**Report format**

**Title of the project** – Disaster Management

**Team No.** – 1

**Names of the team members along with Reg. Nos.**

1. Mahak Surana – 19BAI1027

2. Rahul Dash – 19BAI1121

3. Rishma Mukhopadhyay – 19BAI1128

4. Sagnik Sanyal – 19BCE1489

5. Ishita Kumar – 19BCE1551

6. Balraj Agarwal – 19MIS1132

7. Abhisek Mohapatra – 19BCE1790

8. Shreya Agarwal – 19BCE1690

9. Sam Methuselah – 19BCE1698

10. Sarthak Keshari – 19BCE1672

**Slot –** S4+S6

**Abstract**

The main and the best part of this project is that it will save a lot of lives, and the only thing we need is to collect accurate data regarding the previous natural calamities. This will be a worldwide project and the whole world will be helpful with this project. The main motivation or slogan of this project would be “Prevention is better than cure” as we need not wait for the disaster to happen as there will be precautions take beforehand. We would be able to predict the disaster but we will not be sure of the cause as the prediction will be on the previous caused disasters, but too we would be in a condition we face the disaster beforehand to face it.

Like many other Technological Innovations, Disaster Prediction – using Machine Learning will be the next future for predicting and taking precautions of the Natural Disasters. However little research has been there in this field, but no such program or code has been written in this area. So, we came up with the idea of collecting the data sheets of the past movement of the Tectonic Plates and predicting the movement of the further movement of the Tectonic Plates using the concept of Machine Learning.

**Leader Name and recorder Names**

Leader – Sarthak Keshari(19BCE1672)

Recorders – Rahul Dash(19BAI1121)

Sagnik Sanyal(19BCE1489)

**List of 10 issues from each student along with the final issue selected along with justification**

1. Mahak Surana – 19BAI1027
2. No proper utilization of Energy Resources - Solar Energy
3. Health Management
4. Youth unemployment
5. Cyber crime
6. Grooming in personality development
7. Crop Management
8. Student activity tracker
9. To determine the strength of building
10. Natural disasters
11. Emergency health planner

These are the 10 topics I listed and I personally felt that “To determine the strength of building” would like to go with this. The reason behind this is because our country is in developing stage and daily thousands of buildings were started to build. So, this is very necessary for us to know the strength of these. These modern infrastructures have a very crucial role in modern India.

The problems or difficulties not to choose this are:

1. First of all, the building can be made up of different materials, so without having appropriate knowledge of individual material’s strength, we can’t justify anything.
2. The design of infrastructure, design and shape play an important role in the strength of building, without having proper knowledge of these things, this can’t be possible to predict.
3. There is no data set for the ratio of different components, without providing data to our machine that can’t predict the strength, and to provide data one has to write particular data and provide to it and that can’t be possible without having knowledge of mixtures and components.
4. Rahul Dash – 19BAI1121
5. Financial crisis - Household helpers
6. Natural Calamity
7. Wastage of food
8. Local Service Availability - like- Plumber, Electrician, etc.
9. Climate changes - Global Warming
10. Cyber Security and Privacy
11. Proper Education
12. Problems of the private sector - Maternity leave
13. Expensive health care
14. Improper City Planning

The problem I choose - Extreme Climate changes

As we speak the sea levels are rising, soon all continents will be underwater. Global warming is the cause of extreme rising sea level. Rising temperatures have also affected the rain patterns, which is creating droughts and poor agricultural yields. These hot temperatures are causing skin disease and have put the life of mankind and animals in complete distress.  
I opted to not go forward with my problem because I don’t have a solid technical plan that works effectively to reduce global warming.

1. Rishma Mukhopadhyay – 19BAI1128
2. Natural Calamity: Relief System
3. Energy Management - Aviation Company
4. Equality: no discrimination
5. Unemployment
6. Education - Not fulfilling industry requirement
7. Disease Testing solutions
8. Slow Economic Growth
9. Workers not taken proper care of
10. No proper schema of medical facilities and treatment
11. Moral ethics in work place

No proper schema of medical facilities and treatment Justification.

