SMART Poultry Farm in Sri Lanka Using IOT

Project ID

22_23 J - 35

Individual Project Proposal Report

B.M.W.S.Wijesekara

IT19958248

B.Sc. (Hons) Degree In Information Technology

Department of Information Technology

Sri Lanka Institute of Information Technology Sri Lanka

September 2022

SMART Poultry Farm in Sri Lanka Using IOT

Project ID

22_23 J - 35

Individual Project Proposal Report

B.M.W.S.Wijesekara

Supervisor : Mr. Kanishka Yapa

Co-Supervisor: Mrs. Pipuni Wijesiri

B.Sc. (Hons) Degree In Information Technology

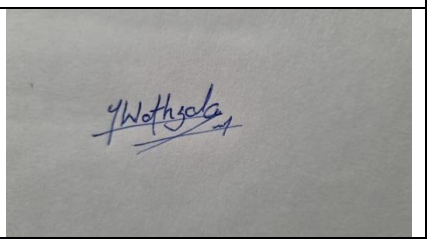
Department of Information Technology

Sri Lanka Institute of Information Technology Sri Lanka

September 2022

Declaration

I declare that this is my own work and this proposal does not incorporate without acknowledgment any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of our knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgment is made in the text.

Name	Student ID	Signature
B.M.W.S.WIJESEKARA	IT19958248	

The supervisor/s should certify the proposal report with the following declaration.

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

Signature of the supervisor:

Date:

ABSTRACT

Poultry-related products are a type of food that has directly affected human food needs, both now and in the past. There is a large market for poultry products, these products are produced in Sri Lanka and imported from abroad. In Sri Lanka, poultry houses are spread all over the country.But the handling of these poultry houses using information technology is at a minimum level in sri lanka. By using information technology to manage poultry houses, the amount of money spent on workers and other additional expenses can be reduced.In addition, it will be possible to increase the efficiency as well as increase the production capacity.

Through our project, these poultry houses are expected to be 80% automated. We hope to automate all the things like temperature, humidity, light, food and water in the poultry house through our project.Through machine learning, we hope to provide a prediction of whether the output is productive or non-productive in relation to the production cost, and the measures to be taken for them.This project will enable efficient production at low cost.

Table of Contents

1.INTRODUCTION

1.1 Background Literature

Poultry farming can be mentioned as a major sector of animal husbandry. Basically layer chicken farming is done with the aim of getting eggs and boiler chicken farming is done with the aim of getting meat. Poultry farming as a business is developing day by day in Sri Lanka. The Department of Animal Production and Health estimates that egg production was around two billion in 2016 and 2.5 billion by 2020. This is a good business opportunity as there is good demand for eggs.

But in these poultry farms, special attention should be paid to the basic aspects such as temperature, humidity, light, food and water. If these animals do not receive the above correctly, production may also decrease. Also, it is essential to properly dispose of the waste that accumulates as a by-product of poultry farming. so not because of the ammonia produced from those wastes, the health of the hens may decrease and the production may decrease.

In running a poultry farm, the owner should have a good understanding of the income from the products compared to the energy consumption and the cost of food and labor to increase the production capacity.

What I am trying to do through my project is to calculate the production outcome (number of eggs) and give a clear result to the owner of the poultry farm by considering the power cost or production cost for the feed and poultry farm.

Utilizing the data collected by egg production in a poultry farm requires a deep understanding of the data collected. Techniques based on machine learning have more reliable, accurate explanations and predictive capabilities.

It provides practical definitions and examples of machine learning-based statistical approaches for data analysis based on poultry products (eggs) and poultry feed safety.

Using machine learning techniques combined with IOT and sensors can provide a more comprehensive, efficient and timely approach to evaluating chicken egg productivity, food safety and profitability.

We visited Poultry farms to get information from them. We got good responses from the owners of these farms about this project and about the requirements they pointed out.

Here I will get information based on the following points and give the management decision as well as inform the owner about the action to be taken.

