

MATLAB汽车大数据分析平台的构建及应用

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牛人如何看汽车大数据分析？

“Today's cars produce upwards of 25GB of information per hour ... information is helping us understand how people move, see patterns that most customers don't ...”

Mark Fields, CEO, Ford



从大数据中挖掘信息对车企的意义



Decision support



Sound quality analysis

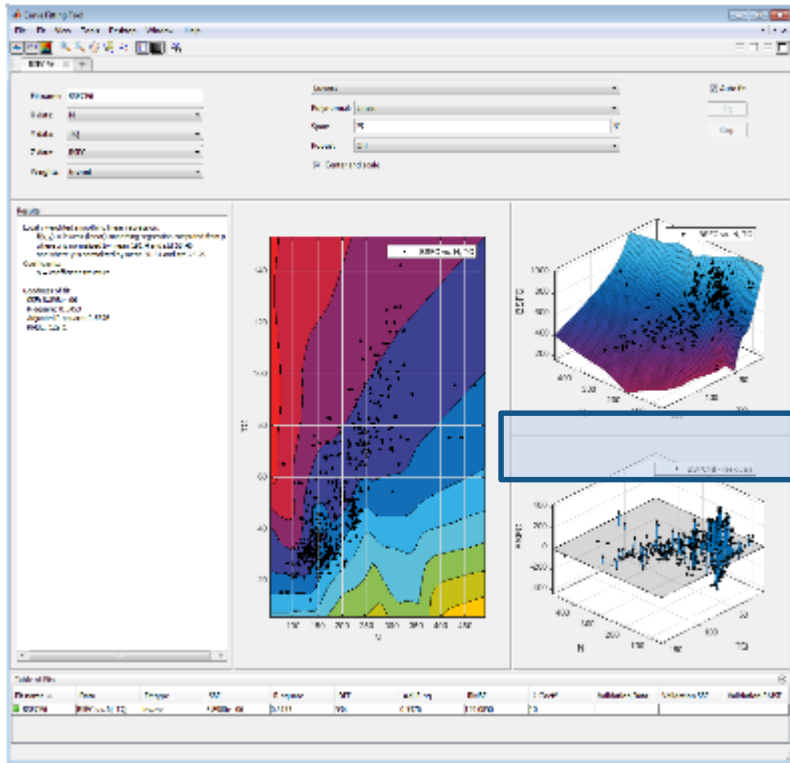


Active safety testing



Prognostics algorithms

Why MATLAB: 从分析到产品



```

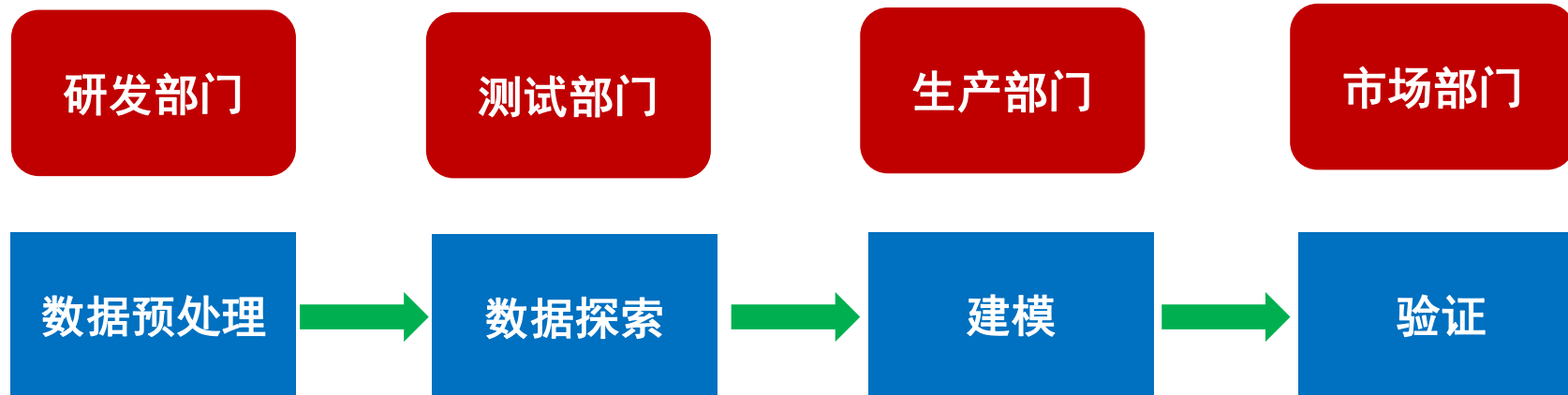
1 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
2 % Create a 2D grid of BSFC values.