There are many set of rules that need to be followed before actually getting the medical measures we require Consent of the guardian or consent of the Head of the department to start any risky medical process.

Life matters way more than few signed papers. Doctors should first treat and then care about rules and laws. We need to make these laws very flexible why not chosen.

There is no solid technical solution. it depends on the moral of the doctor and the law maker. It cannot be forced on someone.

1. Sagnik Sanyal – 19BCE1489

1)Energy Management

2)Education for poor

3)Existing stereotypes in the society

4)Road safety norms not taken seriously in our country

5)Inhumane Treatment of prisioners

6)Expensive education

7)Expensive Healthcare

8)Mental Health

9)Poor quality of journalism and news coverage

10)Toxicity on Social media

Problem that I Chose- Expensive healthcare

Reason- The reason that I chose this problem is because I believe the health of our body should have the highest priority over anything else, and nobody should be deserted of the privilege of healthcare and to keep out body and mind in perfect shape due to monetary issues. A lot of people lose their lives every year because they cannot afford proper healthcare and refrain to less quality or no healthcare. Healthcare privilege should not be a choice it should be a necessity and everyone in our country should be able to reap the benefits of it equally.

1. Ishita Kumar – 19BCE1551
2. Overpopulation
3. Illiteracy
4. Unemployment
5. Corruption
6. Women’s safety
7. Communalism
8. Intolerance
9. Baseless criticism of the government
10. Blind faith in the government
11. Hygiene and sanitation

The problem I chose- Unemployment

I chose this topic because the personal and social costs of unemployment include severe financial hardship and poverty, debt, homelessness and housing stress, family tensions and breakdown, boredom, alienation, shame and stigma, increased social isolation, crime, erosion of confidence and self-esteem, the atrophying of work skills and ill-health

1. Balraj Agarwal – 19MIS1132
2. Electricity scarcity – can be solved by making a total solar house.
3. Plastic dumping – can be solved by making a machine that makes plastic balls in the house itself which further can be sold to the plastic factories.
4. Tree plantation – can be solved by making tree id’s for each tree and having such tree in each house.
5. Road cleanliness – can be solved by making the same system as in abroad countries.
6. Online portal for kirani commodities – can be solved by making a store which sells goods at the cheapest cost.
7. Online portal for repair of electrical appliances – can be solved by making an online portal that sends repairman to the house.
8. Need of blood after an accident – a system where everyone gets a message if there is an accident around a certain radius.
9. Automated cleaning machine – a machine which cleans the floor and tiles automatically.
10. Automated braking for vehicles – sensors which brakes a vehicle when it reaches a certain distance with the vehicle.
11. Paint machine – a machine that paints walls by itself.

I chose the problem 5) online portal for kirani commodities because in today’s online shopping, let it may be any app no app provides essential commodities like sugar, pulses, milk, tea, wheat and essential grains at the cost of the market rate. Each and every app or online site provides all the MNC products like soap, shampoos, detergents, chocolates and cloth materials. So, I came up with the idea that I will deliver all these essential commodities like sugar, rice, tea powder, milk, grains and other essential products fresh and clean at the market rate or the production rate online.

1. Sarthak Keshari – 19BCE1672
2. Poverty
3. Education System
4. Health issues
5. Corruption
6. Gender inequality
7. Constipation
8. No or little usage of elderly experiences
9. Even to get a trivial job done by government sector it takes more than required time
10. No or minimal utilization of man power for creative work
11. Harassment of people of lower strata by people of power and authority

I chose the topic - No or minimal utilization of man power for creative work

The reason behind choosing this topic is to make people aware about the imbalance ecosystem which can lead to havoc if not controlled.

Some of the important reasons supporting the cause are as follows:

* ***Eutrophication***

Throwing toxic waste into the bodies of water cause the release of nitrogen and phosphorus in the water body. Thus, polluted water body cause the Ecological impact EUTROPHICATION.

* ***Global Warming or Green House Effect***

Greenhouse gases trap heat which cause the climatic changes. The studies show that climate change in addition to altering the plant communities also disrupt the ecological balance between the interdependent and often endangered plant and animal species, i.e. reduce biodiversity and can also affect the various types of biogeochemical cycles.

