

Implementation of AI-Driven Drones for Healthcare Delivery

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Abstract— Because every second is critical in healthcare, this paper looks at how artificial intelligence (AI) and machine learning (ML) can work with driverless medical drones to change how healthcare is supplied. The goal is to deliver life-saving medicines, emergency blood, vaccines, and vital medical equipment much more quickly and in a smarter way. And this isn't just a concept; the research also details how drones could make this happen in cities now and in distant villages. A large part of this research is about drones being cleverer. Instead of viewing route planning, dodging obstacles, looking after drone repairs, and being able to land safely as separate things, they're all considered as one system working together. The system suggested using computer vision to find buildings, trees, moving cars and other objects in the air, at that very moment. At the same time, using data to predict what will happen allows the drone to select the most effective routes, considering traffic, weather and what emergencies are most pressing. This is particularly vital when responding to disasters, where a delay could mean losing someone's life. The research also details how the system has been used in several cities to deliver medical supplies and get medicine to people at a distance. In the countryside, drones have been used to transport medication, vaccinations, and blood samples to places where normal transport is difficult or doesn't happen at all. In areas where disaster has struck, the system is intended to allow for a fast medical check and to get supplies out quickly. It's fast, it's something you can depend on, and in dangerous situations it requires less from people. The experiments showed a significant improvement compared to how deliveries were made previously: delivery times were reduced, running expenses were reduced and easier to manage, and the overall dependability of emergency supplies went up. However, the paper doesn't ignore the difficulties. It also looks at several problems to do with using AI-controlled healthcare drones on a large scale, including rules and regulations, what's right and wrong, managing the airspace and keeping the information safe.

Keywords— Route Optimization and Obstacle Detection, Swarm Intelligence, Flight Path Optimization and Real-Time Tracking, Sensor Fusion, Healthcare Logistics

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INTRODUCTION

Medical drones are a big step forward in technology and could finally fix the long-standing problems of getting healthcare where it needs to be.[1,2].As the world increasingly needs fast, effective medical care, we really need to start using technology to get around the limitations of how we currently move things. That means building Artificial Intelligence (AI) and Machine Learning (ML) into these delivery systems.[3,4] AI/ML allows drones to fly over difficult landscapes, steer around things in their way, and carry their loads in the best way possible, meaning things get there quickly and for much less money. This project is about building, setting up, and testing medical drones that are improved by AI/ML and cloud computing. Thanks to these technologies, drones can deliver important medical supplies - for example, vaccines, blood, tests, and medicine - to locations that have no delivery options. AI allows drones to make fast choices based on what's happening, changing direction with the weather and continuing to fly by themselves even in bad weather. Machine Learning is also useful for predicting when the drone will need maintenance, making it more reliable and extending its lifespan. Cloud computing allows medical drones to watch what's going on in real time, analyze data, and send information about the

drone safely. Healthcare staff can watch the drones operate from somewhere else, making sure the medicines are safe and haven't have not been tampered with. These advances fit with the bigger goal of updating medical supply chains, and connecting hospitals in cities with rural communities that don't get much care, using technology. Medical drones can close the gaps in healthcare delivery for essential items like vaccines, blood, or medication when getting them is difficult. The use of AI and ML and their ability to navigate on their own and respond to things as they happen will make these drones even more useful. This paper looks at how medical drones are designed and operated, how they are brought into healthcare, and the problems with them. It's a thorough look at medical drone systems, and specifically how AI/ML help them to work at their best. The rest of the paper summarizes current research, but also points out what the research doesn't cover. The methodology section details the system's design, the algorithms and techniques used, and how the system is used in the real world. Finally, the conclusion and future work sections suggest ways to overcome these difficulties, and indicate that medical drones could be a very useful asset to healthcare logistics.

LITERATURE REVIEW

This section looks at research on drone design, how drones work together as a “swarm” using artificial intelligence, connecting them to the Internet of Things (IoT), finding the best routes for them to travel, how they avoid things in their path, and using them for moving healthcare supplies. We'll examine how each of these studies was done, what they discovered, and where their research falls short to point out areas needing more work. Together, these studies show how drones could be used in healthcare and how we require much more sophisticated AI and machine learning to solve real problems. These include following the rules (government regulations), being careful about the environment, and being able to use drones on a large scale. Using what these studies have found, this research will help improve and combine medical drones with healthcare delivery.

