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Natural Disasters intensity Analysis and classification using Artificial Intelligence

DOCUMENTATION

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1. INTRODUCTION

1.1 Project Overview

Natural disasters not only disturb the human ecological system . Disaster can be caused by naturally occurring events such as earthquakes, cyclones, floods, and wildfires.we developed a multilayered deep convolutional neural network model that classifies the natural disaster and tells the intensity of disaster of natural The model uses an integrated webcam to capture the video frame and the video frame is compared with the Pre-trained model and the type of disaster is identified and showcased on the OpenCV window.

1.2 Purpose

The purpose of the project is analyse the intensity of the Natural Disasters.Now a days,increase the earth quakes and cyclones,floods,and wildfires.So this application help them to predit the earth quakes,cyclones etc...

2. LITERATURE SURVEY

2.1 Existing Problem

AI can help response teams understand natural hazards, monitor events in real time, and anticipate specific risks in the face of impending or on-going disasters.“The more early warning we have, the more prepared we are, and the less will be the humanitarian tragedy”, said Muralee Thummarukudy,Operations Manager at the Crisis Management Branch of the United Nations Environment Programme (UNEP).

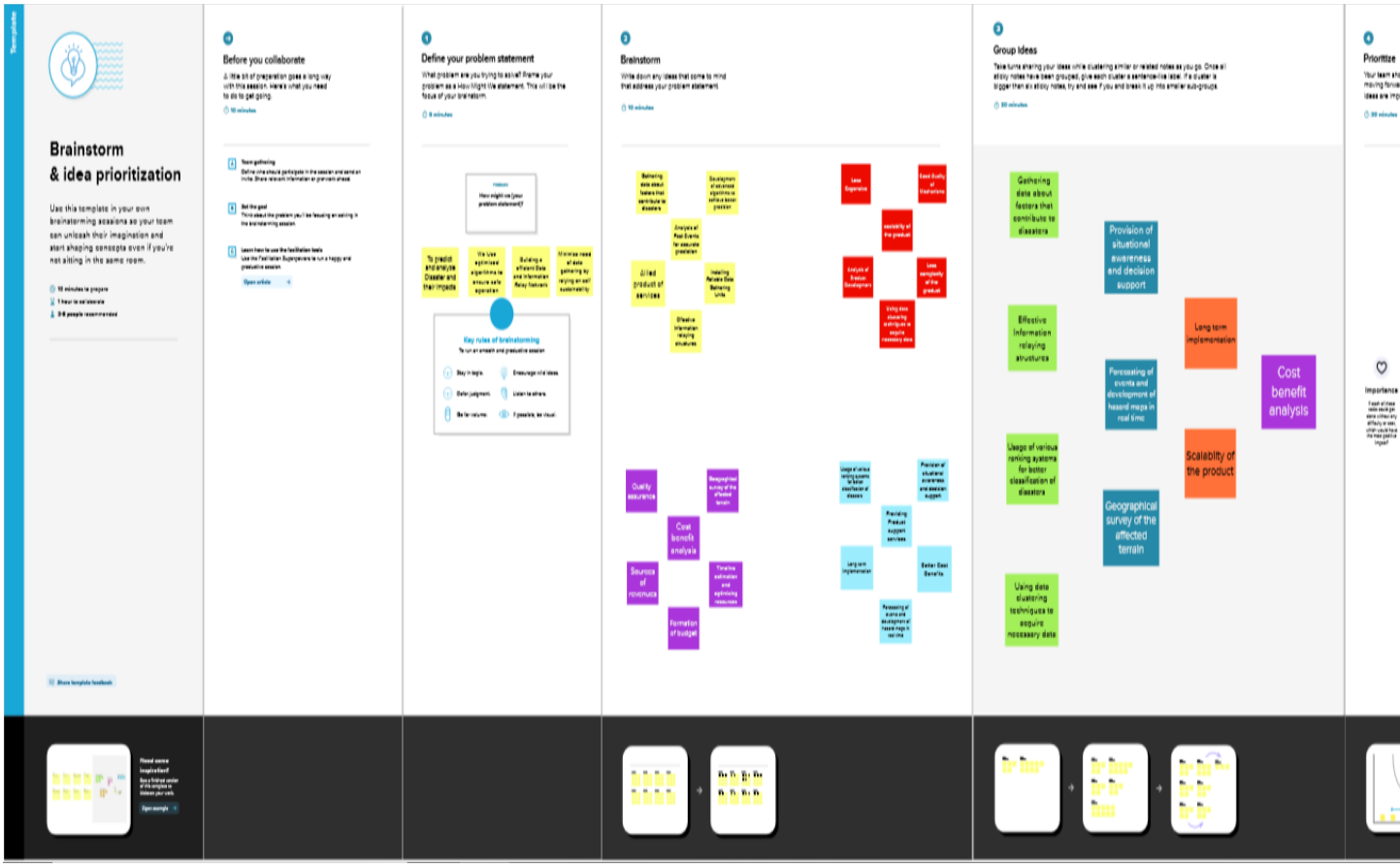
2.2 References

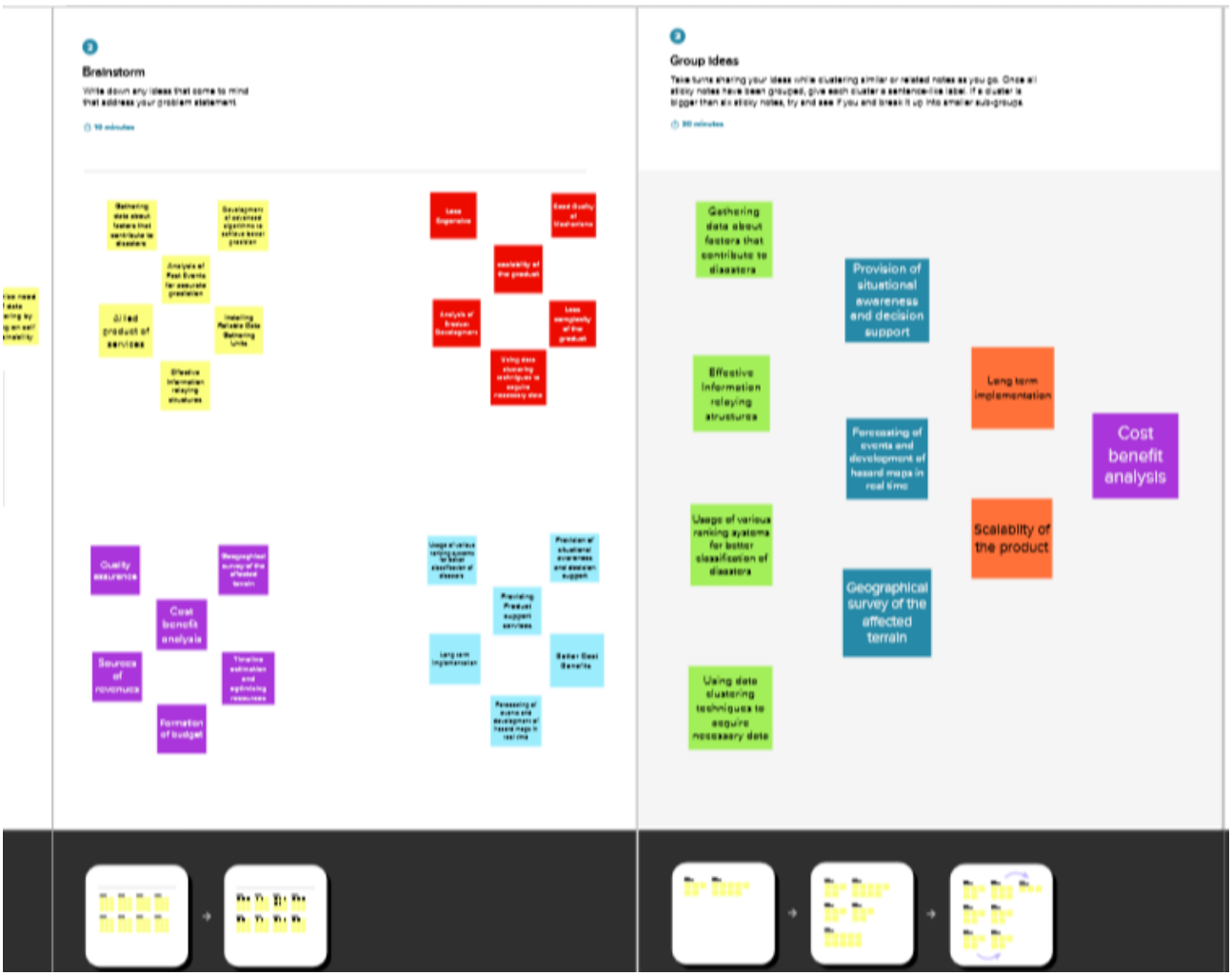
https://www.researchgate.net/publication/350830884_Natural_Disasters_Intensity_Analysis_and_Classification_Based_on_Multispectral_Images_Using_Multi-Layered_Deep_Convolutional_Neural_Network

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

3.2. Ideation & Brainstroming

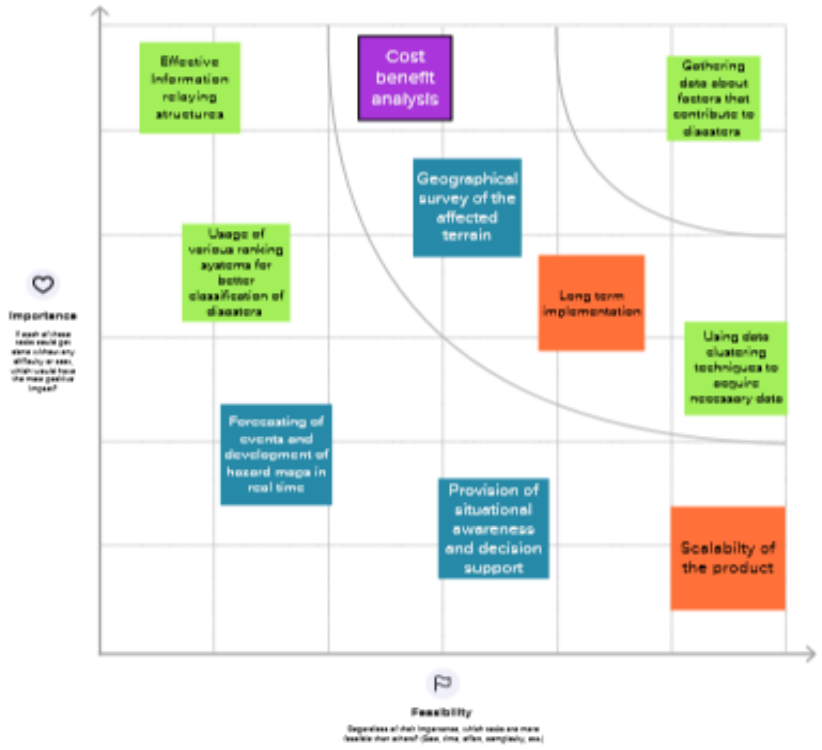



2
Brainstorm
Write down any ideas that come to mind that address your problem statement.