- Production outcome
- Cost
- Revenue
- Profit
- Ammonia level Present

➢ Management Decicion

- If Productive
  - Decision
  - Action

- If None-Productive
  - Decision
  - Action

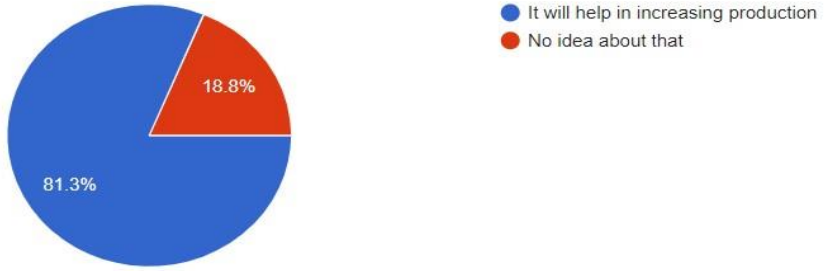
Here this information has to be obtained after installing our project in a poultry farm. After receiving that information, it is possible to inform about changes in production between months, changes in egg production due to changes in climate, as well as solutions to be taken when egg production decreases, as well as in previous years such a decrease in production occurred in this month. .

It will also give the Poultry farm owner the ability to successfully cope with those situations.

What do you think about making predictions based on the production data of a poultry farm?

Copy

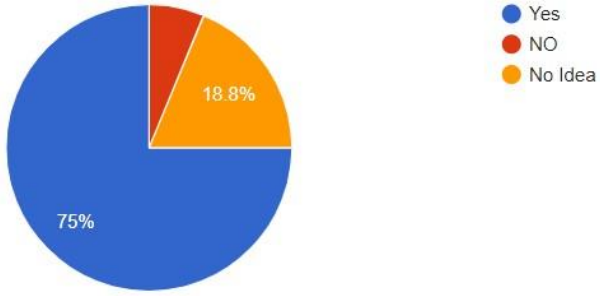
16 responses



Will the predictions given based on the data of the poultry farm and the solutions given and the actions to be taken according to the predictions help to improve the production?

Copy

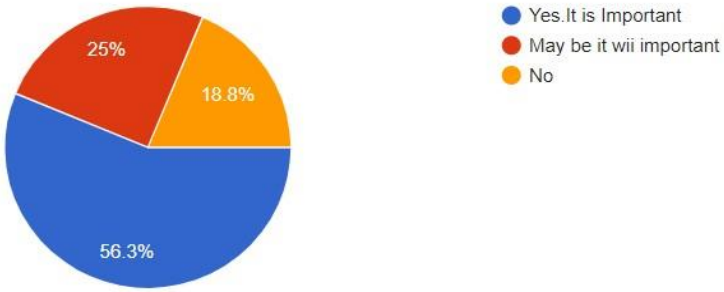
16 responses



Based on data on previous production declines and increases, is it important to notify the owner that this type of production occurred at this point in the future?

Copy

16 responses



1.2 Research Gap

According to the above literature survey, the improvement achieved using IOC technology using machine learning for poultry farms in Sri Lanka is very low. Although such research has been conducted at a low level in Sri Lanka, several countries globally have conducted research using IOT technology and machine learning for poultry farming. The projects have been carried out covering the following points.

- Machine learning-driven dynamic risk prediction for highly pathogenic avian influenza at poultry farms.
- Comparison between random forest and gradient boosting machine methods for predicting Listeria spp. prevalence in the environment of pastured poultry farms.
- Performance Evaluation of Machine Learning and Deep Learning Models for Temperature Prediction in Poultry Farming.
- Internet of Things and Machine Learning techniques in poultry health and welfare management: A systematic literature review.
- Machine learning application in growth and health prediction of broiler chickens.
- Broiler chickens can benefit from machine learning: support vector machine analysis of observational epidemiological data.

Through the above research, machine learning has been used to target different sectors of a poultry farm. The table below shows the differences between this research and my intended research.

