

# [Assignment prediction by: your name table of contents](https://assignbuster.com/assignment-prediction-by-your-name-table-of-contents/)

Assignment No 2 AI techniques forNatural Disasters Prediction                    By: Your NameTable of Contents1-    Natural disaster                                                                                    32-    Natural disaster prediction                                                                  33-    AI techniques for Earthquakepredictions                                        33. 1- Feed forward neural network                                                    43. 2- Particle swarm optimization                                                      43.

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2-  NaturalDisaster predictionNatural disasters are inevitable in our world. Naturaldisasters are of different types so it is difficult to predict each and everyone. Meteorologists can track a hurricane with precision, butseismologists cannot predictexactly when and where an earthquake will occur. Prediction of disasters require extensive research andfunding. To predict a natural disaster we have to collect extensive past data, record live data and generate patterns on previous data. By comparing past andlive data scientist predicts the future events to some extent. Trends arecalculated and used to predict earthquakes, tsunamis and volcanic eruptions. We can also predict natural disasters by constantsurveillance.

Using offshore cameras in hurricane prone areas ensures thatstrong winds and waves can be recognized, that will help in tsunamipredictions. Monitoring ocean currents, weather predictions can be predicted inadvance, warning nearby areas in advance under the risk of hurricanes andtornados. But these short term warnings are only effective when relief programsare planned and effectively carried out. But this method is very costly and inefficient. For cost effectiveness and timely information of naturaldisaster, predicting it in advance is the only solution. However it is notalways reliable, because disasters unexpected and do not always follows trends.

But it will save much time and resource than constant surveillance. 3-  AItechniques for earthquake predictionsNatural disasters like earthquakes are caused due to the propagatingseismic waves underneath the surface of earth. Seismometers are installed ondifferent geographical positions to record vertical motion of surface waves.

Groundmotion types are divergence, convergence which results in transforming plateboundaries. Major earthquakes are caused by divergence, convergence andtransformation of plate boundaries commonly known as faults.  The origin where earthquake takes place isorigin point. Total sum of waves are calculated and time series data iscollected for further processing. There are four different aspects of this time series datawith respect to geophysical analysis can be considered for experimentation. 1.

Analyze the earthquake data recording indifferent time points independent of common source gather or common receivergather recordings. 2.      Analyze the earthquake data set in fixed orvariable length time intervals to predict different hidden patterns3.      Gathering layers data, like layer between Euro-Asianand Indian plate etc, in time points to better analyze and study the seismic patternsof layer with respect to time4.      Gather and analyze the earth lithosphere layerdata with respect to time intervals   Such identified characteristics of earthquake can be easilyscaled down using some activation function.                                                                                                        Figure 1: Illustration of criteria for fitness function3. 1                       – Feed Forward Neural NetworkIt is used with sigmoid function. FFN is used on Seismic Electric signals, predicted magnitude andpre-determined future seismic events.

Prediction of structural responses for astructure has 80. 55% accuracy. Prediction has 71%efficiency.

It is ableto predict both long and short term shocks. Outputs of different layers are notfeedback.  3. 2                       – Particle Swarm OptimizationPSO is used for building prior knowledge system. It is used for selection of input valuesfor the BPN (Back Propagation NeuralNetwork) based network. It can determine earthquake local earthquakelocation.

Works on the principles of Swarms of particlessearching for optimal solution in the defined search space. Converge to thesolution more efficiently then general BPN.  3. 3                       – Genetic Algorithm Rock mass stability is estimated for planningpurpose.

Structural formation has been studied using GA. Lower the data uncertainty. Used for buildingsettlement forecast after main shocks. Used in combination with support vectormachines for earthquake data set.  GA can work with improper or incomplete seismicdata. It is found highly efficient in prediction for future earthquakes. Commonly used in research with different alterations.  3.

4                       – ClusteringSpatial clustering is used versus temporalclustering for earthquake data sets. Spatial clustering has been identified indata set while building earthquake forecast model using differentialprobability.  Set of clusters is developed from huge set ofunsupervised data. This makes the overall scenario to be divided into manysub-scenarios. Used in MSc algorithm with different aspect.  Until recently, Artificial Intelligence based techniques were widely used for earthquake timeseries prediction. , the results of traditional approaches of probabilityestimation should be enhanced by using the particle swarm optimization andgenetic algorithms based approaches. PSO and GA are capable to find actualfault intensity in any particular region.

This work is an attempt to coverdifferent strategies related to AI for earthquake prediction and crosschecktheir reliability. . 4-  AItechniques for Water Storms PredictionWater storms occur due to intenseunsustainable winds in oceans. Hurricanes, cyclones and typhoons are all water stormsbut their name is different due to the geographical location of storm. There are different artificialintelligence techniques to predict storms. Some are given below. 4.

1                       – Nonlinear AI ensemblepredictionA new nonlinear artificialintelligence ensemble prediction (NAIEP) model has been developed forpredicting typhoon intensity based on multiple neural networks with the sameexpected output and using an evolutionary genetic algorithm (GA). Ensemble numerical prediction(ENP) model, whether created with different physical process parameterizationschemes or with different initial conditions from a Monte Carlo approach, formally consists of many different ensemble members. By optimizing the networkstructure and the connection weight of ANNs, genetic evolution is able tocreate a number of different neural network individuals. Ensemble prediction of NWP ismotivated by the fact that NWP forecasts are sensitive both to smalluncertainties in the initial conditions and model errors, so it is hard tofurther improve the accuracy of single model deterministic predictions. To construct an NAIEP model, anumber of individual neural networks are first created and then integrated tobuild an ensemble prediction model. A GA is used to construct themembers of the ensemble, and a three-layer back-propagation (BP) network isused as the basic model for the neural networks, the major computational stepsare summarized below: 1.      Randomlygenerate the connection weights and thresholds from input layer to hidden layerand from hidden layer to output layer, and set the global convergence error, ?, of the model.