3 BSFC = zeros(100, 100);
4 % Generate random data for BSFC.
5 BSFC = randi(1000, 100, 100);
6 % Plot BSFC vs. RPM and Torque.
7 figure;
8 imagesc(RPM, Torque, BSFC);
9 title('BSFC vs. RPM and Torque');
10
11 % Save the plot to a file.
12 save('BSFC_plot.mat', 'BSFC');
13
14 % Load the plot back into the workspace.
15 load('BSFC_plot.mat');
16
17 % Display the plot.
18 figure;
19 imagesc(RPM, Torque, BSFC);
20 title('Loaded BSFC vs. RPM and Torque');
21
22 % End of script.
23
24 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
25 % Create a 3D grid of BSFC values.
26 BSFC_3D = zeros(100, 100, 100);
27 % Generate random data for BSFC.
28 BSFC_3D = randi(1000, 100, 100, 100);
29 % Plot BSFC vs. RPM and Torque.
30 figure;
31 surf(RPM, Torque, BSFC_3D);
32 title('3D BSFC vs. RPM and Torque');
33
34 % Save the plot to a file.
35 save('BSFC_3D_plot.mat', 'BSFC_3D');
36
37 % Load the plot back into the workspace.
38 load('BSFC_3D_plot.mat');
39
40 % Display the plot.
41 figure;
42 surf(RPM, Torque, BSFC_3D);
43 title('Loaded 3D BSFC vs. RPM and Torque');
44
45 % End of script.
46
47 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
48 % Create a 2D grid of BSFC values.
49 BSFC_2 = zeros(100, 100);
50 % Generate random data for BSFC.
51 BSFC_2 = randi(1000, 100, 100);
52 % Plot BSFC vs. RPM and Torque.
53 figure;
54 imagesc(RPM, Torque, BSFC_2);
55 title('2D BSFC vs. RPM and Torque');
56
57 % Save the plot to a file.
58 save('BSFC_2_plot.mat', 'BSFC_2');
59
60 % Load the plot back into the workspace.
61 load('BSFC_2_plot.mat');
62
63 % Display the plot.
64 figure;
65 imagesc(RPM, Torque, BSFC_2);
66 title('Loaded 2D BSFC vs. RPM and Torque');
67
68 % End of script.
69
70 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
71 % Create a 3D grid of BSFC values.
72 BSFC_3 = zeros(100, 100, 100);
73 % Generate random data for BSFC.
74 BSFC_3 = randi(1000, 100, 100, 100);
75 % Plot BSFC vs. RPM and Torque.
76 figure;
77 surf(RPM, Torque, BSFC_3);
78 title('3D BSFC vs. RPM and Torque');
79
80 % Save the plot to a file.
81 save('BSFC_3_plot.mat', 'BSFC_3');
82
83 % Load the plot back into the workspace.
84 load('BSFC_3_plot.mat');
85
86 % Display the plot.
87 figure;
88 surf(RPM, Torque, BSFC_3);
89 title('Loaded 3D BSFC vs. RPM and Torque');
90
91 % End of script.
92
93 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
94 % Create a 2D grid of BSFC values.
95 BSFC_4 = zeros(100, 100);
96 % Generate random data for BSFC.
97 BSFC_4 = randi(1000, 100, 100);
98 % Plot BSFC vs. RPM and Torque.
99 figure;
100 imagesc(RPM, Torque, BSFC_4);
101 title('2D BSFC vs. RPM and Torque');
102
103 % Save the plot to a file.
104 save('BSFC_4_plot.mat', 'BSFC_4');
105
106 % Load the plot back into the workspace.
107 load('BSFC_4_plot.mat');
108
109 % Display the plot.
110 figure;
111 imagesc(RPM, Torque, BSFC_4);
112 title('Loaded 2D BSFC vs. RPM and Torque');
113
114 % End of script.
115
116 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
117 % Create a 3D grid of BSFC values.
118 BSFC_5 = zeros(100, 100, 100);
119 % Generate random data for BSFC.
120 BSFC_5 = randi(1000, 100, 100, 100);
121 % Plot BSFC vs. RPM and Torque.
122 figure;
123 surf(RPM, Torque, BSFC_5);
124 title('3D BSFC vs. RPM and Torque');
125
126 % Save the plot to a file.
127 save('BSFC_5_plot.mat', 'BSFC_5');
128
129 % Load the plot back into the workspace.
130 load('BSFC_5_plot.mat');
131
132 % Display the plot.
133 figure;
134 surf(RPM, Torque, BSFC_5);
135 title('Loaded 3D BSFC vs. RPM and Torque');
136
137 % End of script.