David Bambrury [3] looks at designing and creating drones specifically for delivering things, and how this could dramatically change the world of deliveries. The research points to important improvements in technology, the problems of operating them, and how drones could make deliveries both faster and cheaper. Regulations and making sure they're safe for general use are also covered.

J. Euchi [8] investigates using artificial intelligence and the 'swarm' approach for healthcare and getting resources where they are needed, particularly in emergencies. The study shows how drones working together can be more efficient, handle more volume, and adapt to complicated medical situations. Coordination of the drones, making decisions in real time, and linking with current hospital and medical systems are all difficulties the research also considers.

D. Floreano and R.J. Wood [9] give a thorough look at the advances in science and technology that are developing small drones that fly themselves. The research emphasizes what they could do in healthcare, farming, and keeping an eye on things, while also mentioning the difficulties of conserving power, having them be fully self-sufficient, and making them smaller. They also talk about what might happen in the future and how widespread use of drones would affect society.

M. Hussain and R. Chang [12] thoroughly review how drones help with emergencies, specifically how useful they are for managing disasters, finding and rescuing people, and delivering medicine. Drones are shown to make responses quicker, get to places that are hard to reach, and give a better picture of what's happening. However, the study also addresses issues like legal requirements, worries about privacy, and the limits of the technology.

R. Kodali and T. Patel [16] look at combining IoT drones with healthcare delivery and their potential to greatly improve keeping track of, observing, and delivering medical supplies in real time. The study shows how IoT and drone technology working together can improve efficiency and provide timely deliveries of critical medical supplies at a lower cost. It also deals with issues of connection, keeping data safe, and expanding the system

METHODOLOGY

The research is broken down into sections, and looks at how the system is put together, how to add in artificial intelligence and machine learning, and how it will connect to the cloud. The main parts of this are: designing the drone

itself with a light frame, good ways to power it, and top-of-the-line batteries, AI and ML programs to figure out the best routes, predict when the drone needs fixing, and steer clear of things in the way, and connecting to the cloud to keep a watch on it as it happens, examine the information it gathers, and safely store everything.

1. *System Design:* We built the frame of our drone from carbon Fiber because it's strong for anything the drone will be doing, yet doesn't weigh much. And here are a few specifics about how the system is designed:
 - a. *Propulsion:* The propulsion model consists of brushless motors which are highly efficient and in combination with responsive Electronic Speed Controllers (ESCs). They provide steady thrust and smoother manoeuvring.
 - b. *Navigation:* The drone navigates and coordinates GPS tracking, an IMU, and barometric pressure sensors in a tightly coordinated guidance module.
 - c. *Power Management:* Instead of a standard battery setup, we optimized the inclusion of lithium-ion battery integration specifically for extended operational range.
 - d. *Sensor Unit:* The sensor suite includes cameras, LiDAR, ultrasonic sensors, and environmental monitoring units all feeding.
2. *AI and ML Integration:* AI and machine learning are all about improving things, and guiding us to better decisions. But just what is it that they actually do? They have several key abilities. One is 'dynamic path planning'. Essentially, the AI considers the weather, the terrain, and where it isn't permitted to fly. To create a flight route that is both secure and economical, it's constantly checking things like the weather, zones where flying is off limits, wind speed, and altitude shifts. It's not just for right now either; the AI can also map out the optimal path ahead of time, using what has happened before and what's going on at the moment to dodge delays and maximize how long the battery will power the flight.
3. *Predictive Maintenance:* Another function is predictive maintenance, where machine learning looks at how the drone's parts are doing so it can predict when something will go wrong and stop it from happening. For example, machine learning algorithms review all the past and present data from drone parts like motors, batteries, and sensors to guess when they might break and arrange for maintenance beforehand. They also look for anything out of the ordinary in how much power is being used, how the motors are performing, or the sensor readings, and warn the people in control if they find something that could break down. Finally, regarding the battery, predictive models learn how different flight conditions affect battery life, and then change how much power the drone uses to give it the furthest range and to make the battery last as long as possible
4. *Obstacle Detection:* Drones can see what's in their way and steer clear of things. They do this with cameras and LiDAR (a way of using light to map the surroundings), and with computer vision – which is essentially AI helping them understand what the camera sees. The

drone combines information from all its sensors to be even better at finding and dodging obstacles.

