

# Supplemental Materials to: Modeling and Monitoring of Indoor Populations using Sparse Positioning Data

## 1 SUPPLEMENTAL EXPERIMENTS

The supplemental experiments consist of the experiments of whole querying processing for BLD-2 (i.e., Figures 1-14), and the experiments of  $\eta$ 's effect for BLD-1 (i.e., Figures 15-17).

### 1.1 Evaluations of CMPP Processing

**Query Instance.** We generate query instances in the same way with that in the paper.

**Performance Metrics.** We use the same performance metrics with that in the paper.

**Query Parameters.** We use the same query parameter setting with that in the paper

**Table 1: Query parameter settings.**

Parameter	Value
$r$ (meter)	20, 40, <b>60</b> , 80
$\theta$	2, 4, 6, 8
Validity (second)	60, <b>120</b> , 180, 240
$\eta$	<b>0.5</b> , 0.6, 0.7, 0.8

**1.1.1 Effect of Query Range  $r$ .** The query response time, F1-score, and memory usage for BLD-2 are reported in Figure 1, Figure 5, and Figure 9, respectively. They follow similar tendencies as that in BLD-1 (cf. Section 6.3.1 in the paper) and detailed interpretation could be found there.

**1.1.2 Effect of Population Threshold  $\theta$ .** The query response time, F1-score, and memory usage for BLD-2 are shown in Figure 2, Figure 6, and Figure 10 respectively. The tendencies are similar to that in BLD-1 and the explanations could be found in Section 6.3.2 in the paper.

**1.1.3 Effect of Confidence Threshold  $\eta$ .** The query response time, F1-score, and memory usage for BLD-2 are shown in Figure 3, Figure 7, and Figure 11 respectively. Besides, the similar results for BLD-1 are complemented and reported in Figure 15, Figure 16, and Figure 17 respectively. Similar to  $\theta$ ,  $\eta$  a parameter to define a populated partition, has no effect on the query efficiency and effectiveness.

**1.1.4 Effect of Validity.** The query response time, F1-score, and memory usage for BLD-2 are shown in Figure 4, Figure 8, and Figure 12 respectively. The tendencies are similar to that of BLD-1 and detailed explanations are available in Section 6.3.3 in the paper.

**1.1.5 Effect of Caching Mechanism.** The query response time and F1-score are reported in Figure 13 and Figure 14 respectively. Please refer to Section 6.3.4 in the paper for interpretations.

**1.1.6 Summary.** Overall, the results in BLD-2 are similar to that in BLD-1 and this further demonstrates the effectiveness and efficiency of CMPP query processing framework. More detailed information are available in Section 6.3 in the paper.

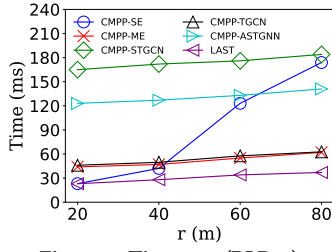


Figure 1: Time vs  $r$  (BLD-2).

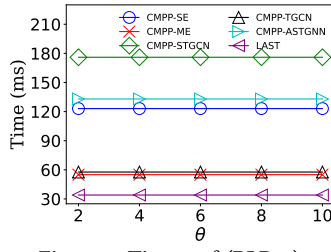


Figure 2: Time vs  $\theta$  (BLD-2).

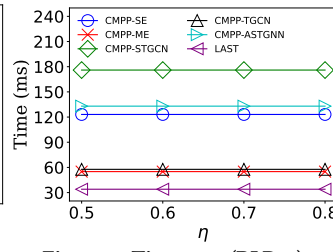


Figure 3: Time vs  $\eta$  (BLD-2).

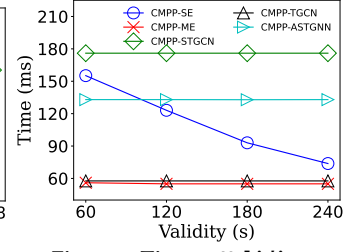


Figure 4: Time vs Validity (BLD-2).