138
139 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
140 % Create a 2D grid of BSFC values.
141 BSFC_6 = zeros(100, 100);
142 % Generate random data for BSFC.
143 BSFC_6 = randi(1000, 100, 100);
144 % Plot BSFC vs. RPM and Torque.
145 figure;
146 imagesc(RPM, Torque, BSFC_6);
147 title('2D BSFC vs. RPM and Torque');
148
149 % Save the plot to a file.
150 save('BSFC_6_plot.mat', 'BSFC_6');
151
152 % Load the plot back into the workspace.
153 load('BSFC_6_plot.mat');
154
155 % Display the plot.
156 figure;
157 imagesc(RPM, Torque, BSFC_6);
158 title('Loaded 2D BSFC vs. RPM and Torque');
159
160 % End of script.
161
162 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
163 % Create a 3D grid of BSFC values.
164 BSFC_7 = zeros(100, 100, 100);
165 % Generate random data for BSFC.
166 BSFC_7 = randi(1000, 100, 100, 100);
167 % Plot BSFC vs. RPM and Torque.
168 figure;
169 surf(RPM, Torque, BSFC_7);
170 title('3D BSFC vs. RPM and Torque');
171
172 % Save the plot to a file.
173 save('BSFC_7_plot.mat', 'BSFC_7');
174
175 % Load the plot back into the workspace.
176 load('BSFC_7_plot.mat');
177
178 % Display the plot.
179 figure;
180 surf(RPM, Torque, BSFC_7);
181 title('Loaded 3D BSFC vs. RPM and Torque');
182
183 % End of script.
184
185 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
186 % Create a 2D grid of BSFC values.
187 BSFC_8 = zeros(100, 100);
188 % Generate random data for BSFC.
189 BSFC_8 = randi(1000, 100, 100);
190 % Plot BSFC vs. RPM and Torque.
191 figure;
192 imagesc(RPM, Torque, BSFC_8);
193 title('2D BSFC vs. RPM and Torque');
194
195 % Save the plot to a file.
196 save('BSFC_8_plot.mat', 'BSFC_8');
197
198 % Load the plot back into the workspace.
199 load('BSFC_8_plot.mat');
200
201 % Display the plot.
202 figure;
203 imagesc(RPM, Torque, BSFC_8);
204 title('Loaded 2D BSFC vs. RPM and Torque');
205
206 % End of script.
207
208 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
209 % Create a 3D grid of BSFC values.
210 BSFC_9 = zeros(100, 100, 100);
211 % Generate random data for BSFC.
212 BSFC_9 = randi(1000, 100, 100, 100);
213 % Plot BSFC vs. RPM and Torque.
214 figure;
215 surf(RPM, Torque, BSFC_9);
216 title('3D BSFC vs. RPM and Torque');
217
218 % Save the plot to a file.
219 save('BSFC_9_plot.mat', 'BSFC_9');
220
221 % Load the plot back into the workspace.
222 load('BSFC_9_plot.mat');
223
224 % Display the plot.
225 figure;
226 surf(RPM, Torque, BSFC_9);
227 title('Loaded 3D BSFC vs. RPM and Torque');
228
229 % End of script.
230
231 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
232 % Create a 2D grid of BSFC values.
233 BSFC_10 = zeros(100, 100);
234 % Generate random data for BSFC.
235 BSFC_10 = randi(1000, 100, 100);
236 % Plot BSFC vs. RPM and Torque.
237 figure;
238 imagesc(RPM, Torque, BSFC_10);
239 title('2D BSFC vs. RPM and Torque');
240
241 % Save the plot to a file.
242 save('BSFC_10_plot.mat', 'BSFC_10');
243
244 % Load the plot back into the workspace.
245 load('BSFC_10_plot.mat');
246
247 % Display the plot.
248 figure;
249 imagesc(RPM, Torque, BSFC_10);
250 title('Loaded 2D BSFC vs. RPM and Torque');
251
252 % End of script.
253
254 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
255 % Create a 3D grid of BSFC values.
256 BSFC_11 = zeros(100, 100, 100);
257 % Generate random data for BSFC.
258 BSFC_11 = randi(1000, 100, 100, 100);
259 % Plot BSFC vs. RPM and Torque.
260 figure;
261 surf(RPM, Torque, BSFC_11);
262 title('3D BSFC vs. RPM and Torque');
263
264 % Save the plot to a file.
265 save('BSFC_11_plot.mat', 'BSFC_11');
266
267 % Load the plot back into the workspace.
268 load('BSFC_11_plot.mat');
269
270 % Display the plot.
