

# Artificial Intelligence in Data Science

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**Abstract**—This paper introduces Current Wireless Systems which works on Automatic gain control (AGC), Adaptive Modulation and Coding Schemes and channel Quality Indicators (CQI). AI-Enabled Wireless CQI Monitoring and Diagnosis System for 6G Cellular Network. The Proposed AI in Data science provides a collaborative process to a systematic process that is adopted in wireless systems that leverages the network performance.

## I. INTRODUCTION

With each passing day cellular network technology progressively emerge to 3G, 4G(LTE), 5G, the sophistication of wireless networks is expanding speedily[1]. Thus, Network Structures of MNOs-Mobile network operators turned into further hard and standardized administration of the parallel wireless Channel Quality Indicator(CQI) is likewise [2] demanding responsibility from a profitable network opinion[3-4]. Alternatively this is approximately impractical for a lot of administrators to guide and maintain wireless CQI for individual cell unit mutually in real-time for entire 6G mobile base stations displayed publicly[5].

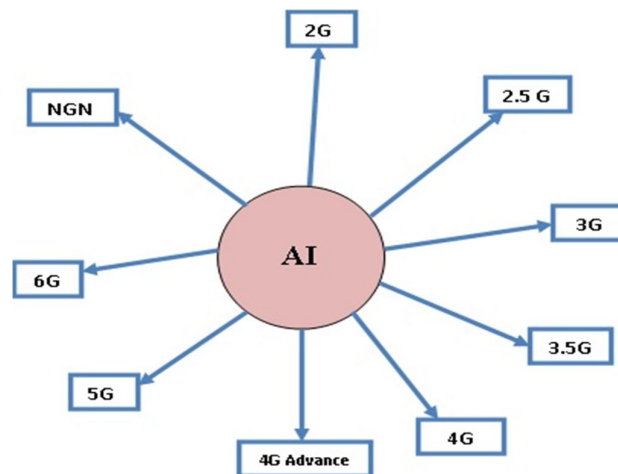


Fig 1. AI Connectivity

To Conquer this obstacle, Artificial Intelligence occupying technique have been suggested in this paper specifically by adopting fair Machine Learning(ML) and Deep Learning(DL) Methods to the THz/6G wireless CQI management for economic purpose. There are lot of relevant works[2]-[4] implementing familiar AI methods to network management fields. In this relation, the major characteristic in this paper is that we centered on wireless CQI administration for present economical 6G cellular networks and for this we introduce a novel AI framework that facilitate present rational CQI analytical procedures, that is being accomplished mutually in individual provincial administration site, further to be automated, creative and precised. In this concern, well-known Machine Learning and deep learning methods with the help of open sources[5-9] are accordingly implemented to our real-time CQI monitoring system and Root Cause Analysis(RCA) respectively.

The below 6G Network structure is considered in this paper to enhance the system, where the part from RU to gNB-CU is about a typical system block of a 6G NR Base station. The element manage system(EMS) as a network entity described the network management system(NMS) is a higher level entity connected to multiple EMS's and carry out integrated management nationwide[7]. In this paper, the Artificial Intelligence system basically deals directly with EMS from which more diverse raw data for CQI performance is enables more easily[8-10].

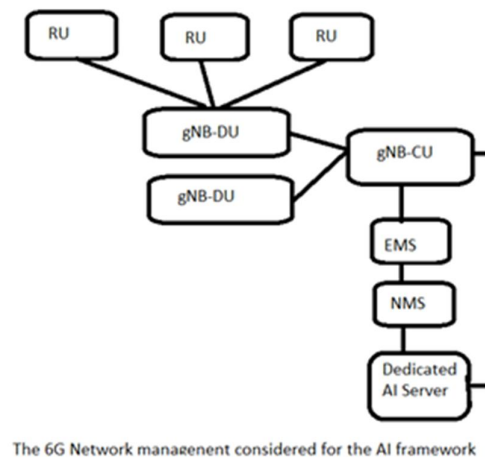


Fig 2. 6G and AI frame work

It collects Cell Level (RU-level) configuration information, wireless performance statistics, fault history and so on for Network management. Here In this paper the following section II deals with the Artificial Intelligence enabled CQI monitoring and alarm system followed by some of the informative concepts inter-related to the AI framework.

## II. THE CQI MONITORING AND ALARM SYSTEM

CQI is a channel Quality Indicator, this indicator describes the data/information on which it specifies the quality of the communication channel a system Model as shown in figure(i) and Figure(ii).

- This CQI is used to monitor the advancement of the HSDPA communication system, it is a cellular Telecommunication.
- => The Media Independent Handover Function (MIHF) provides various information to the channel quality source. This source uses some existing MIH services such as Link\_Up, Link\_Down, Link\_Going\_Down and Link\_Get\_Parameters in order to determine the link status and QoS parameters of different links.

Link\_Up and Link\_Down events are generated by Lower Layers (layer 1 or layer 2), and these events are notified to MIHF. Access to network specific information like network identifiers is provided by the information elements(IE) of the MIH Information Services (MIIS). Uplink multi-antenna techniques, For uplink transmissions a device with multiple antenna elements can use beamformed MIMO methods to improve the channel quality.