10 minutes
Gathering data about factors that contribute to disasters
Development of advanced algorithms to achieve better precision
Analysis of Past Events for accurate prediction
Skilled product of services
Initiating Partners Data Gathering Units
Effective information relaying structures
Less Expensive
Good Quality of Mechanisms
availability of the product
Analysis of Product Development
Less complexity of the product
Using data clustering techniques to acquire necessary data
Quality assurance
Geographical survey of the affected terrain
Cost benefit analysis
Sources of revenues
Timeline estimation and optimizing resources
Formation of budget
Usage of various ranking systems for better classification of disasters
Provision of situational awareness and decision support
Providing Product support services
Long term implementation
Better Cost Benefits
Forecasting of events and development of hazard maps in real time
3
Group ideas
Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.
20 minutes
Gathering data about factors that contributes to disasters
Provision of situational awareness and decision support
Effective information relaying structures
Long term implementation
Cost benefit analysis
Forecasting of events and development of hazard maps in real time
Scalability of the product
Usage of various ranking systems for better classification of disasters
Geographical survey of the affected terrain
Using data clustering techniques to acquire necessary data

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

30 minutes



After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

Keep moving forward

Strategy blueprint
Define the components of a new idea or strategy.
Open the template

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template

Share template feedback

3.3 Proposed Solution

ProposedSolutionTemplate:

Projectteamshallfillthefollowinginformationinproposedsolutiontemplate.