271 figure;
272 surf(RPM, Torque, BSFC_11);
273 title('Loaded 3D BSFC vs. RPM and Torque');
274
275 % End of script.
276
277 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
278 % Create a 2D grid of BSFC values.
279 BSFC_12 = zeros(100, 100);
280 % Generate random data for BSFC.
281 BSFC_12 = randi(1000, 100, 100);
282 % Plot BSFC vs. RPM and Torque.
283 figure;
284 imagesc(RPM, Torque, BSFC_12);
285 title('2D BSFC vs. RPM and Torque');
286
287 % Save the plot to a file.
288 save('BSFC_12_plot.mat', 'BSFC_12');
289
290 % Load the plot back into the workspace.
291 load('BSFC_12_plot.mat');
292
293 % Display the plot.
294 figure;
295 imagesc(RPM, Torque, BSFC_12);
296 title('Loaded 2D BSFC vs. RPM and Torque');
297
298 % End of script.
299
300 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
301 % Create a 3D grid of BSFC values.
302 BSFC_13 = zeros(100, 100, 100);
303 % Generate random data for BSFC.
304 BSFC_13 = randi(1000, 100, 100, 100);
305 % Plot BSFC vs. RPM and Torque.
306 figure;
307 surf(RPM, Torque, BSFC_13);
308 title('3D BSFC vs. RPM and Torque');
309
310 % Save the plot to a file.
311 save('BSFC_13_plot.mat', 'BSFC_13');
312
313 % Load the plot back into the workspace.
314 load('BSFC_13_plot.mat');
315
316 % Display the plot.
317 figure;
318 surf(RPM, Torque, BSFC_13);
319 title('Loaded 3D BSFC vs. RPM and Torque');
320
321 % End of script.
322
323 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
324 % Create a 2D grid of BSFC values.
325 BSFC_14 = zeros(100, 100);
326 % Generate random data for BSFC.
327 BSFC_14 = randi(1000, 100, 100);
328 % Plot BSFC vs. RPM and Torque.
329 figure;
330 imagesc(RPM, Torque, BSFC_14);
331 title('2D BSFC vs. RPM and Torque');
332
333 % Save the plot to a file.
334 save('BSFC_14_plot.mat', 'BSFC_14');
335
336 % Load the plot back into the workspace.
337 load('BSFC_14_plot.mat');
338
339 % Display the plot.
340 figure;
341 imagesc(RPM, Torque, BSFC_14);
342 title('Loaded 2D BSFC vs. RPM and Torque');
343
344 % End of script.
345
346 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
347 % Create a 3D grid of BSFC values.
348 BSFC_15 = zeros(100, 100, 100);
349 % Generate random data for BSFC.
350 BSFC_15 = randi(1000, 100, 100, 100);
351 % Plot BSFC vs. RPM and Torque.
352 figure;
353 surf(RPM, Torque, BSFC_15);
354 title('3D BSFC vs. RPM and Torque');
355
356 % Save the plot to a file.
357 save('BSFC_15_plot.mat', 'BSFC_15');
358
359 % Load the plot back into the workspace.
360 load('BSFC_15_plot.mat');
361
362 % Display the plot.
363 figure;
364 surf(RPM, Torque, BSFC_15);
365 title('Loaded 3D BSFC vs. RPM and Torque');
366
367 % End of script.
368
369 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
370 % Create a 2D grid of BSFC values.
371 BSFC_16 = zeros(100, 100);
372 % Generate random data for BSFC.
373 BSFC_16 = randi(1000, 100, 100);
374 % Plot BSFC vs. RPM and Torque.
375 figure;
376 imagesc(RPM, Torque, BSFC_16);
377 title('2D BSFC vs. RPM and Torque');
378
379 % Save the plot to a file.
380 save('BSFC_16_plot.mat', 'BSFC_16');
381
382 % Load the plot back into the workspace.
383 load('BSFC_16_plot.mat');
384
385 % Display the plot.
386 figure;
387 imagesc(RPM, Torque, BSFC_16);
388 title('Loaded 2D BSFC vs. RPM and Torque');
389
390 % End of script.
391
392 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
393 % Create a 3D grid of BSFC values.
394 BSFC_17 = zeros(100, 100, 100);
395 % Generate random data for BSFC.
396 BSFC_17 = randi(1000, 100, 100, 100);
397 % Plot BSFC vs. RPM and Torque.
398 figure;
399 surf(RPM, Torque, BSFC_17);
400 title('3D BSFC vs. RPM and Torque');
401
402 % Save the plot to a file.
403 save('BSFC_17_plot.mat', 'BSFC_17');
404
405 % Load the plot back into the workspace.
