matrices), and an assortment of routines for fast operations on arrays, including mathematical, logical, shape manipulation, sorting, selecting, I/O, discrete Fourier transforms, basic linear algebra, basic statistical operations, random simulation and much more.

**VISUAL STUDIO CODE**

Visual Studio Code (famously known as VS Code) is a free open source text editor by Microsoft. VS Code is available for Windows, Linux, and macOS. Although the editor is relatively lightweight, it includes some powerful features that have made VS Code one of the most popular development environment tools in recent times. VS Code supports a wide array of programming languages from Java, C++, and Python to CSS, Go, and Dockerfile. Moreover, VS Code allows you to add on and even create new extensions including code linters, debuggers, and cloud and web development support.

**MEDIAPIPE**

MediaPipe is an open-source framework for building pipelines to perform computer vision inference over arbitrary sensory data such as video or audio. Using MediaPipe, such a perception pipeline can be built as a graph of modular components. The MediaPipe framework is mainly used for rapid prototyping of perception pipelines with AI models for inferencing and other reusable components. It also facilitates the deployment of computer vision applications into demos and applications on different hardware platforms. The configuration language and evaluation tools enable teams to incrementally improve computer vision pipelines.

**BLAZE MODEL**

Media Pipe Face Detection is an ultrafast face detection solution that comes with 6 landmarks and multi-face support. It is based on BlazeFace, a lightweight and well-performing face detector tailored for mobile GPU inference. The detector’s super-Realtime performance enables it to be applied to any live viewfinder experience that requires an accurate facial region of interest as an input for other task-specific models, such as 3D facial key point estimation (e.g., MediaPipe Face Mesh), facial features or expression classification, and face region segmentation. BlazeFace uses a lightweight feature extraction network inspired by, but distinct from MobileNetV1/V2, a GPU-friendly anchor scheme modified from Single Shot MultiBox Detector (SSD), and an improved tie resolution strategy alternative to non-maximum suppression.

**YOLO MODEL**

YOLO is an algorithm that uses neural networks to provide real- time object detection. This algorithm is popular because of its speed and accuracy. It has been used in various applications to detect traffic signals, people, parking meters, and animals.

## **WORKING**

## In this project, we will have drones. A camera will be fixed in that drone. The drone sends video data to the server. The data is processed and the objects and humans in the video are detected. For Face Detection, we can use Blaze algorithm or hog algorithm. Using YOLO, we will create an AL model with google collabo. When faces and objects are detected the signals will be sent to respective devices using SMTP and the mobile app via firebase.