S.No.	Parameter	Description
1.	Problem Statement (Problem tobesolved)	Tomonitoringandpredictingthedisastersand itsintensityofimpacts ontheregion.
2.	Idea/Solutiondescription	Touseclassificationalgorithmtoidentifyth eimpactsofdisaster.
3.	Novelty/Uniqueness	Usage of reinforcement learning algorithm tolet the AI be self-sufficient and capable ofgathering essential data on its own forprediction.
4.	SocialImpact/CustomerSatisfactio n	Thisproductwillhelpinmakingcrucialdecisions upport at times of emergencies and also raisefundamental awareness of the impacts ofdisasters.
5.	BusinessModel(RevenueModel)	Revenue generated through Royalty payments,product license costs in department , researchandeducationalplatforms.
6.	ScalabilityoftheSolution	Disintegration of geographical terrains intomultipleprovinceswhichcanbeinterconn ectedasagridtohelpalleviateitsscale.

3.4 Proposed Solution fit

4. REQUIREMENT ANALYSIS

4.1 Functional requirement

Followingarethefunctionalrequirementsoftheproposedsolution.

FR No.	FunctionalRequirement(Epic)	SubRequirement(Story/Sub-Task)
FR-1	UserRegistration	Register through mobile application Callthegiven emergency number
FR-2	UserConfirmation	Confirmation via Call backConfirmationviaText
FR-3	UserPreparation	Ensure safety of all peopleSupply of cannedfood
FR-4	User evacuation	Waitingforevacuationteam Takerefugeeinnearestsafe location

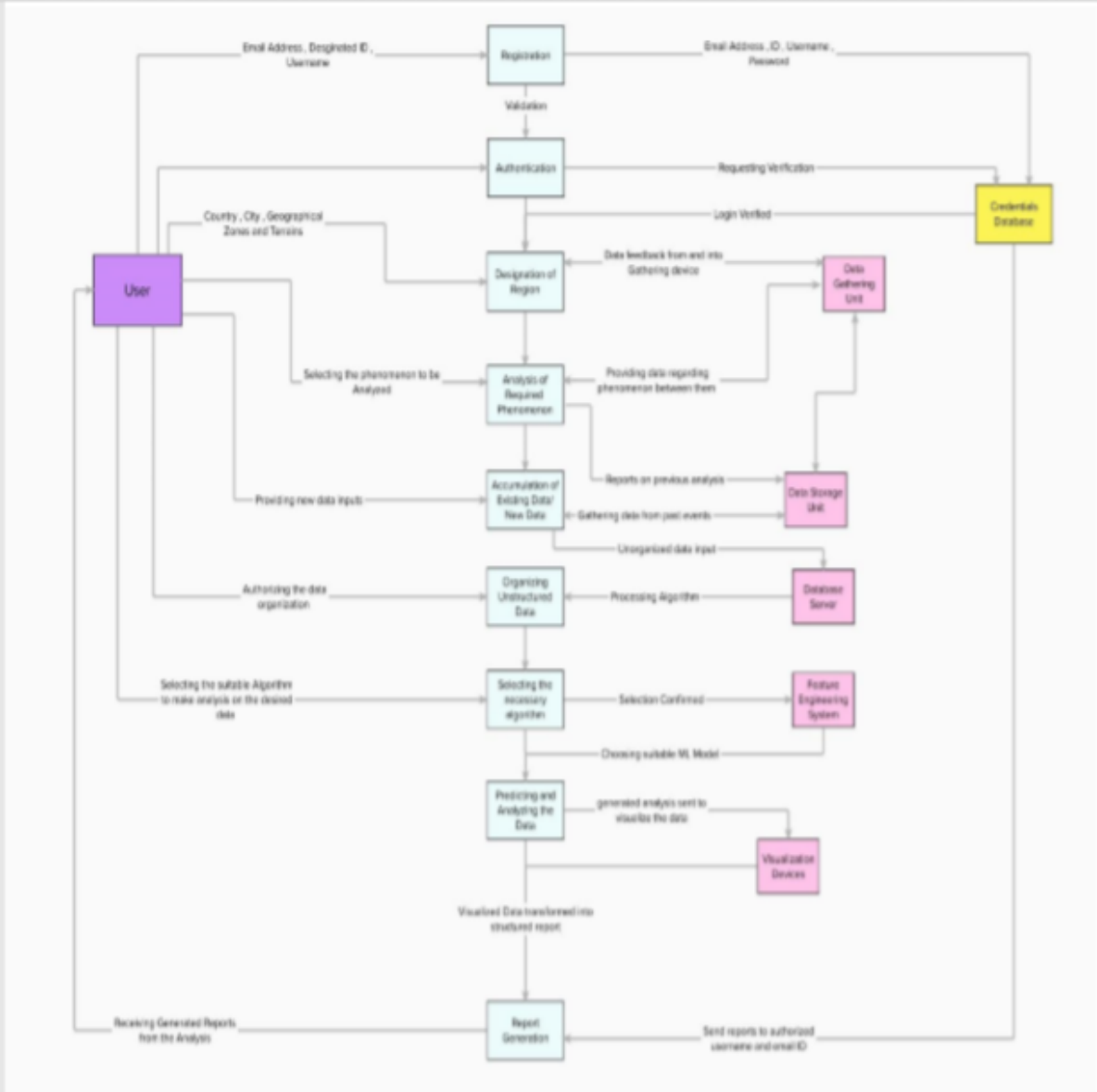
4.2 Non-Functional requirements

Followingarethe non-functional requirementsoftheproposed solution.