406 load('BSFC_17_plot.mat');
407
408 % Display the plot.
409 figure;
410 surf(RPM, Torque, BSFC_17);
411 title('Loaded 3D BSFC vs. RPM and Torque');
412
413 % End of script.
414
415 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
416 % Create a 2D grid of BSFC values.
417 BSFC_18 = zeros(100, 100);
418 % Generate random data for BSFC.
419 BSFC_18 = randi(1000, 100, 100);
420 % Plot BSFC vs. RPM and Torque.
421 figure;
422 imagesc(RPM, Torque, BSFC_18);
423 title('2D BSFC vs. RPM and Torque');
424
425 % Save the plot to a file.
426 save('BSFC_18_plot.mat', 'BSFC_18');
427
428 % Load the plot back into the workspace.
429 load('BSFC_18_plot.mat');
430
431 % Display the plot.
432 figure;
433 imagesc(RPM, Torque, BSFC_18);
434 title('Loaded 2D BSFC vs. RPM and Torque');
435
436 % End of script.
437
438 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
439 % Create a 3D grid of BSFC values.
440 BSFC_19 = zeros(100, 100, 100);
441 % Generate random data for BSFC.
442 BSFC_19 = randi(1000, 100, 100, 100);
443 % Plot BSFC vs. RPM and Torque.
444 figure;
445 surf(RPM, Torque, BSFC_19);
446 title('3D BSFC vs. RPM and Torque');
447
448 % Save the plot to a file.
449 save('BSFC_19_plot.mat', 'BSFC_19');
450
451 % Load the plot back into the workspace.
452 load('BSFC_19_plot.mat');
453
454 % Display the plot.
455 figure;
456 surf(RPM, Torque, BSFC_19);
457 title('Loaded 3D BSFC vs. RPM and Torque');
458
459 % End of script.
460
461 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
462 % Create a 2D grid of BSFC values.
463 BSFC_20 = zeros(100, 100);
464 % Generate random data for BSFC.
465 BSFC_20 = randi(1000, 100, 100);
466 % Plot BSFC vs. RPM and Torque.
467 figure;
468 imagesc(RPM, Torque, BSFC_20);
469 title('2D BSFC vs. RPM and Torque');
470
471 % Save the plot to a file.
472 save('BSFC_20_plot.mat', 'BSFC_20');
473
474 % Load the plot back into the workspace.
475 load('BSFC_20_plot.mat');
476
477 % Display the plot.
478 figure;
479 imagesc(RPM, Torque, BSFC_20);
480 title('Loaded 2D BSFC vs. RPM and Torque');
481
482 % End of script.
483
484 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
485 % Create a 3D grid of BSFC values.
486 BSFC_21 = zeros(100, 100, 100);
487 % Generate random data for BSFC.
488 BSFC_21 = randi(1000, 100, 100, 100);
489 % Plot BSFC vs. RPM and Torque.
490 figure;
491 surf(RPM, Torque, BSFC_21);
492 title('3D BSFC vs. RPM and Torque');
493
494 % Save the plot to a file.
495 save('BSFC_21_plot.mat', 'BSFC_21');
496
497 % Load the plot back into the workspace.
498 load('BSFC_21_plot.mat');
499
500 % Display the plot.
501 figure;
502 surf(RPM, Torque, BSFC_21);
503 title('Loaded 3D BSFC vs. RPM and Torque');
504
505 % End of script.
506
507 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
508 % Create a 2D grid of BSFC values.
509 BSFC_22 = zeros(100, 100);
510 % Generate random data for BSFC.
511 BSFC_22 = randi(1000, 100, 100);
512 % Plot BSFC vs. RPM and Torque.
513 figure;
514 imagesc(RPM, Torque, BSFC_22);
515 title('2D BSFC vs. RPM and Torque');
516
517 % Save the plot to a file.
518 save('BSFC_22_plot.mat', 'BSFC_22');
519
520 % Load the plot back into the workspace.
521 load('BSFC_22_plot.mat');
522
523 % Display the plot.
524 figure;
525 imagesc(RPM, Torque, BSFC_22);
526 title('Loaded 2D BSFC vs. RPM and Torque');
527
528 % End of script.
529
530 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
531 % Create a 3D grid of BSFC values.
532 BSFC_23 = zeros(100, 100, 100);
533 % Generate random data for BSFC.
534 BSFC_23 = randi(1000, 100, 100, 100);
535 % Plot BSFC vs. RPM and Torque.
536 figure;
537 surf(RPM, Torque, BSFC_23);
538 title('3D BSFC vs. RPM and Torque');
539
540 % Save the plot to a file.