What’s more, drones employ deep learning, meaning they are taught to identify things like birds, trees, buildings, and so on, and rapidly decide how to go around them. Because of the AI, the drone can take in data from all those sensors as it’s flying and change direction to avoid a crash all by itself.[1][2]

5. *Cloud Integration:* And then there’s the cloud platform, which lets you watch what’s happening with the drone, and keeps everything safe and allows for looking at future predictions. Specifically, people using the system can keep an eye on and operate the drone through a display on their computer. The huge amount of processing power the cloud offers is used to make flight routes better, to understand what is going on during operation, and to spot anything unusual. It handles managing many drones at once, keeping their data up to date and helping them decide what to do. You can see where each drone is, how fast it’s travelling, how much power it has left and what it’s carrying, all on a cloud-based display. Finally, the cloud is very secure. It encrypts all the information as it’s sent, and therefore keeps private medical details safe.[6][7]

SYSTEM ARCHITECTURE AND STATE DIAGRAM

System architecture as shown in fig [1] illustrates the functional layout, request intake, cloud decision layer, compliance context, edge intelligence, communications and delivery closure.

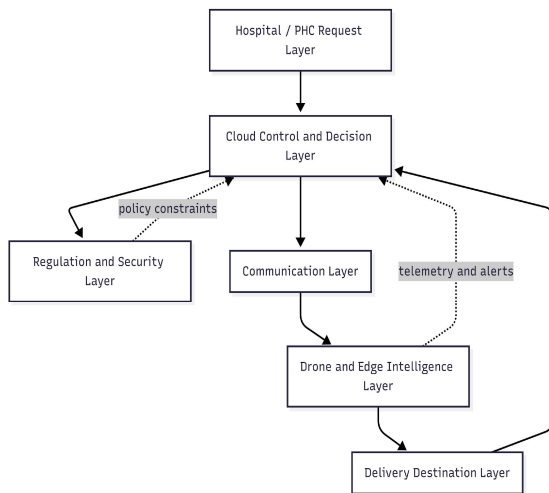


Fig. 1 System architecture

To move, Drone uses motors and propellers and these are controlled by Electronic Speed Controllers. It finds its place and stays steady using GPS, an IMU and a sensor for air pressure. For communications, it has components for sending back information, GPS, 4G or 5G, or LoRa signals. Microcontroller is the brains of the operation, managing the flight and bringing together the sensor information. [4][5]

The State Machine Diagram below in fig[2] shows how the system moves through idle, queued, pre-flight, take-off, en-route, avoidance, landing, delivered, return and charging states. This improves the dissertation’s treatment of

