5G Quality of Service 30-Day Dataset

I've generated a comprehensive dataset simulating 5G network Quality of Service measurements over a 30-day period from April 15 to May 14, 2024. The dataset contains **30,225 data points** covering various application types and network conditions with realistic usage patterns.

Dataset Overview

- **Time Period**: April 15 - May 14, 2024 (30 days)
- **Daily Hours**: 9:00 AM to 8:00 PM
- **Time Granularity**: 15-minute intervals
- **Total Records**: 30,225
- **File Format**: CSV
- **Filename**: QoS_5G_30Days_Dataset.csv

Dataset Features

The dataset includes the following columns:

1. **Timestamp**: Date and time of the measurement
2. **User_ID**: Identifier for the user (100 unique users)
3. **Application_Type**: Type of network application or service
4. **Signal_Strength**: 5G signal strength in dBm
5. **Latency**: Network latency in milliseconds
6. **Required_Bandwidth**: Bandwidth required by the application
7. **Allocated_Bandwidth**: Actual bandwidth allocated to the application
8. **Resource_Allocation**: Percentage of requested resources actually allocated

Realistic Usage Patterns

The dataset incorporates several realistic patterns:

Time-of-Day Patterns

- **Lunch Hour Peak**: 12:00 PM - 2:00 PM
- **Evening Peak**: 5:00 PM - 7:00 PM
- **Regular Hours**: Lower traffic during other times

Day-of-Week Patterns

- **Weekdays**: Higher business and productivity application usage

- **Midweek (Tue-Thu)**: Peak overall usage

- **Weekends**: Higher streaming and gaming, lower business applications

Application Type Distribution

```
Streaming:          7,799 (25.8%)
Web_Browsing:       4,549 (15.1%)
Video_Call:         4,279 (14.2%)
File_Download:      4,122 (13.6%)
Online_Gaming:      3,889 (12.9%)
VoIP_Call:          3,311 (10.9%)
Emergency_Service:  1,144 (3.8%)
IoT_Temperature:    1,132 (3.7%)
```

Hourly Distribution

```
9 AM:    1,860 events
10 AM:   1,860 events
11 AM:   1,860 events
12 PM:   3,100 events (lunch peak)
1 PM:    3,100 events (lunch peak)
2 PM:    3,100 events (lunch peak)
3 PM:    1,860 events
4 PM:    1,860 events
5 PM:    3,720 events (evening peak)
6 PM:    3,720 events (evening peak)
7 PM:    3,720 events (evening peak)
8 PM:      465 events (partial hour)
```

Application Characteristics

Each application type has unique network characteristics:

1. **Video_Call**
   - Bandwidth: 5-15 Mbps

   - Latency: 20-50 ms (ideal: 30 ms)

   - Resource Allocation: 65-85%

   - Peak Usage: Evenings and weekends

2. **VoIP_Call**
   - Bandwidth: 80-150 Kbps

   - Latency: 10-40 ms (ideal: 20 ms)

   - Resource Allocation: 75-90%

- Consistent throughout day with slight evening peak

3. **Streaming**
   - Bandwidth: 3-20 Mbps
   - Latency: 30-80 ms (ideal: 40 ms)
   - Resource Allocation: 60-85%
   - Highest in evenings and weekends

4. **Emergency_Service**
   - Bandwidth: 0.5-2 Mbps
   - Latency: 5-20 ms (ideal: 10 ms)
   - Resource Allocation: 85-100%
   - Priority allocation regardless of network conditions

5. **Online_Gaming**
   - Bandwidth: 1-10 Mbps
   - Latency: 15-40 ms (ideal: 25 ms)
   - Resource Allocation: 75-95%
   - Peak usage: Evenings and weekends

6. **File_Download**
   - Bandwidth: 1-50 Mbps
   - Latency: 40-100 ms (ideal: 60 ms)
   - Resource Allocation: 50-80%
   - Higher during work hours

7. **Web_Browsing**
   - Bandwidth: 0.5-3 Mbps
   - Latency: 20-70 ms (ideal: 35 ms)
   - Resource Allocation: 50-75%
   - Higher during work hours

8. **IoT_Temperature**
   - Bandwidth: 10-50 Kbps
   - Latency: 50-120 ms (ideal: 70 ms)
   - Resource Allocation: 40-70%
   - Consistent throughout the day

Network Condition Factors

Several factors were modeled to affect network conditions:

1. **Signal Quality Levels**
   - Excellent: -50 to -65 dBm
   - Good: -66 to -80 dBm
   - Fair: -81 to -90 dBm
   - Poor: -91 to -110 dBm
   - Very Poor: -111 to -125 dBm

2. **Network Congestion**
   - Peak hours show decreased signal quality and resource allocation
   - Emergency services receive higher priority in allocation

3. **Resource Allocation Factors**
   - Signal quality affects resource allocation
   - Application priority affects allocation percentage
   - Network congestion reduces available resources

Sample Data Records

```
Timestamp,User_ID,Application_Type,Signal_Strength,Latency,Required_Bandwidth,Allocate
4/15/2024 9:00,user88,Video_Call,-109 dBm,55 ms,11.3 Mbps,10.2 Mbps,70%
4/15/2024 9:00,user2,Streaming,-68 dBm,69 ms,11.9 Mbps,10.8 Mbps,71%
4/15/2024 9:00,user85,File_Download,-121 dBm,105 ms,32.3 Mbps,25.2 Mbps,58%
4/15/2024 9:00,user93,Web_Browsing,-82 dBm,61 ms,1.6 Mbps,1.4 Mbps,66%
4/15/2024 9:00,user57,File_Download,-84 dBm,94 ms,46.6 Mbps,45.7 Mbps,78%
```

Usage Notes

This generated dataset can be used for:

1. Network traffic analysis and prediction
2. Quality of Service (QoS) monitoring and optimization
3. Application performance analysis
4. Network resource allocation algorithm testing
5. Machine learning model training for network optimization