541 save('BSFC_23_plot.mat', 'BSFC_23');
542
543 % Load the plot back into the workspace.
544 load('BSFC_23_plot.mat');
545
546 % Display the plot.
547 figure;
548 surf(RPM, Torque, BSFC_23);
549 title('Loaded 3D BSFC vs. RPM and Torque');
550
551 % End of script.
552
553 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
554 % Create a 2D grid of BSFC values.
555 BSFC_24 = zeros(100, 100);
556 % Generate random data for BSFC.
557 BSFC_24 = randi(1000, 100, 100);
558 % Plot BSFC vs. RPM and Torque.
559 figure;
560 imagesc(RPM, Torque, BSFC_24);
561 title('2D BSFC vs. RPM and Torque');
562
563 % Save the plot to a file.
564 save('BSFC_24_plot.mat', 'BSFC_24');
565
566 % Load the plot back into the workspace.
567 load('BSFC_24_plot.mat');
568
569 % Display the plot.
570 figure;
571 imagesc(RPM, Torque, BSFC_24);
572 title('Loaded 2D BSFC vs. RPM and Torque');
573
574 % End of script.
575
576 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
577 % Create a 3D grid of BSFC values.
578 BSFC_25 = zeros(100, 100, 100);
579 % Generate random data for BSFC.
580 BSFC_25 = randi(1000, 100, 100, 100);
581 % Plot BSFC vs. RPM and Torque.
582 figure;
583 surf(RPM, Torque, BSFC_25);
584 title('3D BSFC vs. RPM and Torque');
585
586 % Save the plot to a file.
587 save('BSFC_25_plot.mat', 'BSFC_25');
588
589 % Load the plot back into the workspace.
590 load('BSFC_25_plot.mat');
591
592 % Display the plot.
593 figure;
594 surf(RPM, Torque, BSFC_25);
595 title('Loaded 3D BSFC vs. RPM and Torque');
596
597 % End of script.
598
599 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
600 % Create a 2D grid of BSFC values.
601 BSFC_26 = zeros(100, 100);
602 % Generate random data for BSFC.
603 BSFC_26 = randi(1000, 100, 100);
604 % Plot BSFC vs. RPM and Torque.
605 figure;
606 imagesc(RPM, Torque, BSFC_26);
607 title('2D BSFC vs. RPM and Torque');
608
609 % Save the plot to a file.
610 save('BSFC_26_plot.mat', 'BSFC_26');
611
612 % Load the plot back into the workspace.
613 load('BSFC_26_plot.mat');
614
615 % Display the plot.
616 figure;
617 imagesc(RPM, Torque, BSFC_26);
618 title('Loaded 2D BSFC vs. RPM and Torque');
619
620 % End of script.
621
622 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
623 % Create a 3D grid of BSFC values.
624 BSFC_27 = zeros(100, 100, 100);
625 % Generate random data for BSFC.
626 BSFC_27 = randi(1000, 100, 100, 100);
627 % Plot BSFC vs. RPM and Torque.
628 figure;
629 surf(RPM, Torque, BSFC_27);
630 title('3D BSFC vs. RPM and Torque');
631
632 % Save the plot to a file.
633 save('BSFC_27_plot.mat', 'BSFC_27');
634
635 % Load the plot back into the workspace.
636 load('BSFC_27_plot.mat');
637
638 % Display the plot.
639 figure;
640 surf(RPM, Torque, BSFC_27);
641 title('Loaded 3D BSFC vs. RPM and Torque');
642
643 % End of script.
644
645 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
646 % Create a 2D grid of BSFC values.
647 BSFC_28 = zeros(100, 100);
648 % Generate random data for BSFC.
649 BSFC_28 = randi(1000, 100, 100);
650 % Plot BSFC vs. RPM and Torque.
651 figure;
652 imagesc(RPM, Torque, BSFC_28);
653 title('2D BSFC vs. RPM and Torque');
654
655 % Save the plot to a file.
656 save('BSFC_28_plot.mat', 'BSFC_28');
657
658 % Load the plot back into the workspace.
659 load('BSFC_28_plot.mat');
660
661 % Display the plot.
662 figure;
663 imagesc(RPM, Torque, BSFC_28);
664 title('Loaded 2D BSFC vs. RPM and Torque');
665
666 % End of script.
667
668 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
669 % Create a 3D grid of BSFC values.
670 BSFC_29 = zeros(100, 100, 100);
671 % Generate random data for BSFC.
672 BSFC_29 = randi(1000, 100, 100, 100);
673 % Plot BSFC vs. RPM and Torque.
674 figure;
675 surf(RPM, Torque, BSFC_29);
676 title('3D BSFC vs. RPM and Torque');
677
678 % Save the plot to a file.