1. Abhisek Mohapatra – 19BCE1790
2. Poverty
3. Natural calamity
4. Wastage of food
5. Disaster Management
6. Increasing corruption
7. Proper Drainage system
8. Proper treatment in Government Hospitals
9. Cyber Attacks
10. Unemployment

The Problem I Chose – Disaster Management

I chose this topic because Disasters may be explosions, earthquakes, floods, hurricanes, tornados, or fires. In a disaster, you face the danger of death or physical injury. You may also lose your home, possessions, and community.

I opted to go forward with this topic because by training proper ml models we can reach an optimal solution

1. Shreya Agarwal – 19BCE1690
2. Lack of knowledge among lower strata of society (generally) regarding what actions to be taken or whom to approach when in crises.
3. Indian govt. is only emphasising on very few career options (engineering/med./law)
4. People give IITs and NITs way too much importance making others feel like they are not important.
5. Sometimes bars are set low for women compared to men as it is believed that women won’t be able to compete men.
6. Many women are not allowed to focus on their career/ higher education and pressurised by their families to get married and get settled.
7. Money is big deciding factor in this nation when it comes to education.
8. Science is an important subject to be taught to kids as it will help in eliminating many social issues but it is only taught in few good schools.
9. In the USA for any issue people simply call 911 and the police provides with all the help they can, but in India people only prefer calling when the matter is related to some serious crime, otherwise also if people ask the police for help, they are not provided help unless until they have reached the right police station (if you reach some other area’s police station, they won’t register your complaint).
10. Lack of awareness of traffic rules and norms
11. Increase in the rate of suicide among students

The topic I chose: topic 1) Lack of knowledge among lower strata of society (generally) regarding what actions to be taken or whom to approach when in crises.

Justification: Common people face a lot of challenges in their daily life and if they don’t know how to tackle with them, they might get depressed and they might take some wrong steps which will not only affect their family but will also have a negative impact on other people facing same or similar issues.

1. Sam Methuselah – 19BCE1698
2. Graphene usage in very less-
3. Why Anti-matter powered spaceships can’t be built with the current technology-
4. Implementation of 5G is tough because it can be easily interfered by small things like lamppost, traffic lights etc.
5. Humanity is not focusing on growing technology, exploring space, new worlds (some are)
6. Scientists are not seen as a celebrity-
7. Young generation are not involved/interested in politics in India-
8. Energy produced Arc Fusion Reactors cannot be harnessed-
9. Still can’t harness the power of Lightning strikes-
10. Indian Education System has destroyed creativity, ideas, goals etc. Majority of the students lose their ambition, creativity, innovative ideas, they once had.

**The most “need-to-be-solved” problem is the implementation of 5G in India because**

* Other problems can’t be solved soon enough and are not the “need of the hour”.
* Cost is the factor of most of the problems mentioned.
* Technology is also the factor that’s causing some problems above.
* Both cost and technology need time to grow.

So, what is the possible solution of the chosen problem-

This means that antennas and base stations will likely be smaller in the 5G era, but more of them would have to be installed on buildings or homes to compensate for their shorter range. Cities will need to install extra repeaters to spread out the waves and extend range, while also maintaining consistent speeds in more densely populated areas. For this reason, it is likely that carriers will continue to use lower-frequency bands to cover wider areas until the 5G network matures.

But we need to use high-frequencies, which creates a short range, but intensifies the signal. Best possible solution to put 5G repeaters everywhere inside walls, lamppost et

**Final topic selected by the team along with justification**

We chose this topic because Disasters may be explosions, earthquakes, floods, hurricanes, tornados, or fires. In a disaster, you face the danger of death or physical injury. You may also lose your home, possessions, and community.