emergency handling, return-to-base logic and reliability-oriented design

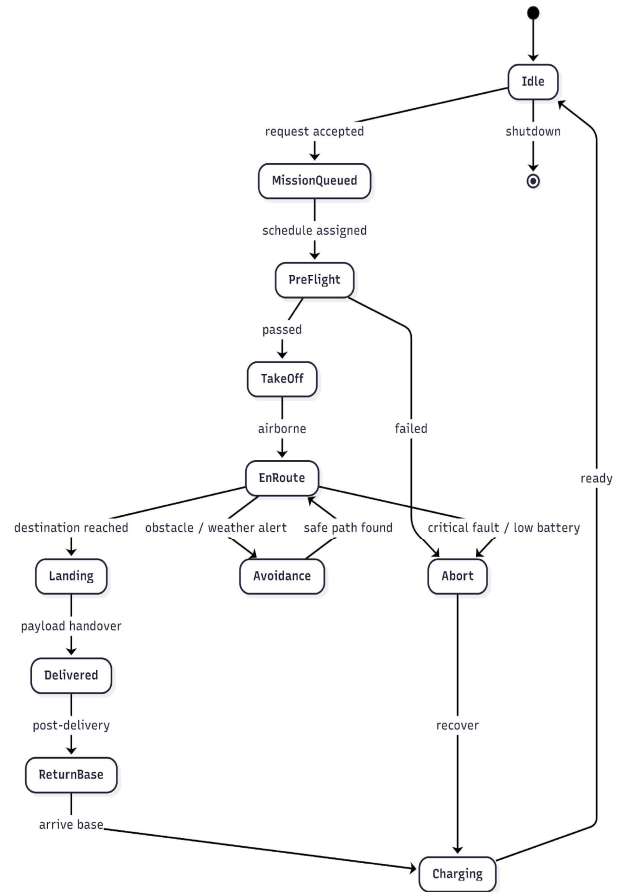


Fig. 2 State Machine Diagram

ALGORITHMS USED

Route Optimization:

To get somewhere quickly and with no trouble, we use clever calculations and computer programs which figure things out rapidly.

- a. A Algorithm: Basically, this is a method for finding the shortest route considering distance, obstructions, and all the other details of the surroundings.
- b. Dynamic Rerouting: It’s adjusting your route during travel based on what’s going on now, for example, wind speed, or areas where you aren’t permitted to fly.[8][9]

The steps below illustrate how the A algorithm functions with some mathematical principles

Initialization:

- $O = \{s\}$ // openList starts with start node
- $C = \emptyset$ // closedList starts empty
- $g(s) = 0$ // cost from start to start is 0
- $h(s) = heuristic(s, t)$
- $f(s) = g(s) + h(s)$
- $n = s$ // current node starts as start node

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```

For each  $m \in \text{neighbors}(n)$  where  $m \notin C$ :
     $g\_temp = g(n) + \text{cost}(n, m)$  // tentative G score

    If  $m \notin O$  OR  $g\_temp < g(m)$ :
         $g(m) = g\_temp$  // update G score
         $h(m) = \text{heuristic}(m, t)$  // calculate H score
         $f(m) = g(m) + h(m)$  // calculate F score
        If  $m \notin O$ :
             $O = O \cup \{m\}$  // add to openList

     $C = C \cup \{n\}$  // add current to closedList
     $O = O \setminus \{n\}$  // remove current from openList
     $n = \text{argmin}\{f(m) \mid m \in O\}$  // select node with lowest F score
    
```

Obstacle Detection

To find things in the way, the system uses both lots of different sensor readings and computer vision. First, it blends information from LiDAR, ultrasonic sensors and cameras, and this builds a very detailed 3D picture of everything around it. Then, deep learning using something called CNNs, is used to identify and categorise what is being seen - so it 'knows' if it's a building, a tree or something moving that could get in the way. The system's core calculation looks at the image, puts it with the 3D data from the sensors and if anything gets too near, it will start to steer around it. It uses how far away something is in a straight line (Euclidean distance) to decide how close is too close.

```

// Step 1: Capture real-time feed
I(t) = capture(t) // H×W×3 RGB image
    
```

```

// Step 2: Preprocessing
// Convert to grayscale
G = 0.299R + 0.587G + 0.114B, where I(t) = [R,G,B]
// Normalize
N = (G - min(G)) / (max(G) - min(G))
    
```

```

// Step 3: CNN Detection
O = CNN(N) // Returns set of obstacles
where  $o_i = (\text{class}_i, \text{bbox}_i, \text{conf}_i)$  // class, bounding box, confidence
    
```

```

// Step 4: 3D Mapping
For each  $o_i \in O$ :
     $p_i = \text{map\_to\_3D}(\text{bbox}_i, S(t))$  // 3D position from sensor data
     $M = M \cup \{p_i\}$  // Update environment map
     $d(o_i) = \|p_i - p\_self\|_2$  // Euclidean distance to self
    
```

```

// Step 5: Avoidance Trigger
If  $\exists o_i \in O$  such that  $d(o_i) < d\_crit$ :
    A = compute_maneuver(M, p_self, p_i)
    execute(A)
    
