**Project Development Phase**

**Model Performance Test**

|  |  |
| --- | --- |
| Date | 10 February 2025 |
| Team ID | LTVIP2025TMID35761 |
| Project Name | Sustainable smart city assistant using IBM granite LLM |
| Maximum Marks |  |

**Model Performance Testing:**

**Performance Testing Template: Sustainable Smart City Assistant (IBM Granite LLM)**

| **S.No.** | **Parameter** | **Screenshot / Values** |
| --- | --- | --- |
| 1 | **Data Rendered** | *e.g.*, live sensor feeds (traffic, air quality, energy usage) displayed on a map or table. Screenshot of raw data input in the assistant. |
| 2 | **Data Preprocessing** | Describe transformations: e.g., imputation of missing values, timestamp alignment, coordinate normalization. Include screenshot of code or processed preview. |
| 3 | **Utilization of Filters** | *e.g.*, user-selectable filters by district, time window, pollutant thresholds. Screenshot showing filter UI and filtered metrics. |
| 4 | **Calculation Fields Used** | *e.g.*, DAX or LLM-generated formulas: |
| • AvgEnergyPerCapita = TotalEnergy / Population |  |  |
| • EmissionsIndex = WeightedSum(PM2.5, NO2) |  |  |
| Screenshot of formula editor or code. |  |  |
| 5 | **Dashboard Design** | **No. of Visualizations / Graphs:** \_\_\_ |
| *e.g.*, 6 visuals: energy trends line chart, AQI map, resource usage gauge, KPIs, alert table, RAG-generated commentary. |  |  |
| 6 | **Story Design** | **No. of Visualizations / Graphs:** \_\_\_ |
| *e.g.*, 4 visuals: monthly sustainability summary, policy impact analysis, citizen request flow diagram, future outlook narrative. |  |  |

**Integrating IBM Granite LLM for Smart City Use Cases**

1. **Data & Preprocessing**
   * The assistant ingests urban IoT, GIS, and environmental datasets.
   * Preprocessing pipelines include normalization, coordinate mapping, and error handling, feeding both visualization and retrieval modules (Granite RAG and vision).
   * IBM Granite’s geospatial/time‑series models enhance data reliability and contextual consistency [ibm.com+3github.com+3news.sap.com+3](https://github.com/KanukaVinay/sustainable-smart-city-ai-assistant?utm_source=chatgpt.com)[reddit.com+12ibm.com+12reddit.com+12](https://www.ibm.com/granite?utm_source=chatgpt.com)[reddit.com+5reddit.com+5reddit.com+5](https://www.reddit.com/r/LocalLLaMA/comments/1cmugga?utm_source=chatgpt.com)[reddit.com](https://www.reddit.com/r/LocalLLaMA/comments/1hh403g?utm_source=chatgpt.com).
2. **Filtering**
   * Filters (by region, sensor type, thresholds) dynamically adjust dashboard visuals and RAG responses.
   * Granite LLM uses filter-meta context to tailor explanations or alerts based on the filtered subset.
3. **Calculation Fields**
   * Use DAX (e.g., in Power BI) or LLM‑generated formula logic to calculate metrics such as “EnergyPerCapita” or “AQI weighted average.”
   * Use time-series Granite models for forecasting trends (e.g., next-day energy demand or pollutant peaks) .
4. **Dashboard & Story Design**
   * Dashboards combine data visuals with Granite‑generated commentary, explaining patterns or anomalies. Visuals may include maps, charts, KPIs, and alert widgets.
   * Story or report pages synthesize key insights—like monthly summaries—combining charts and narrative supported by RAG-enhanced LLM responses.

**✅ Example Entry**

| **S.No.** | **Parameter** | **Values** |
| --- | --- | --- |
| 1 | Data Rendered | Live traffic, energy, and AQI feeds from IoT sensors. |
| 2 | Data Preprocessing | Imputed missing timestamps, converted coordinates to GeoJSON. |
| 3 | Utilization of Filters | Filters by zone and AQI levels (>100). |
| 4 | Calculation Fields Used | - AvgEnergyPerCapita = SUM(Energy)/SUM(Population) - EmissionScore, a weighted average of PM2.5 & NO₂ |
| 5 | Dashboard Design | **6 visuals**: line, bar, map, gauge, table, KPI card with commentary. |
| 6 | Story Design | **4 visuals**: monthly summary, emissions trend, policy impact, forecast. |