679 save('BSFC_29_plot.mat', 'BSFC_29');
680
681 % Load the plot back into the workspace.
682 load('BSFC_29_plot.mat');
683
684 % Display the plot.
685 figure;
686 surf(RPM, Torque, BSFC_29);
687 title('Loaded 3D BSFC vs. RPM and Torque');
688
689 % End of script.
690
691 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
692 % Create a 2D grid of BSFC values.
693 BSFC_30 = zeros(100, 100);
694 % Generate random data for BSFC.
695 BSFC_30 = randi(1000, 100, 100);
696 % Plot BSFC vs. RPM and Torque.
697 figure;
698 imagesc(RPM, Torque, BSFC_30);
699 title('2D BSFC vs. RPM and Torque');
700
701 % Save the plot to a file.
702 save('BSFC_30_plot.mat', 'BSFC_30');
703
704 % Load the plot back into the workspace.
705 load('BSFC_30_plot.mat');
706
707 % Display the plot.
708 figure;
709 imagesc(RPM, Torque, BSFC_30);
710 title('Loaded 2D BSFC vs. RPM and Torque');
711
712 % End of script.
713
714 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
715 % Create a 3D grid of BSFC values.
716 BSFC_31 = zeros(100, 100, 100);
717 % Generate random data for BSFC.
718 BSFC_31 = randi(1000, 100, 100, 100);
719 % Plot BSFC vs. RPM and Torque.
720 figure;
721 surf(RPM, Torque, BSFC_31);
722 title('3D BSFC vs. RPM and Torque');
723
724 % Save the plot to a file.
725 save('BSFC_31_plot.mat', 'BSFC_31');
726
727 % Load the plot back into the workspace.
728 load('BSFC_31_plot.mat');
729
730 % Display the plot.
731 figure;
732 surf(RPM, Torque, BSFC_31);
733 title('Loaded 3D BSFC vs. RPM and Torque');
734
735 % End of script.
736
737 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
738 % Create a 2D grid of BSFC values.
739 BSFC_32 = zeros(100, 100);
740 % Generate random data for BSFC.
741 BSFC_32 = randi(1000, 100, 100);
742 % Plot BSFC vs. RPM and Torque.
743 figure;
744 imagesc(RPM, Torque, BSFC_32);
745 title('2D BSFC vs. RPM and Torque');
746
747 % Save the plot to a file.
748 save('BSFC_32_plot.mat', 'BSFC_32');
749
750 % Load the plot back into the workspace.
751 load('BSFC_32_plot.mat');
752
753 % Display the plot.
754 figure;
755 imagesc(RPM, Torque, BSFC_32);
756 title('Loaded 2D BSFC vs. RPM and Torque');
757
758 % End of script.
759
760 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
761 % Create a 3D grid of BSFC values.
762 BSFC_33 = zeros(100, 100, 100);
763 % Generate random data for BSFC.
764 BSFC_33 = randi(1000, 100, 100, 100);
765 % Plot BSFC vs. RPM and Torque.
766 figure;
767 surf(RPM, Torque, BSFC_33);
768 title('3D BSFC vs. RPM and Torque');
769
770 % Save the plot to a file.
771 save('BSFC_33_plot.mat', 'BSFC_33');
772
773 % Load the plot back into the workspace.
774 load('BSFC_33_plot.mat');
775
776 % Display the plot.
777 figure;
778 surf(RPM, Torque, BSFC_33);
779 title('Loaded 3D BSFC vs. RPM and Torque');
780
781 % End of script.
782
783 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
784 % Create a 2D grid of BSFC values.
785 BSFC_34 = zeros(100, 100);
786 % Generate random data for BSFC.
787 BSFC_34 = randi(1000, 100, 100);
788 % Plot BSFC vs. RPM and Torque.
789 figure;
790 imagesc(RPM, Torque, BSFC_34);
791 title('2D BSFC vs. RPM and Torque');
792
793 % Save the plot to a file.
794 save('BSFC_34_plot.mat', 'BSFC_34');
795
796 % Load the plot back into the workspace.
797 load('BSFC_34_plot.mat');
798
799 % Display the plot.
800 figure;
801 imagesc(RPM, Torque, BSFC_34);
802 title('Loaded 2D BSFC vs. RPM and Torque');
803
804 % End of script.
805
806 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
807 % Create a 3D grid of BSFC values.
808 BSFC_35 = zeros(100, 100, 100);
809 % Generate random data for BSFC.
810 BSFC_35 = randi(1000, 100, 100, 100);
811 % Plot BSFC vs. RPM and Torque.