	RESEARCH A	RESEARCH B	RESEARCH C	RESEARCH	Proposed Research
Find out the gap between the Cost and the Revenue and point out the relevant Solutions or the Action to be taken	✗	✗	✗	✗	✓

Shows monthly production status and decrease or increase in production compared to previous months.	✗	✗	✗	✗	✓
Showing the condition of the chicken farm separately in the months of low production and in the months of high production (Eg - Ammonia level)	✗	✗	✗	✗	✓
If there is a decrease in production compared to the previous months from the beginning of the month, an alert will be given to the owner. (Eg - Alert = Physically inspect the chicken farm.)	✗	✗	✗	✗	✓

If there has been a lack of production in previous years, give an alert about it before now. (It will help the owner to control the situation during those times)	✗	✗	✗	✗	✓
If there has been a lack of production in previous years, give an alert about it before now. (It will help the owner to control the situation during those times)	✗	✗	✗	✗	✓

1.3 Research Problem

It is very important to have a proper understanding of the production potential of a poultry farm and their downfalls. By having a good understanding of the data from the beginning of a farm, it is very easy to know the areas of the farm that need improvement. By working with data, it is possible to obtain clear information about changes in production due to changes in the farm.

Poultry products are products that can be released to the market at any time of the year. These products also have the ability to release eggs to the

market on a daily basis. According to the data, if a chicken farm is operating, if the amount of eggs produced gradually decreases, the farm owner has the ability to know about it quickly.

For example, on a large farm, when such a decrease in production is detected, it can be quickly remedied. If a disease occurs and spreads, it can reduce the risk of spreading it to the entire farm.

Through our project, the owner of the farm is updated with every product change through data obtained from the poultry farm itself. After obtaining information about production conditions from the animal farm itself in certain climatic conditions, the owner can be notified of such a change in production in such climatic conditions in the future.

Through our project, the owner of the farm is updated with every product change through data obtained from the poultry farm itself. After obtaining information about production conditions from the animal farm itself in certain climatic conditions, the owner can be notified of such a change in production in such climatic conditions in the future.

2. OBJECTIVES

2.1 Main Objectives

Our aim is to improve a chicken farm with new technology, otherwise using IOT and machine learning to make production in a systematic, efficient and cost-effective manner. Here we are trying to automate a Poultry farm. Our focus is on every aspect of foods, product manufacturing, temperature, safety and waste removal. Additionally, a new machine learning algorithm should be created to predict product data. It helps in getting more benefits of the product as it maintains an uninterrupted supply.

2.2 Specific Objectives

It is expected to provide a forecast based on past production cost and production data to prevent waste and increase production capacity.This shows accurate production data, actions and solutions to minimize problems arising in the production process.

Here's how to get the data.

Daily egg production data is obtained using the photoelectric sensor attached to the egg collecting machine.

Daily feed consumption data can be obtained by the load sensor attached to the automatic feeding device.

After installing our complete project, the electricity consumption data for the poultry farm will be obtained.

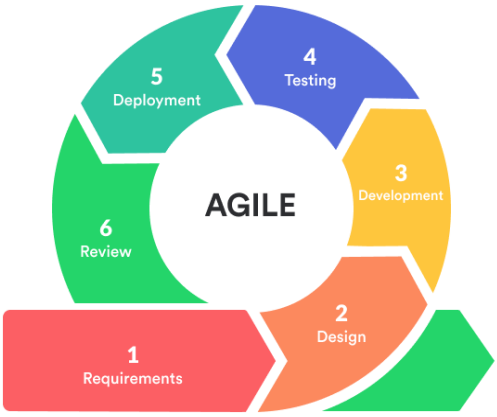
Using this data, machine learning will be able to provide accurate predictions. This leaves no delay in taking action that can boost production.It will also have the ability to quickly recover from a downturn in production conditions.

3. METHODOLOGY

3.1 Software Solution

This Smart Platform for the development of SMART Poultry Farm system will be developed in conjunction with the Agile software development life cycle. The justification for using an agile SDLC (Software Development Life Cycle) is that it is continuously changing and developing. Due to the agile SDLC methodology, we will be able to complete the project quickly. Scrum will be used as another methodology in accordance with the agile philosophy. Scrum has the capacity to react to modifications to the specifications as they occur.