We opted to go forward with this topic because by training proper ml models we can reach an optimal solution

**Brainstorming details (Grp discussion points)**

1. Sarthak -
   1. keeping the datasets updated regularly.
      1. A team to update & analyse the data.
      2. go across various data sheets;
   2. There is heavy loss of life, property, the farm may go through financial crisis and there is no way govt. is going to raise fund.
   3. During disaster there should be some planning;
   4. implementation should not be very complex;
2. Rishma -
   1. evacuate;
   2. don’t live next to such places;
   3. air humidity;
   4. complete transparency of dataset;
   5. 1.Proper planning for evacuation
   6. 2.Avoid living around known affected places
   7. 3.During travel plan, research and be aware of the place
   8. 4.Monitoring the air humidity to know about tsunami, cyclones and rain
   9. 5.Maintaining transparency about datasets so that we can train our model effectively
3. Ishita - different ways of dealing with different disasters
4. Shreya - we should have a system where a city/state faces a disaster then the other nearby state should start creating accommodation, relief support, which will result in less loss of life; quick reconstruction of damaged places; -> helping each other
5. Abhishek - if prediction is correct then we can create groups to gather funds for people; predicting droughts can be done
6. Mahak -I have heard on discovery channel if any disaster related to water is going to happen in nearby future likes tsunami...the water animals nearby coastal regions or corner moved to central part of the sea,
7. Sam -
   1. AI distress call - if someone is stuck and couldn't evacuate even after prediction. This will guide on what to do if the disaster strikes.
   2. This system will work for like a century or two. Because later the humanity will become type-1 civilization and will be able to harness the entire energy of the planet.
   3. Maybe, this system will become 'Weather Control system' in the future. Like modifying weather based on datasets
   4. Using nearby people to know if the rescue route is clear and accessible i.e. using information from people, their phones, cameras, social media accounts.
8. Balraj - some strong evidence so that one can believe us.; not thinking big but starting with something small; start gaining trust; utilizing social media; increase of water levels
9. Sagnik -
   1. /\*I think we should have a support system, in our project, where we can help the affected and those who are stuck in the city during the disaster. \*/ We can set up a facility of relief camps and help the people
   2. We can also include details regarding evacuation, how to evacuate, where to evacuate, what to carry, etc to make it easier for people
10. Rahul - planning route
    1. methods of evacuation, to help everyone evacuate safely
    2. monitoring the ocean levels, to see a rise and warn the fishermen
    3. monitoring the cloud movement, to notice storm and rain showers
    4. planning route for evacuation, to a place that will not be affected.
    5. planning route for relief, to help the rescuers not get injured and the process moves smoothly
    6. basic education for surviving in the wild, to move to places that are less likely to get affected at the moment
    7. releasing dam waters slowly beforehand to ease the actions of the tsunami
    8. Having floating panels in cars to convert them into a boat and ride to a less water place.

/\*Making ppt; how can we cover all the points; three main points: what all things are not present in the world right now; solutions to that problem; how to implement the problem\*/

**Probable solutions**

**MITIGATION**

Permanent reduction of the risk of disaster

“**Primary” Mitigation:**

• reducing the PRESENCE of the Hazard

• reducing Vulnerability

**“Secondary” Mitigation:**

reducing the EFFECTS of the Hazard (Preparedness)

**Principal Objectives of Mitigation**

* Save lives
* Reduce economic disruption
* Decrease vulnerability/increase capacity
* Decrease chance/level of conflict RISK REDUCTION

**Physical Planning Measures**

* Decentralization of elements at risk
* Control of population density
* Design of services and roads
* Land use regulation

**Economic Measures**

* Diversification of economic activity
* Economic incentives (grants loans, taxes)
* Insurance
* Education and training
* Research
* Technical expertise
* Strengthening the capability of local authorities

**Societal Measures**

* Public information campaigns
* Education
* De-sensationalize hazards
* Community involvement

Nature-based solutions to disasters

* Climate change is increasing the frequency, intensity and magnitude of disasters, leading to a higher number of deaths, injuries and increased economic losses.
* Nature-based solutions, such as conserving forests, wetlands and coral reefs, can help communities prepare for, cope with, and recover from disasters, including slow-onset events such as drought.
* Nature can be a cost-effective and no-regret solution to reducing risks from disasters, complementing conventional engineering measures such as sea walls and storm channels.
* However, investment in ‘natural infrastructure’ is underexplored in policies aimed at reducing risk.
* There is an urgent need to invest in nature-based solutions to disaster risk reduction in order to minimise our vulnerability to future events.

