Regulations of AETA Earthquake Prediction

AI Algorithm Competition

Organizer

Peking University Institute of Artificial Intelligence, Peking University Shenzhen Graduate School, CSDN, Wuhan University Computer Science School

Co-Organizer

Shenzhen SVV Technology Services Co., LTD.

Ⅰ. Competition Overview

China is a country with frequent earthquakes and widely distributed fault zones. Earthquakes, especially large earthquakes, can cause incalculable damage to people's lives and property once they occur in densely populated areas without people's awareness.It is very challenging and of great scientific value and social significance to carry out the research work of precursor observation, correlation analysis, precursor mechanism research and earthquake three-element prediction model around the solution of earthquake prediction and prediction problem.

"AETA Earthquake Prediction AI Algorithm Competition" aims at mining the correlation between precursor observation data and earthquake three elements through innovative algorithms, discovering abnormal signals and features related to impending earthquakes, and building earthquake prediction models based on historical observation data and earthquake catalogue, in the hope of promoting the solution of scientific problems of earthquake prediction. At the same time, we also hope that through this competition, more people from all walks of life would pay attention, and more new technology and new methods will be applied in earthquake prediction.

The data provided in this competition include electromagnetic and earth-sound observations of the Sichuan-Yunnan experimental site conducted by AETA seismic monitoring and prediction system over the past three years, as well as a seismic catalog. This competition focuses on evaluating the innovation and advancement of feature extraction and sample modeling methods, as well as the applicability and accuracy of earthquake prediction models, and encourages innovative algorithms to solve scientific problems in earthquake prediction.

Ⅱ. Schedule

Participants can register online and enter the competition after verification. There is no charge for registration.The competition is divided into two stages, the preliminary and the final. The qualification for the final is only obtained after the preliminary selection.The competition is planned to last 9 months. The specific arrangements and requirements are shown in the table below.

Competition Schedule

Stages	Time	Instructions
Competition Start	2019.12.1	Registration Obtain the training and test data of the preliminary A list
Publicity and Training	2019.12.5 ~ 2020. 3. 20	Irregular online and offline training
Submission time of A list of preliminary works	2020.2.10~ 2020.3.28	Submit the prediction results based on the A-list data
Release of the preliminary B list data	2020.3.29	Obtain the data of the preliminary B list
Submission time of B list of preliminary works	2020.3.29~ 2020.3.31	Submit the prediction results based on the B-list data

The preliminary result and the finalist team release	2020.4.2	Publish the predicted results based on group B data and pick the top 30 to enter the final
Teams in the preliminary round submit code and documentation	2020.4.2~ 2020.4.5	A shortlist of 30 teams submitted code and documentation to verify the authenticity of the model and results
Final data release	From 2020.4.12 data is released every Sunday	Prediction of earthquakes in the coming week based on data from the past week
Final Submission	2020.4.12 ~ 2020.7.31 Submit a forecast every Sunday	The performance was evaluated based on the actual earthquake events in the coming week
The final winners are released	2020.8.15	Publish a list of ten winning teams
The award ceremony	Late August 2020	The winning team and guest attend the ceremony

Ⅲ. Qualification

The competition is open to all institutions, individuals, and teams at home and abroad, except for members of the competition organizing committee and judging committee.

Individual or team can participate in the competition. And each individual could only join one team. The maximum number of each team should not exceed 3.

Ⅳ. Questions & Data

Earthquakes, especially large earthquakes, must be accompanied by a lot of physical, chemical and other changes in the field quantity before the occurrence.Through extensive long-term observation of these changes, combined with seismic events, the correlation characteristics between data changes and impending earthquakes are analyzed to serve earthquake prediction. The competition is divided into two stages: preliminary and final.

4.1 Preliminary competition topics, data and submissions

- **Topics**

Through the analysis and mining of the observed data within a certain time interval, the team would combine with the global earthquake catalog of the corresponding time interval to build the earthquake prediction model. Then input the observation data within a specific time range to predict the earthquake three factors of earthquake events, greater than magnitude 3.5, in the target area (22~34 n, 98~107 E) within the corresponding time interval, and test the accuracy of the three factors according to the actual earthquake.

- **Data**

Preliminary data include training and testing data of A-list and B-list data. The A-list training data include the average value data of AETA electromagnetic and ground sound in the Sichuan-Yunnan region for N days, and a catalog of global earthquakes with magnitude ≥3.5 in the corresponding time interval. The A-list test data include the average value data of AETA electromagnetic and ground sound in the Sichuan-Yunnan region for M days. The B-list test data include the average value data of AETA electromagnetic and ground sound in the Sichuan-Yunnan region for X days.