Agile Methodology



3.2 Requirement Gathering and Analysis

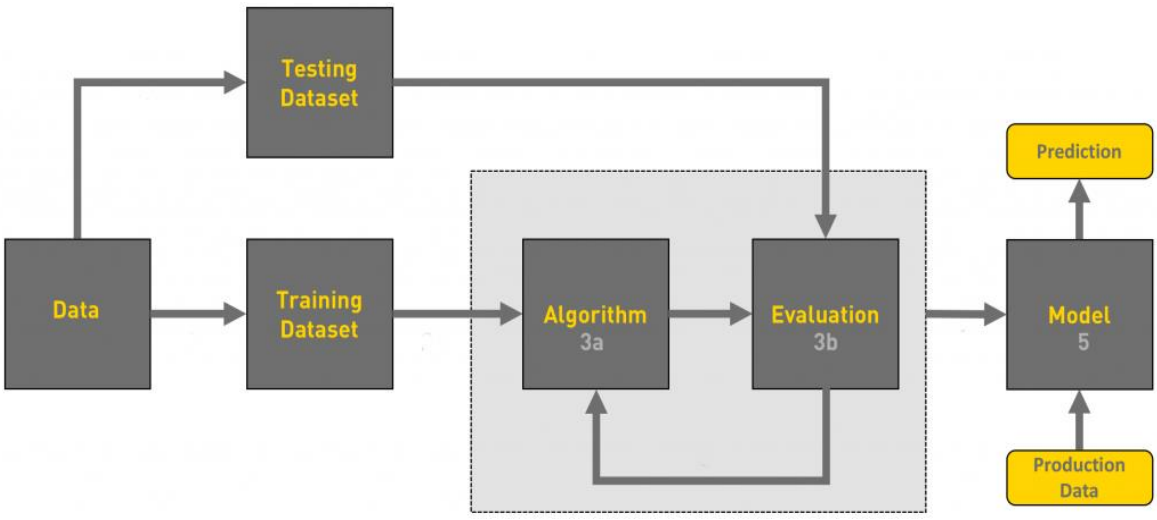
A crucial part of the SLDC process is requirement gathering, and if the requirement is not understood correctly, the method will go in the wrong direction. The system must meet requirements gathering criteria in order to function as intended. This research is to Making poultry farms more efficient by using information technology. To gather requirements, the given methodologies will be used.

- Meeting Poultry farm owners and getting information.
- Visiting Poultry farms.
- Supervisory and co-supervisory meetings are held on a regular basis.
- Read research papers and articles on the subject.
- Survey study
- Group discussions
- Consult with people who are knowledgeable about the subject and have dealt with it before

Following the gathering of data, analysis should be carried out. In the analysis phase, end-user requirements are assessed, and project objectives are converted into the system functions that will be implemented. Following a review of the gathered data, it is crucial to identify the research gap and highlight the unexplored areas of the current structures.

3.3 Design

The proposed system must be created following a thorough system analysis of the pertinent field and in accordance with the standards. This phase of a system's development is crucial. System analysis led to the creation of the conceptual architecture of the system, which was then translated into a physical design. In the design stage, the programming language, hardware-software platform, input, output, and database will all be explained. Data layout, method of control, data source, workload, and device restriction setup, as well as documentation, tests, system implementation process, and backups, are all explained at this point.



WORKFLOW

3.4 Implementation

Our entire research is an IOT based project. Along with this we hope to create a companion app and user can log in through the app and see the predicted information about the products in this section.

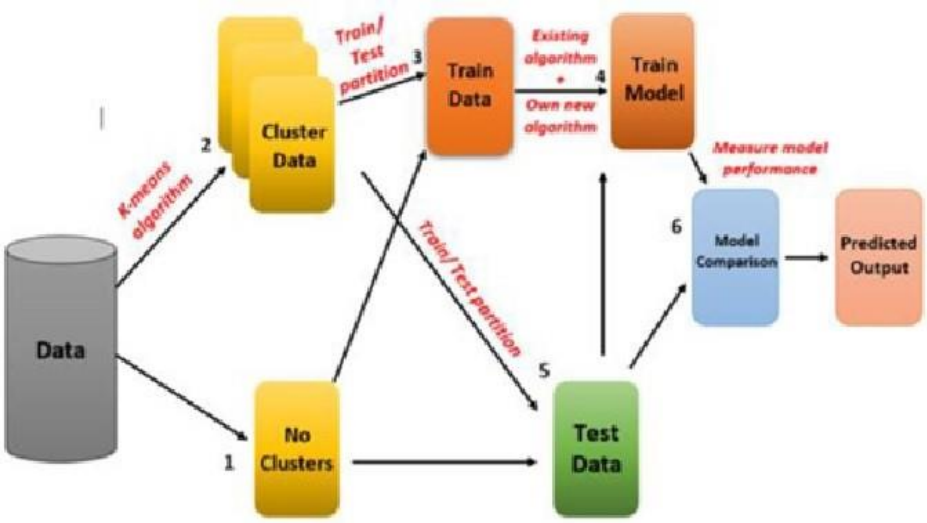
After installing this entire project in a chicken farm, the data will be added to the database.