**Disaster preparedness**

Covering emergency housing, repairs, replacement of essential equipment and protection of the most vulnerable people in the community: the sick, the very young and the old.

• Improvement of water supply and sanitation systems

• Logistics of the predicted need for health and social services need to be laid down in advance, including early warning systems to detect health effects.

• Planning for climate change: as global warming and its effects on water will increase the frequency of water related disasters.

• Public information and education: to ensure early warnings to communities at risk; and give information about how to conserve water and keep it safe from contamination.

The following are some of the means to plan for disastrous situations:

• Escape routes

• Family communications

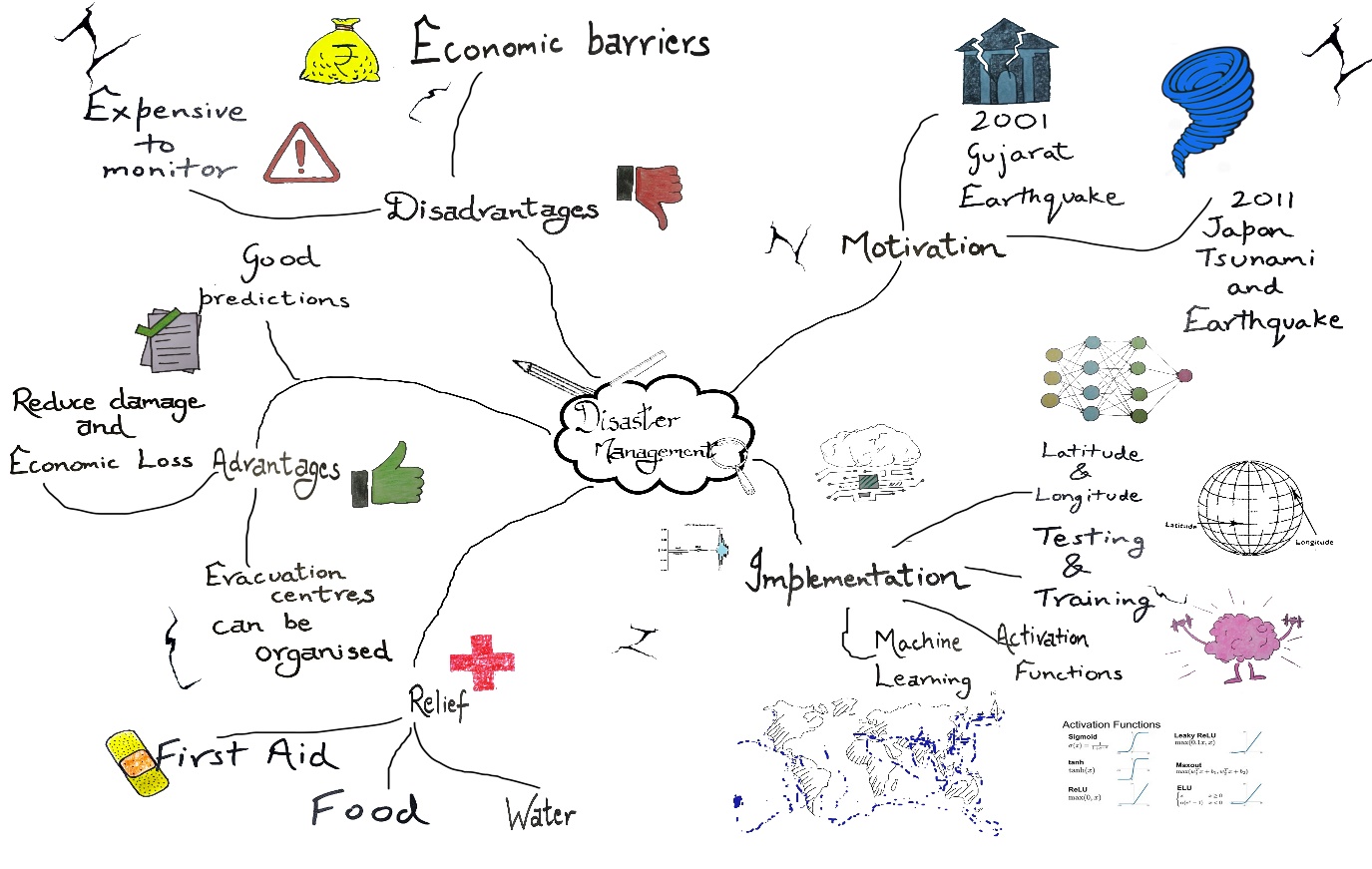
• Utility shut-off and safety

• Insurance and vital records

• Special needs

• Safety Skills

**Mind Map**

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**Final solution**

Training proper ML models to reach an optimal solution.

**Scientific part of it**

**Why do we choose ML?**

It is well known that if a disaster has happened in a region, it is likely to happen there again. Some regions really have frequent earthquakes, but this is just a comparative quantity compared to other regions.

**Steps Involved:**

1. Import the necessary libraries required for building the model and data analysis of the earthquakes.
2. Read the data from csv and also columns which are necessary for the model and the column which needs to be predicted.
3. Figure out the main features from earthquake data and create an object of that features, namely, Date, Time, Latitude, Longitude, Depth, Magnitude.
4. Here, the data is random; we need to scale according to inputs to the model. In this, we convert given Date and Time to Unix time which is in seconds and a numeral. This can be easily used as input for the network we built.
5. Visualization  
   Here, all the earthquakes from the database are visualized on to the world map which shows a clear representation of the locations where frequency of the earthquake will be more.
6. Splitting the Data (Testing & Training)
   1. Firstly, split the data into Xs and ys which are input to the model and output of the model respectively. Here, inputs are TImestamp, Latitude and Longitude and outputs are Magnitude and Depth. Split the Xs and Ys into trains and test with validation. Training dataset contains 80% and Test dataset contains 20%.
   2. Here, we used the RandomForestRegressor model to predict the outputs, we see the strange prediction from this with a score above 80% which can be assumed to be best fit but not due to its predicted values.
