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1 /System/Volumes/Data/Users/liangwenlong/envs/ml_env  
/bin/python3.12 /Users/liangwenlong/study/bme/3/  
ml_usage/project/solutionv6.py  
2     Loading data ...  
3     Cleaning numeric-like columns ...  
4     Feature engineering ...  
5     Target & frequency encoding ...  
6     Will do target encoding for: ['driver_name_and_id'  
, 'vehicle_type', 'vehicle_motortype', '  
deviceuniquecode']  
7     Total features: 76  
8     Categorical features: ['deviceuniquecode', '  
driver_name_and_id', 'vehicle_type', '  
vehicle_motortype', 'env_relative_humidity', '  
vehicle_type_1', 'vehicle_type_2', 'vehicle_type_3'  
, 'vehicle_type_4', 'vehicle_type_5', '  
vehicle_type_6', 'driver_name_and_id_freq', '  
vehicle_type_freq', 'vehicle_motortype_freq', '  
deviceuniquecode_freq']  
9     Start multi-seed LightGBM training ...  
10  
11 ===== Seed 42 =====  
12     -> Seed 42 | Fold 1/5  
13 Training until validation scores don't improve for  
300 rounds  
14 [500]    valid_0's l1: 19.8894  
15 [1000]   valid_0's l1: 19.6067  
16 [1500]   valid_0's l1: 19.4642  
17 [2000]   valid_0's l1: 19.3796  
18 [2500]   valid_0's l1: 19.3176  
19 [3000]   valid_0's l1: 19.2768  
20 [3500]   valid_0's l1: 19.244  
21 [4000]   valid_0's l1: 19.2228  
22 [4500]   valid_0's l1: 19.2008  
23 [5000]   valid_0's l1: 19.1832  
24 [5500]   valid_0's l1: 19.1681  
25 [6000]   valid_0's l1: 19.1565  
26 [6500]   valid_0's l1: 19.1454  
27 [7000]   valid_0's l1: 19.1378  
28 [7500]   valid_0's l1: 19.1293  
29 [8000]   valid_0's l1: 19.1192
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30 [8500] valid_0's l1: 19.1151
31 [9000] valid_0's l1: 19.109
32 [9500] valid_0's l1: 19.1009
33 [10000] valid_0's l1: 19.0977
34 Did not meet early stopping. Best iteration is:
35 [10000] valid_0's l1: 19.0977
36      Fold 1 MAE: 19.0977
37      -> Seed 42 | Fold 2/5
38 Training until validation scores don't improve for
300 rounds
39 [500] valid_0's l1: 20.0581
40 [1000] valid_0's l1: 19.7639
41 [1500] valid_0's l1: 19.6321
42 [2000] valid_0's l1: 19.5639
43 [2500] valid_0's l1: 19.5097
44 [3000] valid_0's l1: 19.4762
45 [3500] valid_0's l1: 19.447
46 [4000] valid_0's l1: 19.4254
47 [4500] valid_0's l1: 19.4041
48 [5000] valid_0's l1: 19.3886
49 [5500] valid_0's l1: 19.3765
50 [6000] valid_0's l1: 19.3621
51 [6500] valid_0's l1: 19.3526
52 [7000] valid_0's l1: 19.3428
53 [7500] valid_0's l1: 19.3353
54 [8000] valid_0's l1: 19.3288
55 [8500] valid_0's l1: 19.3195
56 [9000] valid_0's l1: 19.3133
57 [9500] valid_0's l1: 19.3069
58 [10000] valid_0's l1: 19.3023
59 Did not meet early stopping. Best iteration is:
60 [9978] valid_0's l1: 19.3021
61      Fold 2 MAE: 19.3021
62      -> Seed 42 | Fold 3/5
63 Training until validation scores don't improve for
300 rounds
64 [500] valid_0's l1: 20.1878
65 [1000] valid_0's l1: 19.8709
66 [1500] valid_0's l1: 19.737
67 [2000] valid_0's l1: 19.6598
68 [2500] valid_0's l1: 19.6094
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69 [3000] valid_0's l1: 19.5592