The sensor collects the data of the chicken farm and stores it in a database, and the data is expected to be predicted and given predictions.

We obtain the historical data from the database and use it along with known methods like linear regression, k-means algorithms, logistic regression, decision trees, and random forests, among others, to forecast of Predicting egg production conditions in poultry farms.

The database contains two categories of historical information referred to as cluster data. We cluster the data using k means algorithm. Then, using the train-test partition, the data set is randomly divided into the training set and testing set.After that models are trained using my own algorithm and existing algorithms. Then data is fed into each trained model to measure model performance. These measurements show us how overfit any model is in relation to the training data and help us to assess the generalizability of the remaining data that was not used in the study.

System Architecture



3.5 Testing

The main component of the software life cycle is testing. Here, there are two different kinds of testing: fictional testing and nonfunctional testing. Testing will take place in various phases from the lifecycle's beginning to its conclusion. Small components will be tested in component wise during functional testing. testing that is not functional. In addition to functional testing, nonfunctional testing is carried out to help protect the system.

3.6 Tools and Technologies

I will implement my machine learning functions in Jupiter notebook using python language in my research part. The backend will be developed using node JS, and all functions will be implemented in connection with databases and machine learning algorithms. React js makes it simple to integrate with the node js backend, so I can use it to build the front end of my research component. I mainly use firebase create and implement our database because it is a real-time database and can be configured online. may use the machine learning kit in the firebase to add various features to my system, such analyzed graphs, charts, etc. And I hope to use Robo 3T for big data analysis part when needed. For my research, I also hope to create a native mobile application. The best text editor for creating web and native mobile applications is Visual Studio Code. We use JavaScript, java and python as the development languages . The following is a list of our key tools and technologies.