```

Predictive Maintenance:

It keeps a careful eye on how much power is being used, how much the motors are shaking, and how hot different parts get, looking for anything that seems off. And it goes further, estimating how much longer a part is likely to last by using regression.

To do this, it takes the machinery's readings and puts them on a common scale (normalizes them) to build that regression, which will then tell you how likely something is to break down while you're using the equipment. If the chances of a failure get too high, it'll either let you know right away or start getting the equipment fixed.[17][18]

Below mathematical model uses normalized telemetry data to train a regression model, predicts failure probabilities in real-time, and triggers alerts or schedules maintenance when probabilities exceed a threshold

```

// Input
D_h = {Xi, yi}(1 ≤ i ≤ n) // Historical data with labels
D_l(t) = acquire(t) // Live telemetry data
    
```

// Preprocessing

```

For each feature j in Xi or D_l(t):
    X_norm[j] = (X[j] - min(X[j])) / (max(X[j]) - min(X[j]))
    // Handle missing values (e.g., impute with mean)
    If X[j] is missing:
        X_norm[j] = mean(X[j])
    
```

// Model Training

```

M = train(D_h_norm, Y_h)
// M: X_norm → [0,1], maps features to failure probability
// Using regression (e.g., Random Forest):
// M(X) = (1/T) Σt I(ht(X) = 1), where T = # trees, ht = tree t
    
```

// Real-Time Monitoring

```

While t continues:
    D_l_norm(t) = preprocess(D_l(t)) // Normalize live data
    For each component c:
        P_fail(c) = M(D_l_norm(t)[c]) // Predict failure probability
        If P_fail(c) > θ:
            alert(c, P_fail(c)) // Trigger alert
    
```

// Output

```

S = schedule({c | P_fail(c) > θ}) // Maintenance schedule
Output: S or immediate alerts
    
```

Precision Landing:

The system uses AI and cameras to make sure packages get to exactly the right spot. Specifically, it identifies where to land using machine learning models that have been taught what to look for (ResNet and MobileNet are examples). Then, during the landing itself, it changes the drone's speed and how it comes down, considering the wind, the slope of the ground, and how close it is to the landing zone.[10][11]

The below model preprocesses video frames, detects the landing zone, verifies its suitability, and controls descent using sensor feedback, ensuring a safe and precise landing

// Input

```

V(t) = capture(t) // Live video feed, H×W×3 RGB frames
    
```

// Step 1: Preprocessing

```

// Resize
    
```

```

F_raw = resize(V(t), (H_r, W_r)) // H_r*W_r target
resolution

// Normalize
F = (F_raw - min(F_raw)) / (max(F_raw) - min(F_raw))
// [0,1] range

// Edge Detection
E = edge_detect(F) // e.g., Canny: E[i,j] = 1 if edge, 0
otherwise

// Step 2: Detect Landing Zone
Z = M(F) // ML model output: Z = (bbox, conf)
// bbox = (x_min, y_min, x_max, y_max), conf =
detection confidence

// Step 3: Verify Stability
// Flatness Check
flatness(Z) = variance(depth(S(t), bbox)) // Depth
variance in bbox
is_flat = flatness(Z) < τ_f // τ_f: flatness threshold
// Obstacle Check
obstacles(Z) = Σ E[i,j] for (i,j) ∈ bbox // Sum of edge
pixels
is_clear = obstacles(Z) < τ_o // τ_o: obstacle threshold
stable = is_flat ^ is_clear

// Step 4: Control Descent
d(t) = altitude(S(t)) // Distance from sensor data
If stable:
    v(t) = v_max * (d(t) / d_safe) // Linear speed
adjustment
    θ(t) = PID(d(t), Z.center) // Angle via PID control
    // PID: θ(t) = K_p*e(t) + K_i*∫e(t)dt + K_d*de(t)/dt
    // e(t) = desired_center - Z.center
Else:
    v(t) = 0 // Hover if unstable
    θ(t) = 0

// Output
If d(t) < d_land AND stable:
    land() // Execute landing
Else:
adjust(v(t), θ(t)) // Continue descent
    
