Supplementary Feature Description for ICASSP-SPGC-2022: Root Cause Analysis for Wireless Network Fault Localization

February 23, 2023

In this document, we will give some physical interpretations of the data used in the grand challenge.

Data collection: The data were collected through 5G road test in multiple locations. The engineers, holding their user equipments, drove/walked along the streets to collected the raw data. The data presented in the grand challenge were further gathered and processed by our analysts.

Feature Interpretation:

We give the physical interpretations of some features as shown in Table 1.

Specially, we briefly introduce the concept of beam space, for a better understanding of `feature20`, see Figure 1. The user equipments (mobile phones) located in different scenes can receive the signals sent from the base station. The base station can send out 32 directional beams as shown in the figure. The user equipment typically are equipped with four antennas, each of which can measure the signal strength of the received beams. The data may contain missing values due to the received signal strength from certain beams are too weak. The `feature20` indicates the received beam directions by their beam ID.

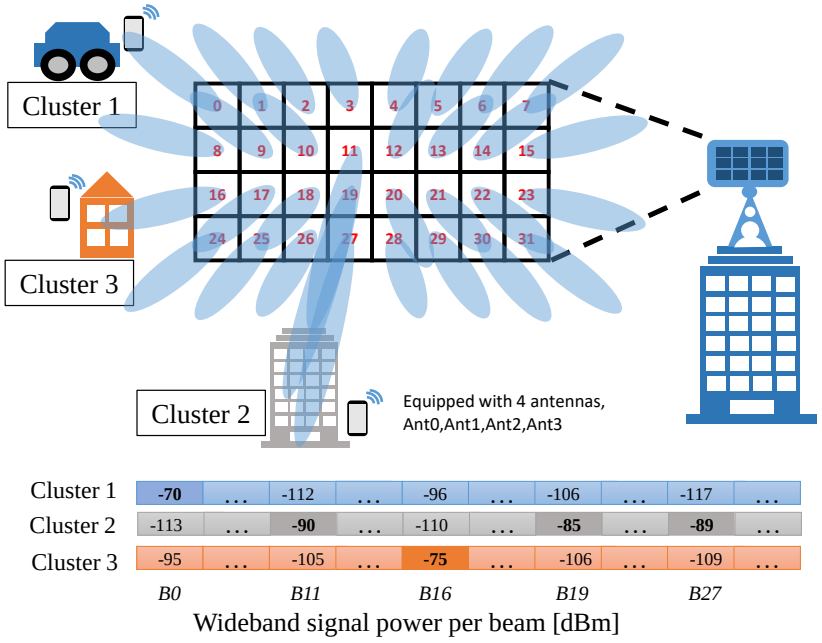

Figure 1: Illustration of the beam space.

Table 1: Feature Description

ID	Variable Name	Variable Meaning	Variable Property
0	Date & Time	Timestamp	XXXX-XX-XX XX:XX:XX
1	feature0	Target KPI, Downlink (DL) Troughput (Mbit/s)	Continuous value>0
2	feature1	MCS	discrete value: 0∼28
3	feature2	Rank, the number of streams used in the Space Division Multiplexing	discrete value: normally 0∼4
4	feature3_m, m=1,2,...8	The count for the use of m-streams in one second, feature2=mean(m×feature3_m)	Continuous non-negative integer
5	feature11	DL BLER(%), Downlink Block Error Rate in the MAC layer	Continuous value: 0∼100
6	feature12	DL Retransfer Rate(%) in the MAC layer	Continuous value: 0∼100
7	feature13	RB Number per second	Continuous positive value
8	feature14	RB Number per slot	Continuous positive value
9	feature15	Grant Count	Continuous positive value
10	feature16	CQI, Channel Quality Index	discrete value: 0∼15
11	feature17	RI, referable number of SDM streams reported by the phone	discrete value: normally 0∼4
12	feature18	Serving CSI SINR(dB), CSI Signal Noise Interference Ratio in the serving cell	Continuous value
13	feature19	Serving Best CSI RSRP(dBm), the largest CSI signal in the serving cell	Continuous negative value
14	feature20_n, n=0,1,...,7	CSI Beam ID n, n=0,1,...,7, the Beam ID (0,1,...,31) of the n-th receiving direction	Continuous non-negative integer 0-31, arranged as 4*8 matrix: 24,25,26,27,28,29,30,31 16,17,18,19,20,21,22,23 8,9,10,11,12,13,14,15 0,1,2,3,4,5,6,7
15	feature28_n, n=0,1,...,7	Together as a set of feature Y, representing KPI Y; feature28/36/44/52 should be considered jointly regarding direction n.	CSI_Beam_Ant0_RSRP_n(dBm), n=0,1,...,7, the RSRP of received eight beams on the Antenna0, continuous negative value (8 directions in total)
16	feature36_n, n=0,1,...,7		CSI_Beam_Ant1_RSRP_n(dBm), n=0,1,...,7, the RSRP of received eight beams on the Antenna1
17	feature44_n, n=0,1,...,7		CSI_Beam_Ant2_RSRP_n(dBm), n=0,1,...,7, the RSRP of received eight beams on the Antenna2
18	feature52_n, n=0,1,...,7		CSI_Beam_Ant3_RSRP_n(dBm), n=0,1,...,7, the RSRP of received eight beams on the Antenna3
19	feature60	Detected Best CSI RSRP(dBm), the strongest interference signal from the neighbor cells	Continuous negative value
20	feature61_n, n=0,1,...,7	Together as a set of feature X, representing KPI X; Equal to the ratio of feature Y over some other factor; feature61/69/77/85 corresponds to feature 28/36/44/52, respectively.	CSI_Beam_Ant0_SINR_n(dBm), n=0,1,...,7, the SINR of received eight beams on the Antenna0, continuous negative value (8 directions in total)
21	feature69_n, n=0,1,...,7		CSI_Beam_Ant1_SINR_n(dBm), n=0,1,...,7, the SINR of received eight beams on the Antenna1
22	feature77_n, n=0,1,...,7		CSI_Beam_Ant2_SINR_n(dBm), n=0,1,...,7, the SINR of received eight beams on the Antenna2
23	feature85_n, n=0,1,...,7		CSI_Beam_Ant3_SINR_n(dBm), n=0,1,...,7, the SINR of received eight beams on the Antenna3