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Siti Zarina Mohd Muji Marlia Morsin Roziah Aziz Radzi Ambar Suratun Nafisah



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Contents

Content	Page
Speech from the Dean	V
Speech form the Program Director	vi
Proceeding	1-605
a) Professional	1-158
b) Undergraduate and Postgraduate	159-375
c) Sijil and Diploma	376-496
d) Secondary School	497-544
e) Primary School	545-605

Sea Level Anomaly and Earthquake Predictions: Endangered Countries Prognostications

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Abstract - Climate change is one of the factors that affect weather and natural disaster. It is extremely difficult to predict a natural disaster. This paper is going to focus on two different types of natural hazard that is going to affect people – rising sea level and earthquake. The aim of this paper is to use predictive analysis on both sea level anomaly and earthquake as well as listing down the countries who will face problem in future. The results would be deduced by data analysis. There are several existing machine learning algorithms which are currently used to predict earthquake. In this analysis, deep learning algorithm will be used to see whether it can predict the occurrence of these events more accurately. The technique used in this paper can be upgraded further in future to help the endangered countries to be prepared better against these sudden calamities.

Keywords: Sea Level Anomaly; Deep Learning; Earthquake; LSTM; Predictive Analysis

1. Introduction

Earthquakes cause massive destruction all over the world. One such example would be the earthquake in Indonesia year 2018. The magnitude of the earthquake was 7.5 and the death toll was around 4300. In year 2018, total 134 earthquakes of magnitude > 6 were recorded. The countries can prepare better against earthquake if a system was able to predict accurately the event before its happening. Most of the major earthquakes under sea levels cause massive tsunami which destroys lives and properties on coastal regions. This proposed earthquake prediction method will help to save lives and the countries can prepare better in terms of saving resources to reduce property destruction.

Around 60 percent of world's population live in the coastal areas. Coastal countries are facing huge risk due to climate change. Climate change is influencing rise in sea level which pose danger to the coastal areas. One such example would be Maldives, which will be sinking under sea within 80 years. Another example found was Venice, which is also facing similar risk. With proper prediction, the countries will know exactly when their country is going to sink and take proper precaution and measurements.

Implementing machine learning with earth science is still relatively new. The community is small, there is a huge potential in this area to be improved using machine learning technology. This project would be a small contribution towards the scientific community who can improve this project further. Additionally, this paper is going to use deep learning technique and evaluate the results, which will help the community to learn more about our model. In future, this project can be used as reference to evaluate or improve the prediction regrading earthquake and sea level anomaly. The techniques used in this project can be improved and further analyzed for more proper and appropriate prediction.

Imani, You and Kuo (2014) forecast sea level changes in Caspian Sea using satellite altimetry data ranging from June 1992 until December 2013. Imani et al., applied two artificial intelligence technique: Support Vector Machine (SVM) and Gene Expression Programming (GEP). Also, a comparison was done between these two techniques and Cascade Correlation Neural Network (CCNN), SVM and GEP outperform CCNN. The dataset was divided into three parts: first 13 years as training dataset, next 6 years as testing dataset and last 2 years as validation dataset. RBF kernel Function was used to obtain most reliable prediction in SVM, and the performance is better than any of the other kernels for time series data. The performance was evaluated using

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Root Mean Square Error (RMSE) and maximum coefficient of determination (R^2). SVM model outperform GEP and CCNN. In future, optimal parameters of SVM will be used to enhance prediction performance.

Devries, Viegas, Wattenberg and Meade (2018) applied deep learning technique for aftershock pattern after large earthquakes. The article showed that forecast aftershock location prediction is possible without prior assumption of fault orientation. The dataset was split into 75 percent and 25 percent for training and testing dataset respectively. There were more than 131,000 mainshock-aftershock pairs in training dataset and more than 30,000 mainshock-aftershock pairs in testing dataset. Deep Neural Network model was used which was fully connected and had six hidden layers each with 50 neurons and each of the neuron was activated using hyperbolic tangent activation function, 13, 451 weights and biases in total. The model was evaluated using Receiver Operating Characteristic curve (ROC curve). The area under an ROC curve (AUC) for this model was around 84 percent. It performs better than the classic Coulomb stress criterion which AUC was around 58 percent. Devries et al., highlighted in their article that deep learning approach can lead to improve aftershock forecast.