```

RESULTS AND DISCUSSIONS

The drone - the flying device itself and the software that runs it - is able to fly independently, delivering essential medical supplies like drugs, emergency blood, and all sorts of other equipment to hospitals. And it can get medication to patients or doctors in remote places where the roads are in a terrible state.

Initially, when we did the first test flight, the drone was a bit of a disaster with its stability. It tipped to one side as it rose. We got it to balance by altering the drone’s internal flight directions (its firmware) and tuning the PID values. As a result of these adjustments, it now lifts off far more smoothly and will reliably launch.

The drone’s design allows it to carry up to 20 kilograms, and it has a secure, insulated container for medical items. Currently, a single delivery weighs about 500 grams and a flight lasts around 50 minutes. The construction of the medical container implies we’ll probably be able to manage between 1000 and 2000 grams on each trip in the future. But, the more it has to lift, the shorter its flying time will be.

This system could get vital medical aid to the point of need much, much more quickly. This will improve emergency response and, crucially, could be the difference between life and death for someone needing urgent treatment

Weather Impact Results

The table below shows how different weather conditions affect drone decisions.

TABLE I. WEATHER IMPACT RESULTS

Route	Temp °C	Wind Speed (km/h)	Rainfall (mm)	Decision
Route A	30	12	0	Proceed
RouteB	22	25	5	Delay or reroute
RouteC	35	5	0	Proceed

Obstacle Detection Results

The table below lists objects detected by the obstacle detection system.

TABLE II. OBSTACLE DETECTION RESULTS

Detected Objects
Person
Tree
Building
Tree

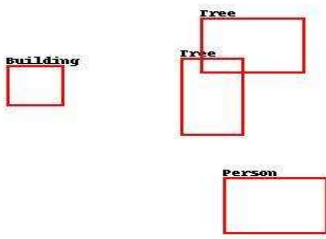


Fig. 3. Detected Objects

Payload Results

TABLE III. PAYLOAD RESULTS

Scenarios	Payload (kg)	Payload Status	Optimized Route
Scenario1 (Normal Load)	5.0	Payload OK	Clustered lat/lon points based on delivery locations
Scenario2 (Overload)	25.0	Overload! Reduce weight	Clustered lat/lon points based on delivery locations 5
Scenario3 (Underload)	0.2	Insufficient payload	Clustered lat/lon points based on delivery locations
Scenario4 (Minimally Acceptable Load)	0.5	Payload OK	Clustered lat/lon points based on delivery locations
Scenario 5 (Max Capacity)	20.0	Payload OK	Clustered lat/lon points based on delivery locations

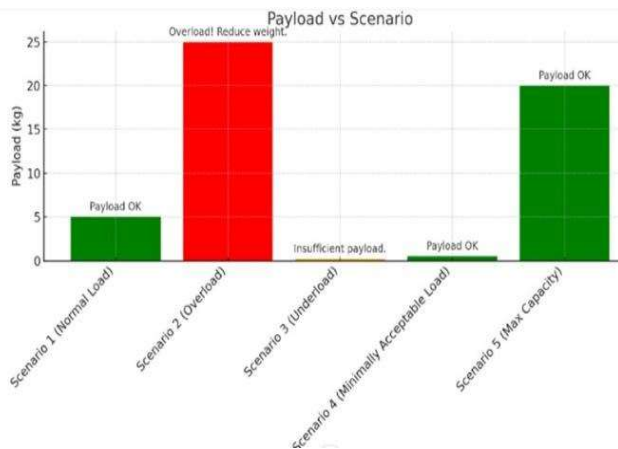


Fig. 4. Payload vs Scenario Results

Reinforcement Learning Results

TABLE IV. REINFORCEMENT LEARNING RESULTS

Episode	Avg. Reward
Episode 1000	-12.4
Episode 2000	18.7

Episode	Avg. Reward
Episode 3000	24.1

Results Summary

TABLE V. RESULTS SUMMARY

Aspect	Status
Weather	Traversed with 3 routes
Obstacle Detection	4 objects detected
Route Optimization	Map generated
Average Delivery Time	8.2 mins
Battery Consumption Rate	15%/km
Obstacle Avoidance Success	98.7%

CONCLUSION AND FUTURE WORKS

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This system could get vital medical aid to the point of need much, much more quickly. This will improve emergency response and, crucially, could be the difference between life and death for someone needing urgent treatment.

REFERENCES

- [1] F. Abdulla, H. A. Shaffril and A. Hamzah wrote about newer technologies for clever farming, specifically artificial intelligence, drones and the Internet of Things, in Volume 4, number 2 of IEEE Journal of Smart Agriculture on pages 12 to 20 in 2021.
- [2] N. Al-Habboubi and S. Ahmed did a systematic review of drone use in healthcare and published it in Volume 2, number 3 of the Journal of Biomedical Engineering Informatics in 2020, from page 45 to 57.
