**Sorting Algorithm Assumptions and Design Part**

Di He in Sorting Team

**Algorithm Assumptions:**

1. **Combined In-Patient Scheduling and out-patient scheduling**

In-Patient Scheduling focuses on managing the schedules of patients admitted to the hospital for extended care. It requires accounting for factors like bed availability, room assignments, specialized equipment, and staff resources to ensure continuous and effective care for longer durations.

On the other hand, out-patient scheduling deals with organizing appointments for patients who visit the healthcare facility for shorter consultations or treatments. Out-patient scheduling is generally less complex, emphasizing quick turnarounds and efficient resource usage for routine or minor cases.

Our data includes both in-patient and out-patient cases. As a result, the Patients Sorting algorithm will adapt to the distinct requirements of each context, balancing the complexity of in-patient care with the efficiency demands of out-patient services.

1. **Condition Types and Priority Scores**

Prioritizing appointments is a critical practice for efficient healthcare scheduling. It ensures that patients receive timely and appropriate care while optimizing the use of available resources. A key factor in prioritization is the urgency of the patient’s medical condition. Patients with urgent needs, such as those experiencing severe pain, injuries, or acute illnesses, must be prioritized to provide prompt treatment and prevent further complications.

To streamline this process, we classify medical urgency into three categories: **Emergency**, **Urgent**, and **Routine**. This structured approach allows healthcare providers to address the most critical cases first while maintaining efficiency and equity in resource allocation.

**Priority Scores** are a quantitative measure used to indicate the urgency of care required by a patient. These scores are determined during the referral process, prior to scheduling an appointment, and provide a standardized way to assess and compare patient needs. A higher priority score reflects a more urgent medical condition, helping to ensure that critical cases are addressed promptly.

In our system, priority scores are categorized into three levels:

* **Emergency (70–89):** Patients requiring immediate attention to prevent serious health deterioration.
* **Urgent (50–69):** Patients needing timely care to address significant health concerns that are not immediately life-threatening.
* **Routine (30–49):** Patients with non-urgent needs, such as follow-ups or preventive care, that can be processed later.

**Algorithm Design:**

1. **Input Data:**

Input data details include patient\_id, scheduled\_date, scheduled\_time, duration\_minutes, required\_resources, priority\_score, condition\_type, and wait\_time\_target.

1. **Sorting Strategy:**

To ensure an efficient and fair scheduling process, a three-tiered sorting approach is applied:

**(1) First Level: Scheduled Date and Time**

First, sort patients by scheduled\_date in ascending order to organize appointments chronologically.

Within the same date, sort by scheduled\_time in ascending order to respect the order of appointments.

**(2) Second Level: Condition Type**

Within the same scheduled date, sort patients by condition\_type in the following order:

**Emergency > Urgent > Routine**. Emergency cases receive higher priority over urgent and routine cases.

**(3) Third Level: Priority Score**

For patients with the same scheduled date and condition type, sort by priority\_score in descending order, with higher scores indicating more urgent cases.

This approach ensures that patients are seen in the order of their scheduled date and time, while prioritizing those with more urgent medical conditions. By organizing based on Condition Type and Priority Score, hospital can effectively manage patient flow and ensure timely care for those who need it most.

1. **Output Data:**

A sorted list of patients, ready for resource allocation and scheduling.