70 [3500] valid_0's l1: 19.528
71 [4000] valid_0's l1: 19.5072
72 [4500] valid_0's l1: 19.4889
73 [5000] valid_0's l1: 19.474
74 [5500] valid_0's l1: 19.4593
75 [6000] valid_0's l1: 19.4473
76 [6500] valid_0's l1: 19.4351
77 [7000] valid_0's l1: 19.4265
78 [7500] valid_0's l1: 19.4173
79 [8000] valid_0's l1: 19.413
80 [8500] valid_0's l1: 19.4085
81 [9000] valid_0's l1: 19.4005
82 [9500] valid_0's l1: 19.3945
83 [10000] valid_0's l1: 19.3904
84 Did not meet early stopping. Best iteration is:
85 [10000] valid_0's l1: 19.3904
86      Fold 3 MAE: 19.3904
87  -> Seed 42 | Fold 4/5
88 Training until validation scores don't improve for
  300 rounds
89 [500] valid_0's l1: 20.1123
90 [1000] valid_0's l1: 19.8107
91 [1500] valid_0's l1: 19.6806
92 [2000] valid_0's l1: 19.6148
93 [2500] valid_0's l1: 19.5666
94 [3000] valid_0's l1: 19.5299
95 [3500] valid_0's l1: 19.4942
96 [4000] valid_0's l1: 19.4716
97 [4500] valid_0's l1: 19.4559
98 [5000] valid_0's l1: 19.4387
99 [5500] valid_0's l1: 19.423
100 [6000] valid_0's l1: 19.4104
101 [6500] valid_0's l1: 19.3985
102 [7000] valid_0's l1: 19.3884
103 [7500] valid_0's l1: 19.3795
104 [8000] valid_0's l1: 19.3715
105 [8500] valid_0's l1: 19.3653
106 [9000] valid_0's l1: 19.3586
107 [9500] valid_0's l1: 19.3534
108 [10000] valid_0's l1: 19.3476
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109 Did not meet early stopping. Best iteration is:  
110 [10000] valid_0's l1: 19.3476  
111      Fold 4 MAE: 19.3476  
112  -> Seed 42 | Fold 5/5  
113 Training until validation scores don't improve for  
      300 rounds  
114 [500]  valid_0's l1: 20.0505  
115 [1000]  valid_0's l1: 19.7946  
116 [1500]  valid_0's l1: 19.6556  
117 [2000]  valid_0's l1: 19.5782  
118 [2500]  valid_0's l1: 19.5283  
119 [3000]  valid_0's l1: 19.4854  
120 [3500]  valid_0's l1: 19.4622  
121 [4000]  valid_0's l1: 19.4394  
122 [4500]  valid_0's l1: 19.4222  
123 [5000]  valid_0's l1: 19.4064  
124 [5500]  valid_0's l1: 19.3945  
125 [6000]  valid_0's l1: 19.3809  
126 [6500]  valid_0's l1: 19.3714  
127 [7000]  valid_0's l1: 19.3645  
128 [7500]  valid_0's l1: 19.3576  
129 [8000]  valid_0's l1: 19.3508  
130 [8500]  valid_0's l1: 19.3415  
131 [9000]  valid_0's l1: 19.3327  
132 [9500]  valid_0's l1: 19.3296  
133 [10000] valid_0's l1: 19.3261  
134 Did not meet early stopping. Best iteration is:  
135 [9883]  valid_0's l1: 19.326  
136      Fold 5 MAE: 19.3260  
137 ===== Seed 42 mean MAE: 19.2928 =====  
138  
139 ===== Seed 2025 =====  
140  -> Seed 2025 | Fold 1/5  
141 Training until validation scores don't improve for  
      300 rounds  
142 [500]  valid_0's l1: 20.0491  
143 [1000]  valid_0's l1: 19.7558  
144 [1500]  valid_0's l1: 19.6136  
145 [2000]  valid_0's l1: 19.5492  
146 [2500]  valid_0's l1: 19.4987  
147 [3000]  valid_0's l1: 19.4618
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148 [3500] valid_0's l1: 19.4359
149 [4000] valid_0's l1: 19.409
150 [4500] valid_0's l1: 19.3917
151 [5000] valid_0's l1: 19.3748
152 [5500] valid_0's l1: 19.3579