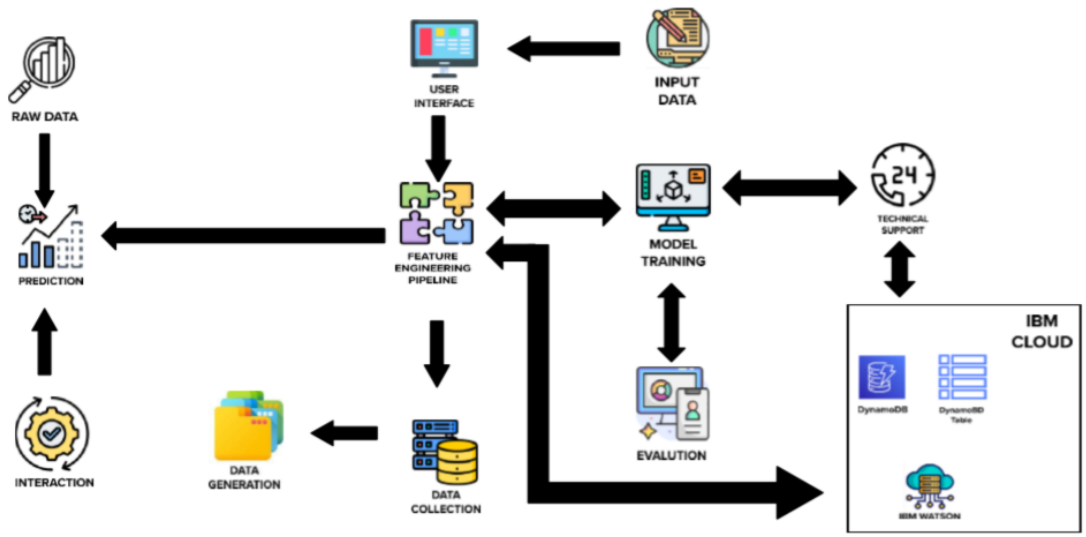
FR No.	Non-FunctionalRequirement	Description
NFR-1	**Usability**	Itis easyandquickmethodtopredictthedisasters.
NFR-2	**Security**	The secure pattern shares components with monitorandcontrol for loggingandcontrol accessandfor providingaudittrails.
NFR-3	**Reliability**	Itshouldbehighly reliable.
NFR-4	**Performance**	Itdealswiththemeasureofthesystem'sresponse time.
NFR-5	**Availability**	It can be available at the any time and we can accessduringany disasters.
NFR-6	**Scalability**	Disaster damages are measured involves examiningthenumberoffatalities,ofinjuries, ofpeople affected.

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

UserStories:

User Type	FunctionalRequirement(Epic)	UserStoryNumber(USN)	UserStory/Task	Acceptance criteria	Priority	Release
Enduser (Customer)	Registration	USN-1	Asauser,Iamabletoregister with theproduct using my validemailaddress	I should be able toregister with myaccountcredentials	High	Sprint-1
EndUser (Customer)	Authentication	USN-2	Asauser,Iamabletologin into the systemwithmycredentials	It should ensuresmooth logincapabilities withoutdelay	High	Sprint-1
EndUser (Customer)	Designation ofRegion	USN-3	I can select the regionof interest to bemonitored andanalyzed	I must be able tochoose certainspecific placeswithouterror	High	Sprint-1

EndUser (Customer)	Analysis ofRequiredP henomenon	USN-4	I am able to monitorcertain factors thatinfluence the actions ofthephenomenon	Itshouldconsidera nd monitor mostof the factorsinvolved in theaction	High	Sprint-2
EndUser (Customer)	Accumulation of requiredData	USN-5	I am able to gatherdata regarding pastevents and a detailedreportonpasta nalysis	It should allow thestorage of data ofpast events forcertainextent	Medium	Sprint-2
EndUser (Customer)	OrganizingU nstructuredd ata	USN-6	I am able to organizeand restructure theraw data into refineddata	It should ensureeasyandef ficientprocessing methods	Low	Sprint-3
EndUser (Customer)	Algorithm selection	USN-7	I am able to choosetherequiredalg orithmforaspecificanal ysis	It must providevarious options forthealgorithmtob eused	High	Sprint-2
EndUser (Customer)	Prediction andanalysisofd ata	USN-8	I am able to easilypredictandvisu alizethedata	Itshouldalloweasyto use predictionand visualizationtechniq ues	High	Sprint-3
EndUser (Customer)	Reportgen eration	USN-9	I am able to generatea clear and detailedreportonthea nalysis	Report generationmust be fast andefficientandsho uldnotbecomplex	Medium	Sprint-4