7. Creating the Neural Network Model
   1. We build the neural network to fit the data for the training set. Neural Network consists of three Dense layers with each 16, 16, 2 nodes and relu, relu and softmax as activation functions.
   2. Here, we find the best fit of the above model and get the mean test score and standard deviation of the best fit model.
   3. The best fit parameters are used for the same model to compute the score with training data and testing data.

**Conclusion**

We see that the above model performs better but it also has a lot of noise (loss) which can be neglected for prediction and use it for further prediction.

**Advantages, disadvantages, pros and cons**

**Advantages-**

* Good predictions and warnings save lives including wildlife’s.
* With only a few minutes' notice of a tornado or flash flood, people can act to protect themselves from injury and death.
* Predictions and warnings can also reduce damage and economic losses.
* Riverine floods, wildfires, and hurricanes, property and natural resources can be protected.
* Ability to prepare belongings and evacuate areas
* Evacuation centres can be organised and prepared.
* Chance to alert relatives etc. of safety.
* Surfers known when large waves are expected.
* Regions can be evacuated if hurricanes or floods are expected.
* All road vehicles, ships, aircrafts can be warned beforehand and a lot of lives can be saved.
* A completely new field to work on, increasing job opportunities.

**Disadvantages-**

* No concrete evidence to prove signals of a disaster.
* Fear of false alarms – no fail proof system in place.
* It is expensive to monitor-so many variables from so many sources.
* The computers needed to perform the millions of calculations necessary are expensive.
* The weather forecasters get blamed if the weather is different from the forecast.
* Economical barriers – paying for research, closure of businesses when potential threats are predicted, loss of income.
* Any prediction made would force people to live in fear.
* Additionally, the warning would be disregarded by the public eventually, as the economic ramifications would take hold and affect all people involved in the prediction areas. So eventually leading to trust issues.

**Difficulties if any in realizing it**

* Gathering latest data from sources. Sometimes the data are not completely updated in the database
* Convincing authorities and the people regarding the legitimacy of the product
* Wrong prediction may result in trust issues.
* Pin-point accuracy needed to process the data

**Any other relevant points**

**-**