2.      Performsupervised learning training of the network with learning matrix samples, calculate the error between the real input and expected output of the network, and tune the connection weight coefficients from input layer to hidden layerand from hidden layer to output layer using the learning algorithm of theerror-inverse propagation of the BP network. 3.      If thecalculated output error of the model is greater than ?, return to step 2; otherwise, end the training and compute the prediction value using theconnection weights, thresholds of the network, and predictors of the predictionsamples. The meteorological ensemblemodeling approach of GNN opens up a vast range of possibilities for operationalweather prediction.

4. 2                       – Back propagation Neural NetworkLike human neural network inartificial neural network has 3 layers; perceptron, dendrites and axon. In NN, each input is multiplied by its weight of its connection of neuron.

Connectiondetermine which input has to be forward and then it sums up all the inputs. Then it is passed through the hidden layer to calculate its results. After itpasses the result to output layer. In back propagation NN, there is only oneinput layer, one output layer and a hidden layer. It is easy to calcite theresults. To compute the prediction ofstorm or any other disaster information is collected and then it is feed to theneural network. First of all data is normalized then it is feed to input layer. From input layer the data is transferred to hidden layer.

There we do ourcalculations by applying sigmoid function. From hidden layer calculations arecollected and summed up, this sum is input to output layer. NN with back propagation is aself-driving system which collects data then train itself for differentconditions and scenarios and produce results. NN with back propagation andother NN’s are not more than pattern recognition techniques. They are just someshort term predictive skills not to replace metrologies.

But it can help inunderstanding metrological problems and can solve many complicated patternsthat are difficult to solve by humans and simple programs.  5-  Degreeof success in natural disaster prediction by AI For some people weather forecastsare just for surety of good day ahead. But for some people it is everything. Their bread and butter depends upon it. By applying artificial intelligenceknowledge we have been able to transforms life of many people and giving them anew chance.

Companies and governments are collecting dataof winds, water and soil from satellites and different devices installed on differentportions on earth. Physical understanding of environment with the combinationof artificial intelligence improves prediction skills for multiple types ofnatural disasters like thunderstorms, tornadoes, hurricanes, volcanic eruptions, earthquakes and many more. Hail forecasting can beforecasted accurately by using machine learning according to research paper. Hailcause billions of dollars damages every year. Many cars, airplanes andbuildings are effected in hail storms. By forecasting hail storms cars can bemoved to safe places, flights can be delayed and prevention measures can betaken for buildings to protect them from heavy damages.

IBM is commercializingits weather forecasting for that purpose so warning can be issued to people fromheavy damage. Big companies like IBM, Panasonicare working on their weather forecasting systems and increasing its accuracy dayby day by applying new developed and refined artificial intelligence and computationalintelligence techniques. Better weather forecasting allows airlines to changetheir routes and save money and time, improve safety and increase on timearrivals.

Better weather predictions hasdirect effect on different fields of life. It directly effects the agriculture, 90% of crops are destroyed by weather conditions. It can be controlled byproper weather conditions. If damage is inevitable then we can save our moneyand time by not planting that kind of crops that are not suitable for that kindof weather condition. Transportation is improved byweather forecasting a lot.

Directing routes of flights in near storm save manylive and money than ever. Road transport is improved by making optimized routesfor hilly and severe condition areas. The company using Panasonic’s weatherforecasting shows significant rise in commercial aircrafts climb profileoptimization.

. They claim their system can reduce fuel consumption by up to 10percent during ascent. By putting in that perspective, US airline carriersspent $24.

6 billion on fuel last year. Better weather forecasting saves manylives and helps to speed up the rebuilding efforts. Companies like IBM andPanasonic has started to combine their weather forecasting tools with informationabout utilities’ distribution networks and data about local ground cover forsevere storms. Machine learning helps them to predict many sever conditions andoutages. IBM claims that their prediction is about 70- 80 % accurate and is 72hours before the disaster. Weather related data source willcontinue to grow dramatically and the new advances in machine learning aremaking it possible for government agencies and companies to make better use ofall this data. Weather is always unpredicted and it can never be trulyperfected, but AI will allow to make consistent improvement in its accuracy andin its resolution.

More refined and localizedweather information will help to make it easier to find distinct patterns andconnections in them. Small improvements in weather forecasting has huge impacton the modern day world. These improvements will give many companies andgovernment agencies useful pieces of data by finding new correlations andgiving companies and government agencies more chances to take full advantage ofthem.  6-  SummaryNatural disasters are inevitableand unpredicted in nature. Nobody can exactly predict that what will happennext. But by the passage of time human being is able to extract informationfrom past events and made patterns from that information. In past those patternswere not so clear and difficult to compute. Modern day technology helps tocollect data and draws results from that data effectively.

Artificial intelligence plays akey role in pattern recognition and analysis of past events to predict futureevents. Different techniques like Neural network (NN), genetic algorithm (GN), particle swarm optimization (PSO), clustering and many more helps us to find patternsand prediction. These algorithms alone do not generate good results. But bymerging two algorithms gives us better results that give us betterunderstanding of occurring and future events. By using artificial intelligencetechniques success rate of prediction is about 60-70%. Although it is not soaccurate one but it helps to save resources and lives. By using weatherprediction crops are not destroying any more than before.

Air traffic iscontrolled in a good manner and they are informed before any bad can happen tothem. In short, artificial intelligence made a good impact on the life ofpeople by giving them useful piece of information in advance.            7-  ReferencesAberson, S. D., and C. R. Sampson, 2003: On thepredictability of tropical cyclone tracks in the northwest Pacific basin. Mon.

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