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

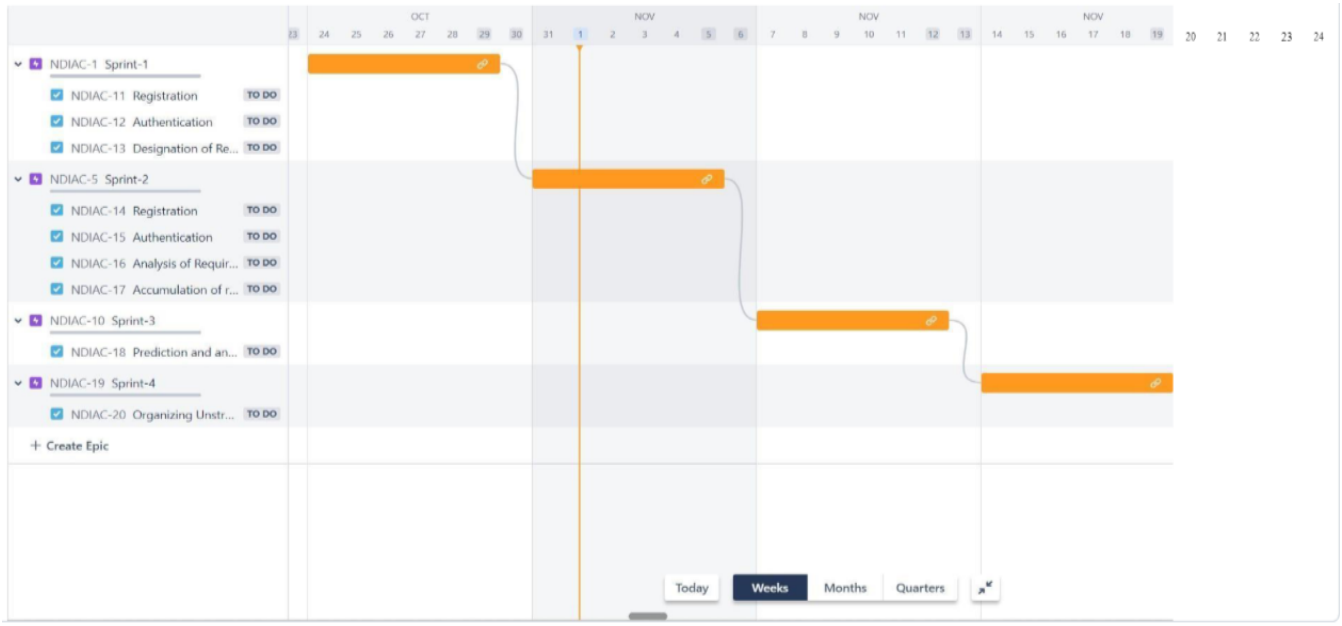
Sprint	FunctionalRe quirement(E pic)	Usersto ryNumb er	Userstory/ Task	Story points	Priority	Teammembers
Sprint-1	Registration	USN–1	Asauser,registering into the product using avalidemailaddress	5	High	Priyatharshini S
Sprint-2	Registration	USN–2	As a user, registeringinto the product using avalidusernameand password	3	Medium	Nandha Kumar M A& Suwetha R
Sprint-1	Authentication	USN–3	As a user, I adept tologging into the systemwith credentials	4	High	Priyatharshini S
Sprint-2	Authentication	USN- 4	As a user, I adept tologging into the systemwith OTP	2	High	Nandha Kumar M A
Sprint-1	Designation ofRegion	USN–5	selecting the region ofinteresttobemonitore dandanalysed	3	High	Priyatharshini S
Sprint-2	Analysis ofRequiredP henomenon	USN–6	Regulating certainfactors influencing theactions of thephenomenon	3	High	Nandha Kumar M A& Pradeepkumar V

Sprint	FunctionalRequirement(Epic)	UserstoryNumber	Userstory/ Task	Story points	Priority	Teammembers
Sprint-2	AccumulationofrequiredData	USN–7	Gathering data anddetailed report on pasteventanalysis	3	Low	Nandha Kumar M A
Sprint-4	OrganizingUnstructureddata	USN–8	Choosing a requiredalgorithm for specificanalysis	2	High	Pradeepkumar V
Sprint-2	Algorithm selection	USN–9	Choosing a requiredalgorithm for specificanalysis	6	High	Nandha Kumar M A& Suwetha R
Sprint-3	Prediction andanalysisofdata	USN–10	Predicting and visualizingthedataeffectively	36	High	Suwetha R
Sprint-4	Reportgeneration	USN– 11	Generating a clear anddetailedreportonproduct dataanalysis	3	High	Pradeepkumar V

6.2) Sprint Delivery Schedule

Sprint	Total StoryPoints	Duration	Sprint StartDate	Sprint EndDate(Planned)	Story PointsCompleted (as onPlannedEndDate)	Sprint ReleaseDate(Actual)
Sprint-1	12	6days	24Oct2022	29Oct2022	12	30Oct2022
Sprint-2	14	6days	31Oct2022	5Nov2022	14	6Nov2022
Sprint-3	6	6days	04Nov2022	9Nov2022	6	8Nov2022
Sprint-4	6	6days	4Nov2022	9Nov2022	6	10Nov2022

6.3 Reports from JIRA



7. CODING & SOLUTION

7.1 Feature 1

Created a GUI based interface for the easy interation of the user using the HTML, CSS, Python Flask. Code in Appendex