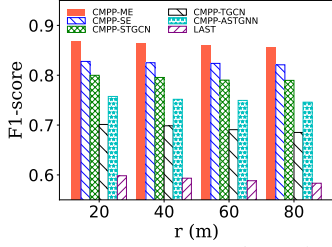


Figure 5: F1-score vs  $r$  (BLD-2).

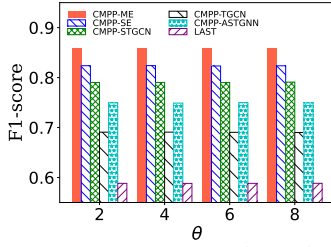


Figure 6: F1-score vs  $\theta$  (BLD-2).

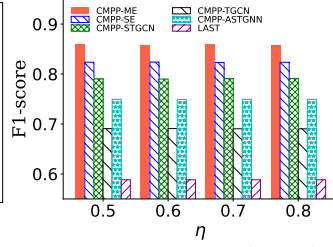


Figure 7: F1-score vs  $\eta$  (BLD-2).

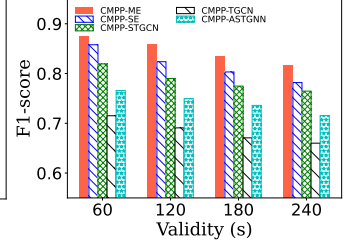


Figure 8: F1-score vs Validity (BLD-2).

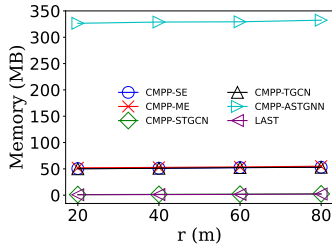


Figure 9: Memory vs  $r$  (BLD-2).

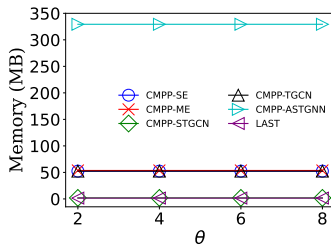


Figure 10: Memory vs  $\theta$  (BLD-2).

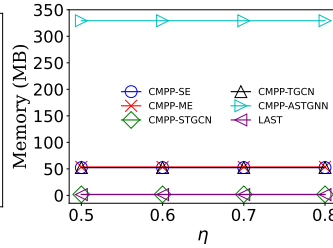


Figure 11: Memory vs  $\eta$  (BLD-2).

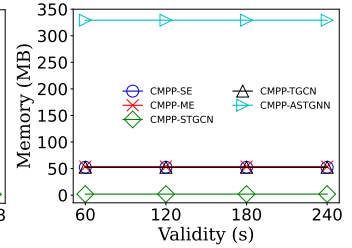


Figure 12: Memory vs Validity (BLD-2).

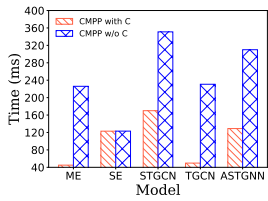


Figure 13: Time vs model (BLD-2).

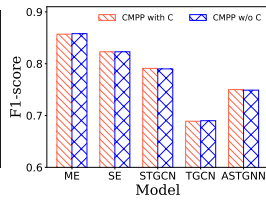


Figure 14: F1-score vs model (BLD-2).

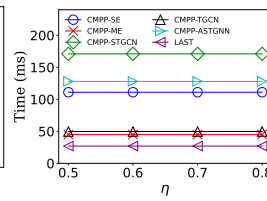


Figure 15: Time vs  $\eta$  (BLD-1).

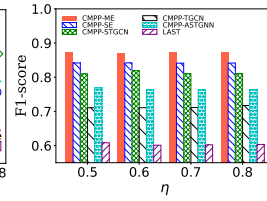


Figure 16: F1-Score vs  $\eta$  (BLD-1).

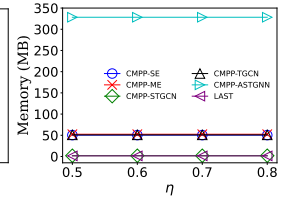


Figure 17: Memory vs  $\eta$  (BLD-1).