Deep Sub-Nyquist Modulation Recognition Challenge

(GBSense Challenge 2022）

Hosted by University of Surrey and
CIC - China Association of Communication UK
http://www.gbsense.net/

Background

The bandwidth and frequency covered by 6G wireless communication are unprecedented. According to the 6G white paper, at least the 300GHz~10THz band needs to be covered to meet the proposed key technical indicators (100Gbit/s~1Tbit/s peak transmission speed and 0.1ms level communication delay). In addition, the 6G wireless communication system will be a complex and ultra-dense heterogeneous network system in which multiple services coexist and numerous communication technologies are integrated [1]. In this scenario, an intelligent spectrum management system is required to manage spectrum resources, optimize network performance, and resolve the contradiction between supply and demand scientifically and efficiently. The research on cognitive-based intelligent spectrum management systems is imperative.

Overview

We announce a deep learning-based challenge to address an automatic modulation recognition task. Several datasets are composed of sub-Nyquist-rate time-domain samples on GHz bandwidth baseband signals [2,3]. Both training sets and testing sets are provided with labels indicating modulation of the signal. The task is to recognize the signal locations in the frequency domain indicated by pre-defined discrete channel indexes and the modulation types of the signals located somewhere in the baseband. Participants are required to train their models using the training set and verify their model with the verification set for the best possible performance. The submitted models will be evaluated on an unpublished test dataset. The competition will contain one basic challenge and one advanced challenge.

Challenge Criteria

The submitted models will be tested on an unpublished datasets, the results will enter the ranking after successful verification

Criteria	Weight
Detection Performance / Efficiency	**50%**
Code / documentation	**30%**
Source code clearance and readability	10%
Quality of the concept paper	20%
Approach Ingenuity	**20%**

- Team entrants are encouraged.
- The datasets can be downloaded here.

Judging

After the submission deadline, the organizing committee will review and evaluate the code submitted by the participating teams. The participating teams must ensure that the submitted optimal model corresponds to the complete end-to-end code, including data processing and model training, and can run the replay. Random submission will be rejected. If the mirror code corresponding to the best score is not obtained by running the complete code, it will be eliminated directly. If the best result on verification set is unreproducible, you can contact the organizing committee to assist in deleting the best record before the final submission deadline. It will not be accepted after the submission deadline. Teams that fail to submit or unsuccessfully reproduce the result will be disqualified.

The Challenges

- **The basic challenge**

1-signal modulation recognition

There exists one signal of several MHz bandwidth and an unknown central frequency between [-600, 600] MHz. The task is to identify the modulation of the signal from sub-Nyquist samples of the signal. The participating teams are required to train the model through the training dataset to realize the identification and verify their model with the test dataset.

- **The advanced challenge**

2-signal modulation recognition

There are two signals of several MHz bandwidth and different central frequencies between [-600, 600] MHz. The positions of the signals are indexed by evenly dividing [-600, 600] MHz into 24 sub-bands. The datasets are given with labels of positions and modulations of both signals. The participating teams are required to train the model through the training dataset to identify both modulation types of the signal and verify their model with the test dataset.

Submission Requirements

Participants need to submit

- The docker form of models.
- A concept paper demonstrating the models and relevant algorithms.

Dates

Challenge announcement:	**20 Jun 2022**
Submission deadline:	**20 Dec 2022**
Winner to be announced:	**20 Feb 2023**

Awards

1 first prize:	**$10,000 USD**
1 second prize:	**$5,000 USD**
1 third prize:	**$3,000 USD**

Interests

Anyone can submit their algorithms and results and must agree with CC BY 4.0, but participants will be judged based on the published criteria. Anyone suspected of plagiarism will be disqualified.

Contact

The challenge is organized by University of Surrey. In the case of questions, feel free to contact Zihang Song (zihang.song@surrey.ac.uk) and Han Zhang (han.zhang@surrey.ac.uk).

Prize Sponsors

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