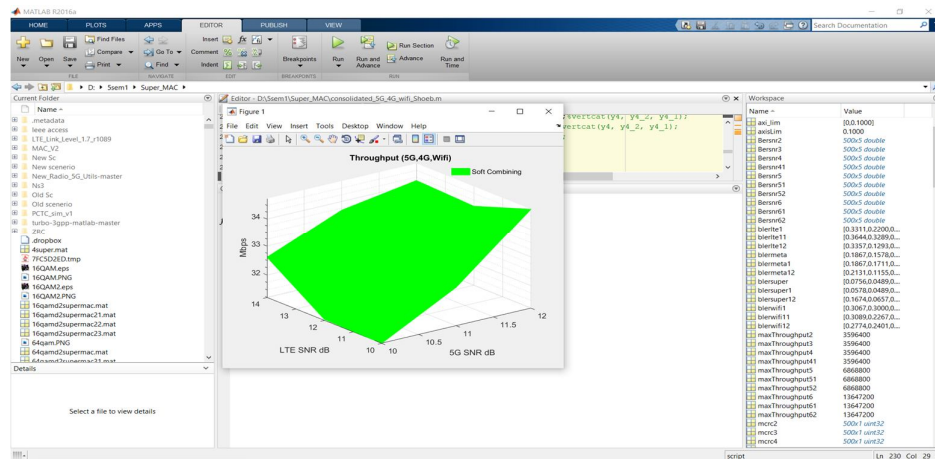
Acquisition CSI is one of the most important aspects of multiantenna techniques since the quality of the CSI is often the limiting factor on the performance of multiantenna techniques. CSI indicates the behavior of the

CSI is a kind of collective name of several different types of indicators (UE report) as given here...Channel quality indicator (CQI), precoding matrix indicator(PMI), precoding type indicator(PTI), rank indication (RI). Most important purpose of CSI on the UE side is to estimate the channel quality and recommend a proper precoding matrix to the network. So the last part of CSI estimation and report is highly related to various precoding matrices. There are several different sets of precoding matrices and different precoding matrix sets are used for different transmission conditions . Therefore in order to understand the overall mechanism of CSI estimation, the main step would be to get familiar with all of these precoding matrices from the selected set.

A Matlab simulations of the proposed setup compare the standalone and AI supported 4G, 5G systems with the specifications listed below:

|                             |            |               |               |                  |                |                |
|-----------------------------|------------|---------------|---------------|------------------|----------------|----------------|
| MAC parameters              | 4G/5G/6G   |               | Wifi          |                  |                |                |
| Access Mode                 | FDD        |               | CSMA/CA       |                  |                |                |
| Transmission                | Downlink   |               | Downlink      |                  |                |                |
| Fading Model                | Rayleigh   |               | Rayleigh      |                  |                |                |
| Number of frames            | 50         |               | 500 (packets) |                  |                |                |
| TTI                         | 1 ms       |               | 1 ms          |                  |                |                |
| Frame duration              | 10 ms      |               | 1 ms          |                  |                |                |
| Bandwidth                   | 20 MHz     |               | 20 MHz        |                  |                |                |
| Physical parameters         | Scenario 1 |               | Scenario 2    |                  | Scenario 3     |                |
|                             | 6G         | 5G            | LTE           | 5G               | LTE            | WLAN           |
| MCS                         | 3          | 0             | 8             | 1                | 12             | 2              |
| Peak data rate (Mbps)       | 7.1        | 6.5           | 17.5          | 14.4             | 28.42          | 21.7           |
| Buffer size (Mb)            | 8.5        | 8.5           | 15            | 15               | 30             | 30             |
| SNR (dB)                    | 5, 6, 6.5  | 7.8, 7.9, 8.0 | 10, 10.5, 11  | 11.3, 11.4, 11.5 | 20, 22.5, 23.5 | 16.8, 17, 17.2 |
| Transport block size (bits) | 7992       | 7992          | 15264         | 15264            | 28336          | 28336          |
| Simulation time (ms)        | 1500       |               | 1500          |                  | 1500           |                |





- 5G will transform the health care category which exclude space and time blockade . Through remote surgery and it will secure health care work flow increment.
- 4G wireless benefits evident lights which powers additional benefit of LED's such as radiance and fast speed data communication. Electromagnetic radiation is not produced by VLC
- NGN hits very huge data rate and very flat latency. This many applications can implement 6G wireless network.

### B. Disadvantages

Further advancements may cause a minimum delay, but it is acceptable with respect to Round trip transmission time RTT delay.

## V. CONCLUSION

In this paper, we recommended a novel AI framework for general wireless CQI monitoring and its diagnosis in LTE/6G mobile networks. Definite methodologies of ML-establish CQI monitoring and DL-establish problem diagnosis were also determined to help reader's perspective. From our first POC- proof of concept data for the AI framework. It has been indicated that our AI framework was being strongly operate with profitable 6G apparatus in real time. In the future, we will further upgrade the framework for KT 6G WACS and the definite conclusion to expand this AI key generally.

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