- **Submissions**

After successfully registering, the contestants will obtain the training and test data of the A-list, train the model based on the A-list training data, and use the A-list test

data to give the earthquake prediction results on a weekly basis as the prediction period, as shown in the following table. The submission period of the work is from February 10, 2020 to March 28, 2020. During this period, the participating teams can submit results 3 times a day and obtain real-time prediction results. The ranking is updated once a day on a daily basis. This result is not counted as the final preliminary result, and serves as the feedback of the results of the team's optimization model.

Preliminary prediction result submission format

No	Day of Predicting	Date duration	Y/N there is an earthquake	Epicenter		Magnitude
				Latitude	Longitude	
1	7	7-14				
2	14	14-21				
3	21	21-28				
…	…					
i	M	M-M+7				

Starting from the day when the verification data set starts, a prediction (Y/N) will be given every 7 days whether there will be an earthquake of magnitude ≥3.5 in the next 7 days, and the predicted geographic range is (22.00°N~34.00°N, 98.00°E ~107.00°E). Whether there is an earthquake is whether there is an earthquake of magnitude ≥3.5. The epicenter gives the specific latitude and longitude (XX.XX°E, XX.XX°N), and the magnitude is Ms.

On March 29, 2020, the participating team will obtain the B list data, and based on the B list data, the earthquake prediction results will be given on a weekly basis for the prediction period. The submission format is the same as the above table. From March 29, 2020 to March 31, 2020, the results can be submitted 3 times a day, and this submission will be the final result of the preliminary round. On April 2, 2020, the results and rankings of this work and the list of finalists will be released. The finalist team is required to submit code and design documents for model authenticity verification between April 2, 2020 and April 5, 2020.

4.2 Final competition topics, data and submissions

- **Topics**

At the beginning of the final, the latest AETA observation data will be released on a weekly basis, and the participating teams will use the latest data released as verification input to predict earthquake events of magnitude ≥3.5 in the

Sichuan-Yunnan area (22.00°N~34.00°N, 98.00°E~107.00°E) in the next week.

- **Data**

Starting from April 12, 2020, the latest week of AETA electromagnetic and geoacoustic mean data in the Sichuan-Yunnan region will be released weekly for prediction. The actual earthquake events of magnitude ≥3.5 in the Sichuan-Yunnan area are used as the verification earthquake catalog every week.

- **Submissions**

On the day after the weekly AETA data is updated, submit the prediction results for the target area (22.00°N~34.00°N, 98.00°E~107.00°E) in the next 7 days whether there will be an earthquake ≥3.5 magnitude, as shown in the following table.

Final prediction result submission format

No.	Release time	Y/N there is an earthquake	Epicenter		Magnitude
			Latitude	Longitude	
1	2020-04-12				
2	2020-04-19				
3	2020-04-26				
…	…				
i	2020-07-26				

Starting from the day when the verification data set starts, a prediction (Y/N) will be given every 7 days whether there will be an earthquake of magnitude ≥3.5 in the next 7 days, and the predicted geographic range is (22.00°N~34.00°N, 98.00°E ~107.00°E). Whether there is an earthquake is whether there is an earthquake of magnitude ≥3.5. The epicenter gives the specific latitude and longitude (XX.XX°E, XX.XX°N), and the magnitude is Ms.

Before July 31, 2020, the participating teams shall submit PPT introduction of the participating algorithms and models and 10-minute audio recording introduction,

including data processing method, feature extraction, sample set construction and prediction model, and test results, etc. As well as design documents, algorithms and model descriptions, source code, etc. The source code part can be directly run in C/C++/Python/ Matlab environment and output the results.For the convenience of review, please provide the source code as well as the operating environment, input and output instructions for the review committee to confirm the authenticity of the results.

The list of ten winning teams will be released on August 15, 2020, and all winning teams will be invited to make on-site reports at the awards ceremony in late August 2020. The final ranking will be given by the on-site guests based on the results and on-site defenses.

Ⅴ. Competition algorithm review rules

The competition organizer will invite famous professors and experts to set up a committee to review the algorithms of each team. Before the competition, the committee will review the "AETA Earthquake Prediction AI Algorithm Contest Review Rules" and announce the files on the official website of the competition.

Ⅵ. Awards

The results of this competition will be examined and approved by the committee and published on the official website.In the preliminary, no less than 30 teams will be selected to enter the final, and the first prize, second prize and third prize will be set according to the ranking of final results, with a total bonus of RMB 140,000 yuan.

First prize: 1 team,RMB 50,000 yuan (before tax), trophy and award certificate.
Second prize: 2 teams,RMB 30,000 yuan (before tax), trophy and award certificate.
Third prize: 3 teams,RMB 10,000 yuan (before tax), trophy and award certificate.
Excellence Award: 4 teams, trophy and award certificate.

The contestants who enter the finals will be awarded the finalist award and the finalist certificate will be issued. The organizer will invite all winning teams to the award ceremony site for technical exchanges, and provide round-trip travel expenses and one night's accommodation expenses.