153 [6000] valid_0's l1: 19.3475
154 [6500] valid_0's l1: 19.3324
155 [7000] valid_0's l1: 19.3226
156 [7500] valid_0's l1: 19.3146
157 [8000] valid_0's l1: 19.3083
158 [8500] valid_0's l1: 19.2993
159 [9000] valid_0's l1: 19.291
160 [9500] valid_0's l1: 19.285
161 [10000] valid_0's l1: 19.282
162 Did not meet early stopping. Best iteration is:
163 [9966] valid_0's l1: 19.2819
164     Fold 1 MAE: 19.2819
165     -> Seed 2025 | Fold 2/5
166 Training until validation scores don't improve for
    300 rounds
167 [500] valid_0's l1: 20.0735
168 [1000] valid_0's l1: 19.8052
169 [1500] valid_0's l1: 19.6922
170 [2000] valid_0's l1: 19.6173
171 [2500] valid_0's l1: 19.568
172 [3000] valid_0's l1: 19.5293
173 [3500] valid_0's l1: 19.504
174 [4000] valid_0's l1: 19.4831
175 [4500] valid_0's l1: 19.4591
176 [5000] valid_0's l1: 19.446
177 [5500] valid_0's l1: 19.4334
178 [6000] valid_0's l1: 19.4245
179 [6500] valid_0's l1: 19.4147
180 [7000] valid_0's l1: 19.4042
181 [7500] valid_0's l1: 19.3955
182 [8000] valid_0's l1: 19.3863
183 [8500] valid_0's l1: 19.3801
184 [9000] valid_0's l1: 19.3734
185 [9500] valid_0's l1: 19.3675
186 [10000] valid_0's l1: 19.362
187 Did not meet early stopping. Best iteration is:
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188 [10000] valid_0's l1: 19.362
189      Fold 2 MAE: 19.3620
190  -> Seed 2025 | Fold 3/5
191 Training until validation scores don't improve for
    300 rounds
192 [500]  valid_0's l1: 19.7784
193 [1000] valid_0's l1: 19.5033
194 [1500] valid_0's l1: 19.3685
195 [2000] valid_0's l1: 19.2995
196 [2500] valid_0's l1: 19.2538
197 [3000] valid_0's l1: 19.2161
198 [3500] valid_0's l1: 19.1943
199 [4000] valid_0's l1: 19.1698
200 [4500] valid_0's l1: 19.1521
201 [5000] valid_0's l1: 19.1362
202 [5500] valid_0's l1: 19.1258
203 [6000] valid_0's l1: 19.1165
204 [6500] valid_0's l1: 19.107
205 [7000] valid_0's l1: 19.0986
206 [7500] valid_0's l1: 19.0901
207 [8000] valid_0's l1: 19.0844
208 [8500] valid_0's l1: 19.0816
209 [9000] valid_0's l1: 19.0765
210 [9500] valid_0's l1: 19.074
211 [10000] valid_0's l1: 19.0685
212 Did not meet early stopping. Best iteration is:
213 [10000] valid_0's l1: 19.0685
214      Fold 3 MAE: 19.0685
215  -> Seed 2025 | Fold 4/5
216 Training until validation scores don't improve for
    300 rounds
217 [500]  valid_0's l1: 20.0705
218 [1000] valid_0's l1: 19.7857
219 [1500] valid_0's l1: 19.6426
220 [2000] valid_0's l1: 19.5715
221 [2500] valid_0's l1: 19.5228
222 [3000] valid_0's l1: 19.4875
223 [3500] valid_0's l1: 19.4643
224 [4000] valid_0's l1: 19.4412
225 [4500] valid_0's l1: 19.4239
226 [5000] valid_0's l1: 19.4091
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227 [5500] valid_0's l1: 19.3953
228 [6000] valid_0's l1: 19.3831
229 [6500] valid_0's l1: 19.3728
230 [7000] valid_0's l1: 19.3638
231 [7500] valid_0's l1: 19.3576
232 [8000] valid_0's l1: 19.3486
233 [8500] valid_0's l1: 19.3415
234 [9000] valid_0's l1: 19.3364
235 [9500] valid_0's l1: 19.3287
236 [10000] valid_0's l1: 19.3238