7.2 Feature 2

implementation of the Model integrated with HTML and CSS in Appendex

8. TESTING

8.1 Test Cases

Input dataset:

```
Archive:  /content/dataset.zip
  inflating: dataset/readme.txt
   creating: dataset/test_set/
   creating: dataset/test_set/Cyclone/
  inflating: dataset/test_set/Cyclone/867.jpg
  inflating: dataset/test_set/Cyclone/868.jpg
  inflating: dataset/test_set/Cyclone/869.jpg
  inflating: dataset/test_set/Cyclone/870.jpg
  inflating: dataset/test_set/Cyclone/871.jpg
  inflating: dataset/test_set/Cyclone/872.jpg
  inflating: dataset/test_set/Cyclone/873.jpg
  inflating: dataset/test_set/Cyclone/874.jpg
  inflating: dataset/test_set/Cyclone/875.jpg
  inflating: dataset/test_set/Cyclone/876.jpg
  inflating: dataset/test_set/Cyclone/877.jpg
  inflating: dataset/test_set/Cyclone/878.jpg
  inflating: dataset/test_set/Cyclone/879.jpg
  inflating: dataset/test_set/Cyclone/880.jpg
  inflating: dataset/test_set/Cyclone/881.jpg
  inflating: dataset/test_set/Cyclone/882.jpg
  inflating: dataset/test_set/Cyclone/883.jpg
  inflating: dataset/test_set/Cyclone/884.jpg
  inflating: dataset/test_set/Cyclone/885.jpg
  inflating: dataset/test_set/Cyclone/886.jpg
```

```
 creating: dataset/test_set/Earthquake/
inflating: dataset/test_set/Earthquake/1321.jpg
inflating: dataset/test_set/Earthquake/1322.jpg
inflating: dataset/test_set/Earthquake/1323.jpg
inflating: dataset/test_set/Earthquake/1324.jpg
inflating: dataset/test_set/Earthquake/1325.jpg
inflating: dataset/test_set/Earthquake/1326.jpg
inflating: dataset/test_set/Earthquake/1327.jpg
inflating: dataset/test_set/Earthquake/1328.jpg
inflating: dataset/test_set/Earthquake/1329.jpg
inflating: dataset/test_set/Earthquake/1330.jpg
inflating: dataset/test_set/Earthquake/1331.jpg
inflating: dataset/test_set/Earthquake/1332.jpg
inflating: dataset/test_set/Earthquake/1333.jpg
inflating: dataset/test_set/Earthquake/1334.jpg
inflating: dataset/test_set/Earthquake/1335.jpg
inflating: dataset/test_set/Earthquake/1336.jpg
inflating: dataset/test_set/Earthquake/1337.jpg
inflating: dataset/test_set/Earthquake/1338.jpg
inflating: dataset/test_set/Earthquake/1339.jpg
inflating: dataset/test_set/Earthquake/1340.jpg
inflating: dataset/test_set/Earthquake/1341.jpg
inflating: dataset/test_set/Earthquake/1342.jpg
inflating: dataset/test_set/Earthquake/1343.jpg
inflating: dataset/test_set/Earthquake/1344.jpg
inflating: dataset/test_set/Earthquake/1345.jpg
inflating: dataset/test_set/Earthquake/1346.jpg
inflating: dataset/test_set/Earthquake/1347.jpg
inflating: dataset/test_set/Earthquake/1348.jpg
inflating: dataset/test_set/Earthquake/1349.jpg
```

```
 creating: dataset/test_set/Flood/
inflating: dataset/test_set/Flood/1000.jpg
inflating: dataset/test_set/Flood/1001.jpg
inflating: dataset/test_set/Flood/1002.jpg
inflating: dataset/test_set/Flood/1003.jpg
inflating: dataset/test_set/Flood/1004.jpg
inflating: dataset/test_set/Flood/1005.jpg
inflating: dataset/test_set/Flood/1006.jpg
inflating: dataset/test_set/Flood/1007.jpg
inflating: dataset/test_set/Flood/1008.jpg
inflating: dataset/test_set/Flood/1009.jpg
inflating: dataset/test_set/Flood/1010.jpg
inflating: dataset/test_set/Flood/1011.jpg
inflating: dataset/test_set/Flood/1012.jpg
inflating: dataset/test_set/Flood/1013.jpg
inflating: dataset/test_set/Flood/1014.jpg
inflating: dataset/test_set/Flood/1015.jpg
inflating: dataset/test_set/Flood/1016.jpg
inflating: dataset/test_set/Flood/1017.jpg
inflating: dataset/test_set/Flood/1018.jpg
inflating: dataset/test_set/Flood/1019.jpg
inflating: dataset/test_set/Flood/1020.jpg
inflating: dataset/test_set/Flood/1021.jpg
inflating: dataset/test_set/Flood/1022.jpg
inflating: dataset/test_set/Flood/1023.jpg
inflating: dataset/test_set/Flood/1024.jpg
inflating: dataset/test_set/Flood/1025.jpg
inflating: dataset/test_set/Flood/1026.jpg
inflating: dataset/test_set/Flood/1027.jpg
inflating: dataset/test_set/Flood/1028.jpg
```

```
inflating: dataset/test_set/Flood/999.jpg
 creating: dataset/test_set/Wildfire/
inflating: dataset/test_set/Wildfire/1035.jpg
inflating: dataset/test_set/Wildfire/1036.jpg
inflating: dataset/test_set/Wildfire/1037.jpg
inflating: dataset/test_set/Wildfire/1038.jpg
inflating: dataset/test_set/Wildfire/1039.jpg
inflating: dataset/test_set/Wildfire/1040.jpg
inflating: dataset/test_set/Wildfire/1041.jpg
inflating: dataset/test_set/Wildfire/1042.jpg
inflating: dataset/test_set/Wildfire/1043.jpg
inflating: dataset/test_set/Wildfire/1044.jpg
inflating: dataset/test_set/Wildfire/1045.jpg
inflating: dataset/test_set/Wildfire/1046.jpg
inflating: dataset/test_set/Wildfire/1047.jpg
inflating: dataset/test_set/Wildfire/1048.jpg
inflating: dataset/test_set/Wildfire/1049.jpg
inflating: dataset/test_set/Wildfire/1050.jpg
inflating: dataset/test_set/Wildfire/1051.jpg
inflating: dataset/test_set/Wildfire/1052.jpg
inflating: dataset/test_set/Wildfire/1053.jpg
inflating: dataset/test_set/Wildfire/1054.jpg
inflating: dataset/test_set/Wildfire/1055.jpg
inflating: dataset/test_set/Wildfire/1056.jpg
inflating: dataset/test_set/Wildfire/1057.jpg
inflating: dataset/test_set/Wildfire/1058.jpg
inflating: dataset/test_set/Wildfire/1059.jpg
inflating: dataset/test_set/Wildfire/1060.jpg
inflating: dataset/test_set/Wildfire/1061.jpg
inflating: dataset/test_set/Wildfire/1062.jpg
inflating: dataset/test_set/Wildfire/1063.jpg
```