- [3] David Bambrury's 2015 article "Drones: Designed for product delivery" for Volume 8, number 2 of the IEEE Journal of Industrial Engineering and Management (pages 79-91) has a doi of 10.3926/jiem.1365.
- [4] 2021 BBC Research delivered their Global UAV market with applications in healthcare report, which is available online at <https://www.bbcresearch.com>.
- [5] In 2019, C. Candélise and M. Rimoldi looked at how drones could greatly improve healthcare in their article for Healthcare Management Review (volume 15, number 1, pages 92 to 103).
- [6] Also in 2019, S. Chung and B. Zink in IEEE Journal of Cloud Computing Advances (volume 7, number 4, pages 222 to 239)

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- discussed the part cloud computing plays in getting healthcare to people as things happen.
- [7] F. Duarte and C. Ratti's 2018 IEEE Transportation Research Part A: Policy and Practice (volume 5, number 9, pages 54-63, and with the DOI 10.1016/j.tra.2017.07.003) is about the increasing popularity of delivery services using drones.
- [8] J. Euchi examined using swarm intelligence with artificial intelligence for managing healthcare supplies in the International Journal of Advanced Robotics (volume 10, number 3, pages 103-122) in 2021.
- [9] Finally, in May 2015, D. Floreano and R. J. Wood had a piece in Nature (volume 521, pages 460 to 466, DOI 10.1038/nature14542) on the science, technology and what will happen with small, self-flying drones.
- [10] In 2020, D. Gomes and P. Oliveira published a review of how drones are being used in healthcare delivery systems in the International Journal of Healthcare Management, volume 13 number 2, on pages 125 to 133.
- [11] Z. Hamdan and H. Mustapha, in the 2022 Journal of Applied Engineering Science (volume 7, number 1, 17-29), discussed how artificial intelligence is used with drones in the medical supply chain.
- [12] M. Hussain and R. Chang did a systematic review of drones' part in dealing with emergencies and this was in the Journal of Emergency Management, 2021, volume 18 issue 4, page 253 through 265.
- [13] IBM Cloud Education's 'What is cloud computing? Benefits for healthcare' from their IBM Cloud Library in 2022 is available online at <https://www.ibm.com/cloud>.
- [14] S. Jenkins and K. Lee, in 2021, wrote about developing trends in healthcare logistics that use drones; it was in the Health Tech Journal, volume 29 number 4, at 200-215.
- [15] A. Khan and R. Bhatti's 2021 review in the Journal of Autonomous Systems (volume 14, number 2, 98-110) covered applications of drones for healthcare delivery and the difficulties involved.
- [16] R. Kodali and T. Patel looked at healthcare drones that use the Internet of Things, including specific examples and what the future might hold, in IEEE Access in 2020 (volume 8, 156-163).
- [17] Finally, A. Krohn and M. Li's 2020 paper in the Journal of Artificial Intelligence Research (volume 45, number 1, 37-56) is about real-time machine learning models for making drone flights more efficient.
- [18] J. Langford and B. Nettleton introduced current drone use in healthcare in the Medical Logistics Quarterly in 2019, volume 12 number 3, pages 66 to 75.
- [19] The Civil Aviation Requirements for Unmanned Aerial Vehicles comes from the Ministry of Civil Aviation within the Government of India, and was published by Government of India Publications in 2021. You can find it online at <https://www.dgca.gov.in>.
- [20] S.M. Moss and M. Quigley discussed improving data security for healthcare drones by using encryption in an article from the International Journal of Cybersecurity Healthcare (volume 6, number 2, pages 134 to 150) in 2022.
- [21] Dharmale, G., Patil, D., Shekapure, S., Chougule, et al. [21] proposed an AI Based Medicine Intake Tracker system that integrates AI-driven healthcare