237 Did not meet early stopping. Best iteration is:
238 [10000] valid_0's l1: 19.3238
239      Fold 4 MAE: 19.3238
240      -> Seed 2025 | Fold 5/5
241 Training until validation scores don't improve for
   300 rounds
242 [500]  valid_0's l1: 20.1182
243 [1000] valid_0's l1: 19.8027
244 [1500] valid_0's l1: 19.6629
245 [2000] valid_0's l1: 19.5884
246 [2500] valid_0's l1: 19.5373
247 [3000] valid_0's l1: 19.5021
248 [3500] valid_0's l1: 19.4747
249 [4000] valid_0's l1: 19.4491
250 [4500] valid_0's l1: 19.4303
251 [5000] valid_0's l1: 19.415
252 [5500] valid_0's l1: 19.3997
253 [6000] valid_0's l1: 19.3894
254 [6500] valid_0's l1: 19.3786
255 [7000] valid_0's l1: 19.3692
256 [7500] valid_0's l1: 19.362
257 [8000] valid_0's l1: 19.3544
258 [8500] valid_0's l1: 19.3488
259 [9000] valid_0's l1: 19.3417
260 [9500] valid_0's l1: 19.336
261 [10000] valid_0's l1: 19.3314
262 Did not meet early stopping. Best iteration is:
263 [9912] valid_0's l1: 19.3313
264      Fold 5 MAE: 19.3313
265 ===== Seed 2025 mean MAE: 19.2735 =====
266
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267 ===== Seed 3407 =====
268     -> Seed 3407 | Fold 1/5
269 Training until validation scores don't improve for
    300 rounds
270 [500]   valid_0's l1: 20.0307
271 [1000]  valid_0's l1: 19.7218
272 [1500]  valid_0's l1: 19.5788
273 [2000]  valid_0's l1: 19.5005
274 [2500]  valid_0's l1: 19.4475
275 [3000]  valid_0's l1: 19.4073
276 [3500]  valid_0's l1: 19.381
277 [4000]  valid_0's l1: 19.3523
278 [4500]  valid_0's l1: 19.3327
279 [5000]  valid_0's l1: 19.3188
280 [5500]  valid_0's l1: 19.3071
281 [6000]  valid_0's l1: 19.2969
282 [6500]  valid_0's l1: 19.2845
283 [7000]  valid_0's l1: 19.275
284 [7500]  valid_0's l1: 19.2688
285 [8000]  valid_0's l1: 19.2619
286 [8500]  valid_0's l1: 19.2543
287 [9000]  valid_0's l1: 19.2468
288 [9500]  valid_0's l1: 19.2407
289 [10000] valid_0's l1: 19.2356
290 Did not meet early stopping. Best iteration is:
291 [9997]  valid_0's l1: 19.2355
292     Fold 1 MAE: 19.2355
293     -> Seed 3407 | Fold 2/5
294 Training until validation scores don't improve for
    300 rounds
295 [500]   valid_0's l1: 20.025
296 [1000]  valid_0's l1: 19.7014
297 [1500]  valid_0's l1: 19.5564
298 [2000]  valid_0's l1: 19.4762
299 [2500]  valid_0's l1: 19.4204
300 [3000]  valid_0's l1: 19.3815
301 [3500]  valid_0's l1: 19.3505
302 [4000]  valid_0's l1: 19.3259
303 [4500]  valid_0's l1: 19.3023
304 [5000]  valid_0's l1: 19.29
305 [5500]  valid_0's l1: 19.279
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306 [6000] valid_0's l1: 19.2682
307 [6500] valid_0's l1: 19.2597
308 [7000] valid_0's l1: 19.2498
309 [7500] valid_0's l1: 19.2395
310 [8000] valid_0's l1: 19.2319
311 [8500] valid_0's l1: 19.2244
312 [9000] valid_0's l1: 19.2174
313 [9500] valid_0's l1: 19.2147
314 [10000] valid_0's l1: 19.2092
315 Did not meet early stopping. Best iteration is:
316 [9982] valid_0's l1: 19.209
317      Fold 2 MAE: 19.2090
318      -> Seed 3407 | Fold 3/5
319 Training until validation scores don't improve for
      300 rounds