Predicted Output:

```
Epoch 1/20
149/149 [==============================] - 42s 272ms/step - loss: 1.1632 - accuracy: 0.5216 - val_loss: 0.9812 - val_accuracy: 0.5354
Epoch 2/20
149/149 [==============================] - 38s 252ms/step - loss: 0.8483 - accuracy: 0.6712 - val_loss: 0.7859 - val_accuracy: 0.7374
Epoch 3/20
149/149 [==============================] - 39s 263ms/step - loss: 0.6883 - accuracy: 0.7278 - val_loss: 0.8899 - val_accuracy: 0.6970
Epoch 4/20
149/149 [==============================] - 41s 279ms/step - loss: 0.6571 - accuracy: 0.7170 - val_loss: 1.0388 - val_accuracy: 0.6111
Epoch 5/20
149/149 [==============================] - 38s 253ms/step - loss: 0.5828 - accuracy: 0.7655 - val_loss: 0.7886 - val_accuracy: 0.7525
Epoch 6/20
149/149 [==============================] - 39s 265ms/step - loss: 0.5124 - accuracy: 0.8113 - val_loss: 0.9449 - val_accuracy: 0.6616
Epoch 7/20
149/149 [==============================] - 38s 252ms/step - loss: 0.4475 - accuracy: 0.8208 - val_loss: 0.9295 - val_accuracy: 0.7626
Epoch 8/20
149/149 [==============================] - 37s 253ms/step - loss: 0.5198 - accuracy: 0.8208 - val_loss: 1.0729 - val_accuracy: 0.7172
Epoch 9/20
149/149 [==============================] - 39s 261ms/step - loss: 0.4103 - accuracy: 0.8423 - val_loss: 1.0310 - val_accuracy: 0.6768
Epoch 10/20
149/149 [==============================] - 42s 280ms/step - loss: 0.4223 - accuracy: 0.8491 - val_loss: 0.7108 - val_accuracy: 0.7929
Epoch 11/20
149/149 [==============================] - 38s 254ms/step - loss: 0.4170 - accuracy: 0.8544 - val_loss: 0.8419 - val_accuracy: 0.7121
Epoch 12/20
149/149 [==============================] - 40s 268ms/step - loss: 0.3207 - accuracy: 0.8841 - val_loss: 0.7221 - val_accuracy: 0.8030
Epoch 13/20
149/149 [==============================] - 38s 249ms/step - loss: 0.3373 - accuracy: 0.8585 - val_loss: 0.9803 - val_accuracy: 0.7525
Epoch 14/20
149/149 [==============================] - 43s 287ms/step - loss: 0.3147 - accuracy: 0.8922 - val_loss: 1.3861 - val_accuracy: 0.6667
Epoch 15/20
149/149 [==============================] - 40s 267ms/step - loss: 0.2967 - accuracy: 0.8841 - val_loss: 1.0562 - val_accuracy: 0.7626
Epoch 16/20
149/149 [==============================] - 39s 261ms/step - loss: 0.2683 - accuracy: 0.9003 - val_loss: 0.9182 - val_accuracy: 0.8182
```

9. RESULTS

9.1 Performance Metrics

```
_________________________________________________________________
 Layer (type)                Output Shape              Param #
=================================================================
 conv2d (Conv2D)             (None, 62, 62, 32)        896

 max_pooling2d (MaxPooling2D  (None, 31, 31, 32)       0
 )

 conv2d_1 (Conv2D)           (None, 29, 29, 32)        9248

 max_pooling2d_1 (MaxPooling  (None, 14, 14, 32)       0
 2D)

 flatten (Flatten)           (None, 6272)              0

 dense (Dense)               (None, 128)               802944

 dense_1 (Dense)             (None, 4)                 516

=================================================================
Total params: 813,604
Trainable params: 813,604
Non-trainable params: 0
_________________________________________________________________
```

10. ADVANTAGES & DISADVANTAGES

Advantages

Simplicity.

Provides transpart view of the economy.

Well suited to short-term recovery periods.

Disadvantages

Rigidity due to linearity.

Inadequately deals with monetary interventions.

Ignores agent behaviourial response to disaster.

11.CONCLUSION

Many researchers have attempted to use different deep learning methods for detection of natural disasters. However, the detection of natural disasters by using deep learning techniques still faces various issues due to noise and serious class imbalance problems. To address these problems, we proposed a multilayered deep convolutional neural network for detection and intensity classification of natural disasters. The proposed method works in two blocks—one for detection of natural disaster occurrence and the second block is used to remove imbalanced class issues. The results were calculated as average statistical values: sensitivity, 97.54%; specificity, 98.22%; accuracy rate, 99.92%; precision, 97.79%; and F1-score, 97.97% for the proposed model. The proposed model achieved the highest accuracy as compared to other state-of-the-art methods due to its multilayered structure. The proposed model performs significantly better for natural disaster detection and classification, but in the future the model can be used for various natural disaster detection processes.

12.FUTURE SCOPE

Aerial Photography and Remote Sensing.
Information Management.
Refugee Assistance Models.
Prevention and Mitigation Tools,Preparedness Tools.
Victims,Relief Systems.

