SMART INDIA HACKATHON 2023

Basic Details of the Team and Problem Statement

Ministry/Organization Name: National Technical Research Organisation,(NTRO) Under Central Ministry

PS Code: SIH1447

Problem Statement Title: Identification and Extraction of Forward Error Correction (FEC) schemes of unknown demodulated signals

Team Name: Daemons

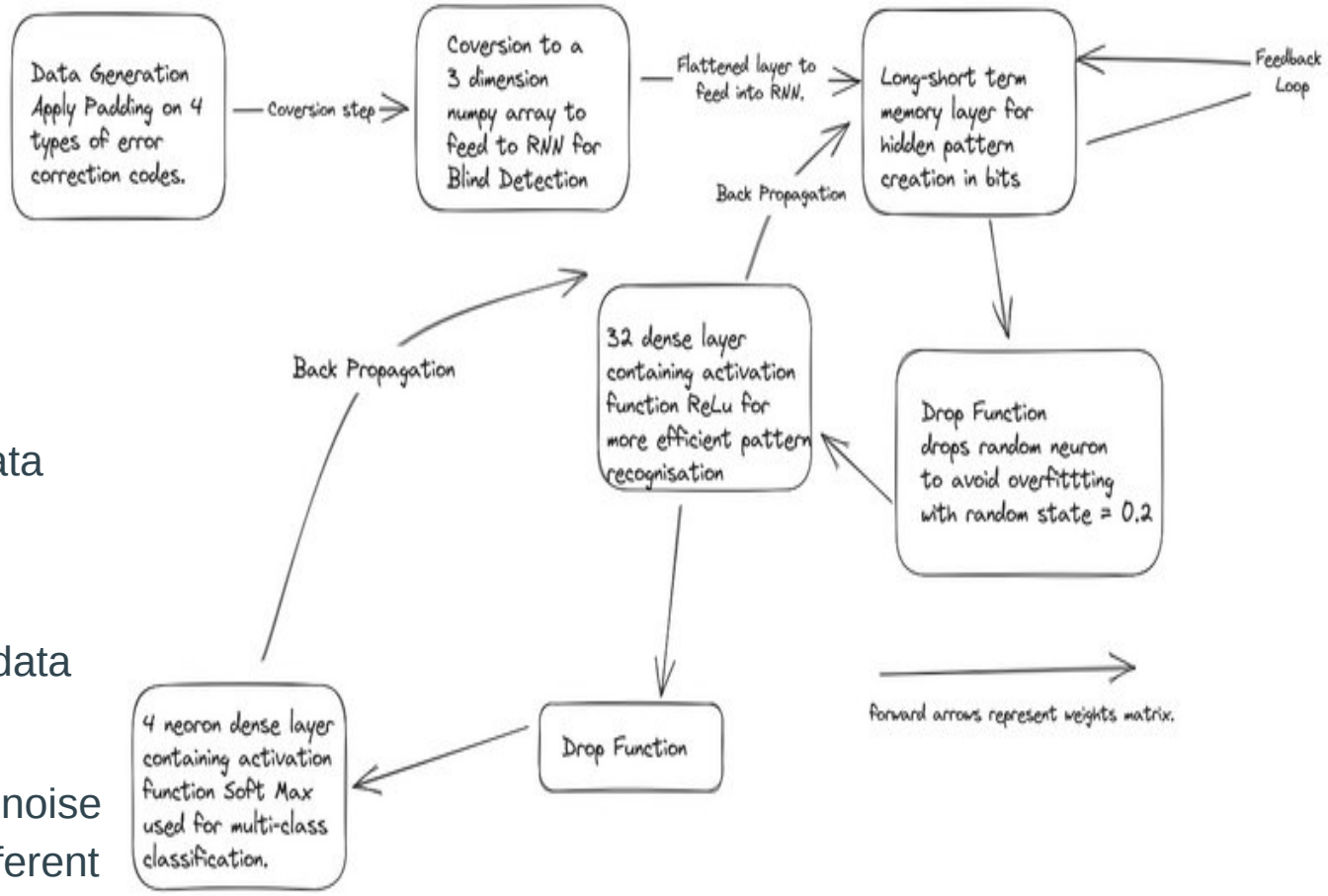
Team Leader Name: Rishi Kumar

Institute Code (AISHE): U-0796

Institute Name: Indian Institute of Information Technology, Kalyani

Theme Name: Miscellaneous

Idea/Approach Details



- Generating surplus amount of satellite training data with **different code rates** and FEC encodings to keep the data realistic using Python and Matlab.
- We have used the coding structure and parameters recommended by the consultative committee for space data systems (**CCSDS**) **standard** to generate datasets
- **Diversify the training data** by applying techniques like noise introduction, varying signal strengths, and simulating different channel conditions.
- Training the **Neural Network** using the generated data and testing on real-life satellite signals to verifying our accuracy.
- Ensure the solution can handle large volumes of data in real-time for **practical implementation** in satellite receivers.

Our Technology stack:

- Machine Learning :TensorFlow/PyTorch
- Backend : Python
- Data Visualisation : Python Libraries
- Data Generation : Matlab/Python

Idea/Approach Details

Use Cases

- **Electronic Warfare (EW) Systems :** identifying and analyzing communication signals in military operations.
- **Satellite Communication:** Enhance the error correction mechanisms and overall performance of satellite communication links.
- **Error Correction in Data Storage:** Improve data integrity and reliability, especially in high-capacity storage systems such as hard drives or solid-state drives
- **Interoperability :** it can facilitate seamless communication between systems that utilize different FEC encoding schemes.
- **Broadcast and Streaming Services:** it can improve the quality and reliability of the transmitted content, ensuring a seamless viewing experience for users.

Dependencies/Show stopper

- The training of the RNN model require powerful machines with sufficient computational resources
- The lack of access to real-life satellite signals for testing purposes can be a potential show stopper.
- The implementation should be compatible with the programming requirements of the satellite receivers
- The implementation should be **robust** enough to handle these variations and provide accurate FEC scheme detection across different scenarios.

Team Member Details

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Team Member 1 Name: Anushka Jhingran

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Team Member 2 Name: Geetansh Jangid

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