2. Material and Methods

In earthquake prediction, the dataset is collected from Kaggle which contains all the earthquake magnitude greater than 5.5 (>5.5) from 1965 until 2015. The aim is to analyze those data and predict future earthquake for a limited time. In order to do this, first, data preprocessing is done, and data visualization is conducted. Data visualization helps to see the regions where earthquake is occurred. Training and testing set is divided into 80 percent and 20 percent respectively. For this project, python and TensorFlow library from google is used. The next step is to build the model using Long-Short Term Memory (LSTM), and train the models based on training dataset. After training the model, test dataset is input into the model to test the model. The performance measurements are evaluated using accuracy, sensitivity, Root Mean Square Errors (RMSR) and others. After that, the model is used to predict the earthquakes occurring in future. The final step is to visualize

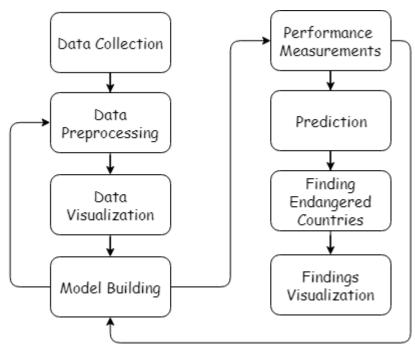


Fig 1: Workflow

again the regions where earthquakes would be frequent from this point forward.

In sea level anomaly prediction, the dataset is gathered from ESA Climate Change Initiatives which has the data from 1995 until 2015. Another dataset is collected which will contain latitude and longitude of countries. The dataset is further analyzed, and data preprocessing is done to fit the data into the model. The dataset is divided into training and testing dataset. Then, the model is created using Long-Short Term Memory (LSTM). The models are trained using training dataset representing 80 percent of original dataset. The next step is to avaluate the model using the test dataset. The performance measurements are used by finding out the accuracy.

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3. Results & Findings

Not Available yet.

Tentative date: November 01, 2019

So far, the earthquake model has been implemented and the accuracy for the model is around 60 percent. The authors are trying to optimize the model to reach accuracy more than 70 percent.

4. Conclusion

In future, the project can be improved further by optimizing the model. Also, more data can be added in the project to improve its performance.

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References

- ECV products, Climate Change Initiatives, European Space Agency. Retrieved from http://www.esa-sealevel-cci.org/products
- List of earthquakes in 2018. (2019, April 17). Retrieved from https://en.wikipedia.org/wiki/List_of_earthquakes_in_2018
- Survey, U. G. (2017, January 26). Significant Earthquakes, 1965-2016. Retrieved from https://www.kaggle.com/usgs/earthquake-database
- Quartly, G. D., Legeais, J.-F., Ablain, M., Zawadzki, L., Fernandes, M. J., Rudenko, S., Carrère, L., García, P. N., Cipollini, P., Andersen, O. B., Poisson, J.-C., Mbajon Njiche, S., Cazenave, A., and Benveniste, J.: A new phase in the production of quality-controlled sea level data, Earth Syst. Sci. Data, 9, 557-572, https://doi.org/10.5194/essd-9-557-2017, 2017.
- Legeais, J.-F., Ablain, M., Zawadzki, L., Zuo, H., Johannessen, J. A., Scharffenberg, M. G., Fenoglio-Marc, L., Fernandes, M. J., Andersen, O. B., Rudenko, S., Cipollini, P., Quartly, G. D., Passaro, M., Cazenave, A., and Benveniste, J.: An improved and homogeneous altimeter sea level record from the ESA Climate Change Initiative, Earth Syst. Sci. Data, 10, 281-301, https://doi.org/10.5194/essd-10-281-2018, 2018.

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