13. APPENDEX

Source Code

```
<!DOCTYPE html>
<html lang="en">
<title>Home - Natural Disasters Database</title>
<meta charset="UTF-8">
<meta name="viewport" content="width=device-width, initial-scale=1">
<link rel="stylesheet" href=https://www.w3schools.com/w3css/4/w3.css>
<link rel="stylesheet" href=https://fonts.googleapis.com/css?family=Lato>
<link rel="stylesheet" href=https://fonts.googleapis.com/css?family=Montserrat>
<link rel="stylesheet" href=https://cdnjs.cloudflare.com/ajax/libs/font-awesome/4.7.0/css/font-awesome.min.css>
<style>
Body,h1,h2,h3,h4,h5,h6 {font-family: "Lato", sans-serif}
.w3-bar,h1,button {font-family: "Montserrat", sans-serif}
.fa-anchor,.fa-coffee {font-size:200px}
</style>
<body>
<!-Navbar ?
<div class="w3-top">
  <div class="w3-bar w3-black w3-card w3-left-align w3-large">
    <a class="w3-bar-item w3-button w3-hide-medium w3-hide-large w3-right w3-padding-large w3-hover-white w3-large w3-red" href="javascript:void(0);" onclick="myFuncti
    <a href="{% url 'home' %}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Home</a>
    <a class="w3-bar-item w3-button w3-padding-large w3-white">Earthquake</a>
```

```
    <a href="{%url 'tsunami'%}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Tsunami</a>
    <a href="{%url 'tornado'%}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Tornado</a>
    <a href="{%url 'volcano'%}" class="w3-bar-item w3-button w3-hide-small w3-padding-large w3-hover-white">Volcanic Activity</a>
  </div>
  <!-Navbar on small screens ?
  <div id="navDemo" class="w3-bar-block w3-white w3-hide w3-hide-large w3-hide-medium w3-large">
    <a href="#" class="w3-bar-item w3-button w3-padding-large">Earthquake</a>
    <a href="#" class="w3-bar-item w3-button w3-padding-large">Tsunami</a>
    <a href="#" class="w3-bar-item w3-button w3-padding-large">Tornado</a>
    <a href="#" class="w3-bar-item w3-button w3-padding-large">Volcanic Activity</a>
  </div>
</div>
<!-Header ?
<header class="w3-container w3-grey w3-center" style="padding:128px 16px">
  <h1 class="w3-margin w3-jumbo">Earthquakes</h1>
  <p class="w3-xlarge">Natural Disasters Database</p>
</header>
<div class="w3-container">
  <h2>Earthquakes</h2>
  <table class="w3-table-all">
    <tr>
      <th>Earthquake_id</th>
      <th>Intensity</th>
      <th>Date</th>
      <th>Country</th>
      <th>Place</th>
```

```
        <th>Latitude</th>
        <th>Longitude</th>
      {% for quake in all_quakes %}
        <tr>
          <td>{{quake.earthquake_id}}</td>
          <td>{{quake.intensity}}</td>
          <td>{{quake.date}}</td>
          <td>{{quake.country}}</td>
          <td>{{quake.place}}</td>
          <td>{{quake.latitude}}</td>
          <td>{{quake.longitude}}</td>
        </tr>
      {% endfor %}
    </table>
  </div>
  <div class="w3-container">
    <h2>Damage caused by the quakes</h2>
    <table class="w3-table-all">
      <tr>
        <th>Earthquake_id</th>
        <th>Amount (in million)</th>
        <th>Deaths (in thousands)</th>
        <th>House_destroyed (in thousands)</th>
      </tr>
      {% for d in damage %}
        <tr>
          <td>{{d.amount}}</td>
          <td>{{d.deaths}}</td>
          <td>{{d.house_destroyed}}</td>
        </tr>
      {% endfor %}

    </table>
  </div>

  <div class="w3-container w3-black w3-center w3-opacity w3-padding-50">
      <h1 class="w3-margin w3-xlarge">Thanks for visiting the website</h1>
  </div>

  <!—Footer ?
  <footer class="w3-container w3-padding-40 w3-center w3-opacity">
    <div class="w3-xlarge w3-padding-20">
      <h1>A Database project </h1>
  </footer>

  <script>
  // Used to toggle the menu on small screens when clicking on the menu button
  Function myFunction() {
    Var x = document.getElementById("navDemo");
    If (x.className.indexOf("w3-show") == -1) {
      x.className += " w3-show";
    } else {
```

Python Code

```python
from flask import Flask, render_template, flash, request, session,send_file
from flask import render_template, redirect, url_for, request
import warnings
import datetime
import cv2



app = Flask(__name__)
app.config['DEBUG']
app.config['SECRET_KEY'] = '7d441f27d441f27567d441f2b6176a'

@app.route("/")
def homepage():

    return render_template('index.html')



@app.route("/Training")
def Training():
    return render_template('Tranning.html')

@app.route("/Test")
def Test():
```

```python
    return render_template('Test.html')



@app.route("/train", methods=['GET', 'POST'])
def train():
    if request.method == 'POST':
        import model as model

        return render_template('Tranning.html')



@app.route("/testimage", methods=['GET', 'POST'])
def testimage():
    if request.method == 'POST':


        file = request.files['fileupload']
        file.save('static/Out/Test.jpg')

        img = cv2.imread('static/Out/Test.jpg')
        if img is None:
```

```
            print('no data')

        img1 = cv2.imread('static/Out/Test.jpg')
        print(img.shape)
        img = cv2.resize(img, ((int)(img.shape[1] / 5), (int)(img.shape[0] / 5)))
        original = img.copy()
        neworiginal = img.copy()
        cv2.imshow('original', img1)
        gray = cv2.cvtColor(img1, cv2.COLOR_BGR2GRAY)

        img1S = cv2.resize(img1, (960, 540))

        cv2.imshow('Original image', img1S)
        grayS = cv2.resize(gray, (960, 540))
        cv2.imshow('Gray image', grayS)

        gry = 'static/Out/gry.jpg'

        cv2.imwrite(gry, grayS)
        from PIL import  ImageOps,Image

        im = Image.open(file)

        im_invert = ImageOps.invert(im)
        inv = 'static/Out/inv.jpg'
        im_invert.save(inv, quality=95)
```

```

        dst = cv2.fastNlMeansDenoisingColored(img1, None, 10, 10, 7, 21)
        cv2.imshow("Nosie Removal", dst)
        noi = 'static/Out/noi.jpg'

        cv2.imwrite(noi, dst)

        import warnings
        warnings.filterwarnings('ignore')

        import tensorflow as tf
        classifierLoad = tf.keras.models.load_model('firemodel.h5')

        import numpy as np
        from keras.preprocessing import image

        test_image = image.load_img('static/Out/Test.jpg', target_size=(200, 200))
        img1 = cv2.imread('static/Out/Test.jpg')
        # test_image = image.img_to_array(test_image)
        test_image = np.expand_dims(test_image, axis=0)
        result = classifierLoad.predict(test_image)

        out = ''
        pre = ''
        if result[0][0] == 1:

```

```
103
104             out = "Cyclone"
105
106         elif result[0][1] == 1:
107
108             out = "Earthquake"
109
110         elif result[0][2] == 1:
111
112             out = "Flood"
113
114         elif result[0][3] == 1:
115
116             out = "Wildfire"
117
118
119         org = 'static/Out/Test.jpg'
120         gry ='static/Out/gry.jpg'
121         inv = 'static/Out/inv.jpg'
122         noi = 'static/Out/noi.jpg'
123
124
125
126
127         return render_template('Test.html',result=out,org=org,gry=gry,inv=inv,noi=noi)
128
```

Github Link:

https://github.com/IBM-EPBL/IBM-Project-30201-1660141771

Demo video Link:

https://youtu.be/rKqshUaYmcs