

Data Manual for two-area AGC system

This manual provides details about the dataset for the two-area Automatic Generation Control (AGC) system. The dataset contains various operational scenarios, each represented in different folders. Each folder corresponds to a specific disturbance scenario followed by a cyber-attack, or, in some cases, a direct cyber-attack without any prior disturbance. Below are the descriptions of each scenario and folder structure:

- 1- Folder “Disturbance in Area1_Pulse” means that the data is collected when we have a disturbance occurred in Area 1 only, followed by a Pulse cyber-attack.
- 2- Folder “Disturbance in Area1_Ramp” means that the data is collected when we have a disturbance occurred in Area 1 only, followed by a Ramp cyber-attack.
- 3- Folder “Disturbance in Area2_Pulse” means that the data is collected when we have a disturbance occurred in Area 2 only, followed by a Pulse cyber-attack.
- 4- Folder “Disturbance in Area2_Ramp” means that the data is collected when we have a disturbance occurred in Area 2 only, followed by a Ramp cyber-attack.
- 5- Folder “Disturbance in Both Areas_Pulse” means that the data is collected when we have a disturbance occurred in both areas, followed by a Pulse cyber-attack.
- 6- Folder “Disturbance in Both Areas_Ramp” means that the data is collected when we have a disturbance occurred in both areas, followed by a Ramp cyber-attack.
- 7- Folder “Disturbance_Both_Areas_DoS” means that the data is collected when we have a disturbance occurred in both areas, followed by DoS attack.
- 8- Folder “Disturbance_Area1_DoS” means that the data is collected when we have a disturbance occurred in area 1, followed by DoS attack.
- 9- Folder “Disturbance_Area2_DoS” means that the data is collected when we have a disturbance occurred in area 2, followed by DoS attack.
- 10- Folder “Without Disturbance” means that the data is collected when we applied cyber-attacks directly without prior disturbance.

Each folder contains seven columns of data. The **first three columns** correspond to attacked frequency 1 deviation, attacked frequency 2 deviation, and the attacked power tie-line, respectively. The fourth column represents the class labels, indicating the type of attack. There are eight distinct classes in this dataset, outlined as follows:

- “0” refers to No Attack
- “1” refers to Attack on Frequency 1 Deviation
- “2” refers to Attack on Frequency 2 Deviation
- “3” refers to Attack on Tie-line Power
- “4” represents Attack on Frequency 1 Deviation & Frequency 2 Deviation
- “5” represents Attack on Frequency 1 Deviation & Tie-line Power
- “6” represents Attack on Frequency 2 Deviation & Tie-line Power
- “7” relates to Attack on Frequency 1 Deviation, Frequency 2 Deviation & Tie-line Power.

The **last three columns** represent the ground truth measurements, the original (un-attacked) frequency 1 deviation, frequency 2 deviation, and the tie-line power, respectively.