

Samsung Prism Objective 1:

Feature selection for the machine learning model

Work done:

1. Did a review of various parameter and kpis affecting 5g in an area
2. Selected a few variable to work with in ml model as feature

Feature Selection:

These are some of the common feature considered in previous studies

Let's break down KPI per each category:

- **Accessibility KPI**

Are used to measure properly whether services requested by users can be accessed in a given condition, also refers to the quality of being available when users need it. eg. user request to access the network, access the voice call, data call

- **Retainability KPI**

Are used to measure how the network keep user's possession or able to hold and provide the services for the users

- **Mobility KPI**

Are used to measure the performance of a network which can handle the movement of users and still retain the service for the user, such as handover

- **Integrity KPI**

Are used to measure the character or honesty of a network to its user, such as what is the throughput, latency which users were served.

- **Availability KPI**

Are used to measure the availability of a network, suitable or ready for users to use services.

- **Utilization KPI**

Are used to measure the utilization of a network, whether the network capacity has reached its resource.

Table 2 5G performance requirements for low latency and high reliability scenarios [12]

Scenario	Communication			User	Connection Density	Service Area Dimension
	End-to-End Latency	Service Availability	Reliability	Experienced Data Rate		
Discrete automation – motion control	1 ms	99,9999%	99,9999%	1 Mbps to 10 Mbps	100 000/km ²	100 × 100 × 30 m
Process automation – remote control	50 ms	99,9999%	99,9999%	1 Mbps to 100 Mbps	1000/km ²	300 × 300 × 50 m
Process automation – monitoring	50 ms	99,9%	99,9%	1 Mbps	10 000/km ²	300 × 300 × 50
Electricity distribution – medium voltage	25 ms	99,9%	99,9%	10 Mbps	1000/km ²	100 km along power line
Electricity distribution – high voltage	5 ms	99,9999%	99,9999%	10 Mbps	1000/km ²	200 km along power line
Intelligent transport – infrastructure backhaul	10 ms	99,9999%	99,9999%	10 Mbps	1000/km ²	2 km along a road

Table 1 5G performance requirements for high data rate and traffic density scenarios [12]

Scenario	Experienced Data Rate (Down-link)	Experienced Data Rate (Uplink)	Area Traffic Capacity (Down-link)	Area Traffic Capacity (Uplink)	Overall User Density	UE Speed
Indoor hotspot	1 Gbps	500 Mbps	15 Tbps/km ²	2 Tbps/km ²	250 000/km ²	Pedestrians
Dense urban	300 Mbps	50 Mbps	750 Gbps/km ²	125 Gbps/km ²	25 000/km ²	Pedestrians and users in vehicles (up to 60 km/h)
Urban macro	50 Mbps	25 Mbps	100 Gbps/km ²	50 Gbps/km ²	10 000/km ²	Pedestrians and users in vehicles (up to 120 km/h)
Rural macro	50 Mbps	25 Mbps	1 Gbps/km ²	500 Mbps/km ²	100/km ²	Pedestrians and users in vehicles (up to 120 km/h)
Broadband in a crowd	25 Mbps	50 Mbps	3,75 Tbps/km ²	7,5 Tbps/km ²	500 000/km ²	Pedestrians
Broadcast-like services	Maximum 200 Mbps (TV channel)	Modest (e.g., 500 kbps per user)	N/A	N/A	15 TV channels of 20 Mbps	Stationary to in vehicles (up to 500 km/h)
High-speed train	50 Mbps	25 Mbps	15 Gbps/train	7,5 Gbps/train	1000/train	Users in trains (up to 500 km/h)
High-speed vehicle	50 Mbps	25 Mbps	100 Gbps/km ²	50 Gbps/km ²	4000/km ²	Users in vehicles (up to 250 km/h)
Airplanes connectivity	15 Mbps	7,5 Mbps	1,2 Gbps/plane	600 Mbps/plane	400/plane	Users in airplanes (up to 1000 km/h)

Format for description of 5g Kpis:

- **Name:** Registered Subscribers of Single Network Slice Instance through AMF
- **Description:** It describe the total number of subscribers that are registered to a network slice instance
- **Logical Formula definition:** This KPI is obtained by counting the subscribers in AMF that are registered to a network slice instance.
- **Physical formula definition:**

$$RSSNSI = \sum_{AMF} RegisteredSubNbrMean$$

- **Measurement names used for the KPI:**
RegisteredAMFSubNbrMean
- **KPI Object:** 5GS
- **KPI category:** Accessibility
- **Unit of the KPI:** Integer
- **Type of the KPI:** Cumulative measurement

Finalised Kpis on first selection:

1. **End to end latency:** *Latency between the server and the UE*
2. **UE data rate:** *Data rate that the user is getting(Peak, Average)*
3. **Service area dimension:** *The dimension of the area in which the service is distributed*
4. **Area traffic capacity:** *The traffic capacity and bandwidth in india*
5. **Experienced data rate:** *The data rate experienced by the user and the area*
6. **Network capacity and reliability:** *The reliability of the network in area*
7. **UE speed:** *The speed with which the User equipment is moving*