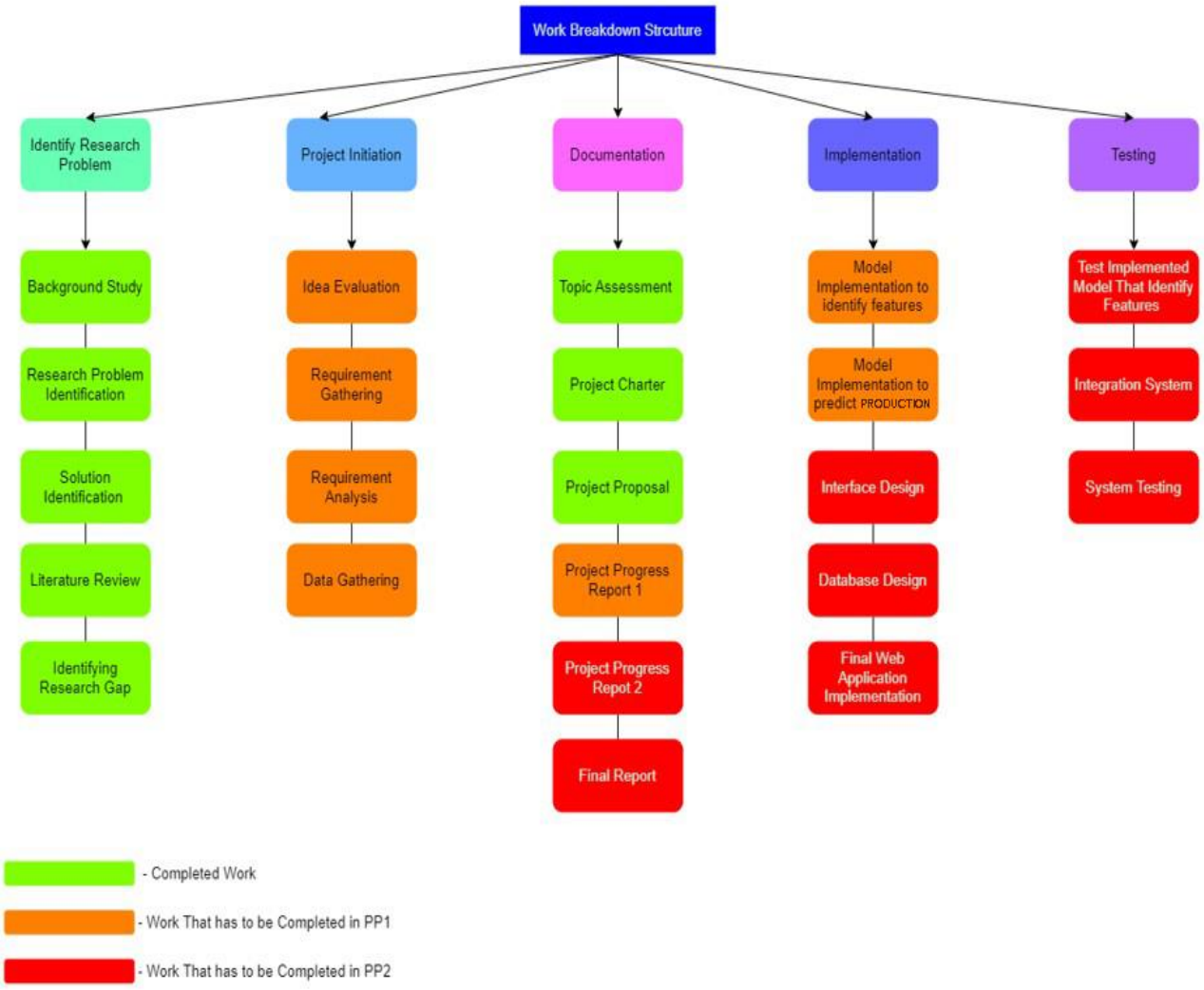
Tools

- Visual studio code
- Jupiter notebook
- Firebase
- Android studio

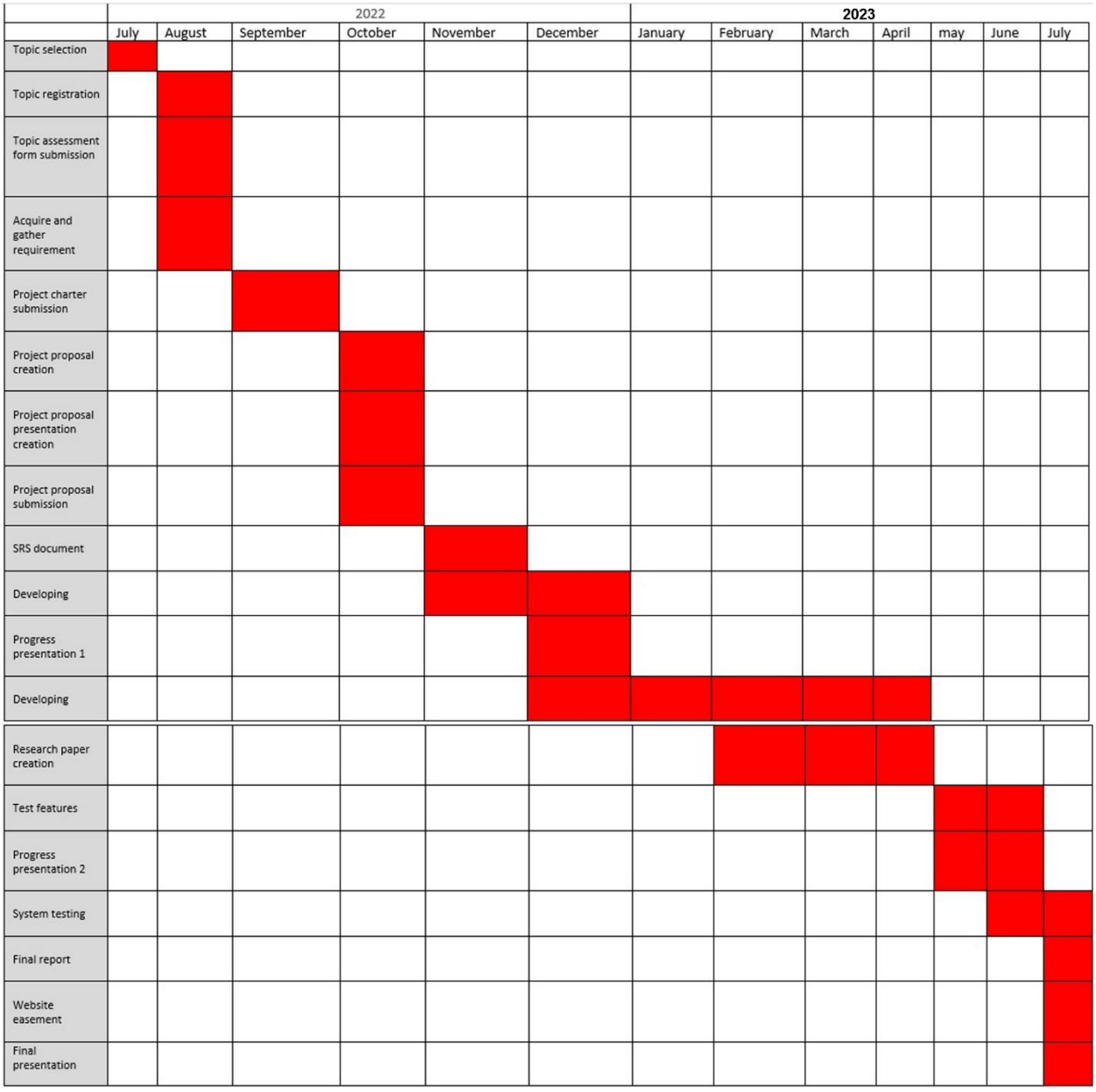
Technologies

- React JS
- Node JS
- Java
- Robo 3T
- Python

3.7Work Breakdown Structure



4.GANTT CHART



5. BUDGET AND BUDGET JUSTIFICATION

	Price (Rs)
Travilling cost	8000
Educationl survey cost	3000
Internet	2500
Stationery	2000
Documentation and print cost	2000
Machanical implemantationpart	15000
Sensors implementation	20000
Total	52500.00

6.COMERCIALIZATION

Target Audience and Market Space

Target Audience

- CRISL – Researchers
- Farmers
- Stakeholders
- External Parties
- Poultry farm Owners

7. References

B. MILOSEVIC, B., 2019. *Machine learning application in growth and health prediction of broiler chickens,* s.l.: Cambridge Core.

Goyal, V., Yadav, A. & Mukherjee, R., 2022. *Performance Evaluation of Machine Learning and Deep Learning Models for Temperature Prediction in Poultry Farming,* s.l.: IEEE XPLORE.

J.RothrockJrbAbhinavMishra, C. E., 2019. Food Research International. *Comparison between random forest and gradient boosting machine methods for predicting Listeria spp. prevalence in the environment of pastured poultry farms,* Volume 122, pp. 47-55.

Maurice Pitesky, J. G. ,. T. B., 2020. *analyses of poultry data to improve food safety and production efficiency,* s.l.: CABI.

Philip J. Hepworth, A. V. N., 2012. *Broiler chickens can benefit from machine learning: support vector machine analysis of observational epidemiological data,* s.l.: royalsocietypublishing.

Rasheed O.Ojo, A. O. ,. H. A., 2022. Computers and Electronics in Agriculture. *Internet of Things and Machine Learning techniques in poultry health and welfare management: A systematic literature review,* Volume 200, p. 150.

Yoo, D.-s., 2021. driven dynamic risk prediction. *driven dynamic risk prediction for highly pathogenic avian influenza at poultry farms in Republic of Korea,* p. 30.