320 [500] valid_0's l1: 19.866
321 [1000] valid_0's l1: 19.5494
322 [1500] valid_0's l1: 19.4207
323 [2000] valid_0's l1: 19.3527
324 [2500] valid_0's l1: 19.2877
325 [3000] valid_0's l1: 19.2473
326 [3500] valid_0's l1: 19.2158
327 [4000] valid_0's l1: 19.1929
328 [4500] valid_0's l1: 19.1701
329 [5000] valid_0's l1: 19.1561
330 [5500] valid_0's l1: 19.1465
331 [6000] valid_0's l1: 19.1369
332 [6500] valid_0's l1: 19.127
333 [7000] valid_0's l1: 19.117
334 [7500] valid_0's l1: 19.109
335 [8000] valid_0's l1: 19.1049
336 [8500] valid_0's l1: 19.098
337 [9000] valid_0's l1: 19.0948
338 [9500] valid_0's l1: 19.0913
339 [10000] valid_0's l1: 19.0855
340 Did not meet early stopping. Best iteration is:
341 [10000] valid_0's l1: 19.0855
342      Fold 3 MAE: 19.0855
343      -> Seed 3407 | Fold 4/5
344 Training until validation scores don't improve for
      300 rounds
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345 [500]    valid_0's l1: 20.1315
346 [1000]   valid_0's l1: 19.7823
347 [1500]   valid_0's l1: 19.6549
348 [2000]   valid_0's l1: 19.5818
349 [2500]   valid_0's l1: 19.5335
350 [3000]   valid_0's l1: 19.4916
351 [3500]   valid_0's l1: 19.463
352 [4000]   valid_0's l1: 19.4306
353 [4500]   valid_0's l1: 19.4077
354 [5000]   valid_0's l1: 19.3909
355 [5500]   valid_0's l1: 19.3753
356 [6000]   valid_0's l1: 19.3661
357 [6500]   valid_0's l1: 19.3541
358 [7000]   valid_0's l1: 19.3433
359 [7500]   valid_0's l1: 19.3367
360 [8000]   valid_0's l1: 19.3313
361 [8500]   valid_0's l1: 19.3251
362 [9000]   valid_0's l1: 19.3177
363 [9500]   valid_0's l1: 19.3128
364 [10000]  valid_0's l1: 19.3103
365 Did not meet early stopping. Best iteration is:
366 [9979]   valid_0's l1: 19.3101
367      Fold 4 MAE: 19.3101
368      -> Seed 3407 | Fold 5/5
369 Training until validation scores don't improve for
            300 rounds
370 [500]    valid_0's l1: 20.1471
371 [1000]   valid_0's l1: 19.8399
372 [1500]   valid_0's l1: 19.7087
373 [2000]   valid_0's l1: 19.6297
374 [2500]   valid_0's l1: 19.5722
375 [3000]   valid_0's l1: 19.5295
376 [3500]   valid_0's l1: 19.4976
377 [4000]   valid_0's l1: 19.4755
378 [4500]   valid_0's l1: 19.4551
379 [5000]   valid_0's l1: 19.4391
380 [5500]   valid_0's l1: 19.4289
381 [6000]   valid_0's l1: 19.4161
382 [6500]   valid_0's l1: 19.4056
383 [7000]   valid_0's l1: 19.3925
384 [7500]   valid_0's l1: 19.3838
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385 [8000] valid_0's l1: 19.377
386 [8500] valid_0's l1: 19.3708
387 [9000] valid_0's l1: 19.3654
388 [9500] valid_0's l1: 19.3608
389 [10000] valid_0's l1: 19.3541
390 Did not meet early stopping. Best iteration is:
391 [9999] valid_0's l1: 19.3541
392      Fold 5 MAE: 19.3541
393 ===== Seed 3407 mean MAE: 19.2389 =====
394
395 =====
396      Multi-seed CV MAE mean: 19.2684 (std: 0.0223)
397 =====
398      Submission saved as:
399          submission_v6_ensemble_mae_19.2684.csv
400      Feature importance plot saved as
401          feature_importance_v6.png
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