812 figure;
813 surf(RPM, Torque, BSFC_35);
814 title('3D BSFC vs. RPM and Torque');
815
816 % Save the plot to a file.
817 save('BSFC_35_plot.mat', 'BSFC_35');
818
819 % Load the plot back into the workspace.
820 load('BSFC_35_plot.mat');
821
822 % Display the plot.
823 figure;
824 surf(RPM, Torque, BSFC_35);
825 title('Loaded 3D BSFC vs. RPM and Torque');
826
827 % End of script.
828
829 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
830 % Create a 2D grid of BSFC values.
831 BSFC_36 = zeros(100, 100);
832 % Generate random data for BSFC.
833 BSFC_36 = randi(1000, 100, 100);
834 % Plot BSFC vs. RPM and Torque.
835 figure;
836 imagesc(RPM, Torque, BSFC_36);
837 title('2D BSFC vs. RPM and Torque');
838
839 % Save the plot to a file.
840 save('BSFC_36_plot.mat', 'BSFC_36');
841
842 % Load the plot back into the workspace.
843 load('BSFC_36_plot.mat');
844
845 % Display the plot.
846 figure;
847 imagesc(RPM, Torque, BSFC_36);
848 title('Loaded 2D BSFC vs. RPM and Torque');
849
850 % End of script.
851
852 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
853 % Create a 3D grid of BSFC values.
854 BSFC_37 = zeros(100, 100, 100);
855 % Generate random data for BSFC.
856 BSFC_37 = randi(1000, 100, 100, 100);
857 % Plot BSFC vs. RPM and Torque.
858 figure;
859 surf(RPM, Torque, BSFC_37);
860 title('3D BSFC vs. RPM and Torque');
861
862 % Save the plot to a file.
863 save('BSFC_37_plot.mat', 'BSFC_37');
864
865 % Load the plot back into the workspace.
866 load('BSFC_37_plot.mat');
867
868 % Display the plot.
869 figure;
870 surf(RPM, Torque, BSFC_37);
871 title('Loaded 3D BSFC vs. RPM and Torque');
872
873 % End of script.
874
875 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
876 % Create a 2D grid of BSFC values.
877 BSFC_38 = zeros(100, 100);
878 % Generate random data for BSFC.
879 BSFC_38 = randi(1000, 100, 100);
880 % Plot BSFC vs. RPM and Torque.
881 figure;
882 imagesc(RPM, Torque, BSFC_38);
883 title('2D BSFC vs. RPM and Torque');
884
885 % Save the plot to a file.
886 save('BSFC_38_plot.mat', 'BSFC_38');
887
888 % Load the plot back into the workspace.
889 load('BSFC_38_plot.mat');
890
891 % Display the plot.
892 figure;
893 imagesc(RPM, Torque, BSFC_38);
894 title('Loaded 2D BSFC vs. RPM and Torque');
895
896 % End of script.
897
898 % Example: Generate a 3D plot of BSFC vs. RPM and Torque.
899 % Create a 3D grid of BSFC values.
900 BSFC_39 = zeros(100, 100, 100);
901 % Generate random data for BSFC.
902 BSFC_39 = randi(1000, 100, 100, 100);
903 % Plot BSFC vs. RPM and Torque.
904 figure;
905 surf(RPM, Torque, BSFC_39);
906 title('3D BSFC vs. RPM and Torque');
907
908 % Save the plot to a file.
909 save('BSFC_39_plot.mat', 'BSFC_39');
910
911 % Load the plot back into the workspace.
912 load('BSFC_39_plot.mat');
913
914 % Display the plot.
915 figure;
916 surf(RPM, Torque, BSFC_39);
917 title('Loaded 3D BSFC vs. RPM and Torque');
918
919 % End of script.
920
921 % Example: Generate a 2D plot of BSFC vs. RPM and Torque.
922 % Create a 2D grid of BSFC values.
923 BSFC_40 = zeros(100, 100);
924 % Generate random data for BSFC.
925 BSFC_40 = randi(1000, 100, 100);
926 % Plot BSFC vs. RPM and Torque.
927 figure;
928 imagesc(RPM, Torque, BSFC_40);
929 title('2D BSFC vs. RPM and Torque');
930
931 % Save the plot to a file.
932 save('BSFC_40_plot.mat', 'BSFC_40');
933
934 % Load the plot back into the workspace.
935 load('BSFC_40_plot.mat');
936
937 % Display the plot.
938 figure;
939 imagesc(RPM, Torque, BSFC_40);
940 title('Loaded 2D BSFC vs. RPM and Torque');
941
942
```

汽车大数据平台的架构

应用层



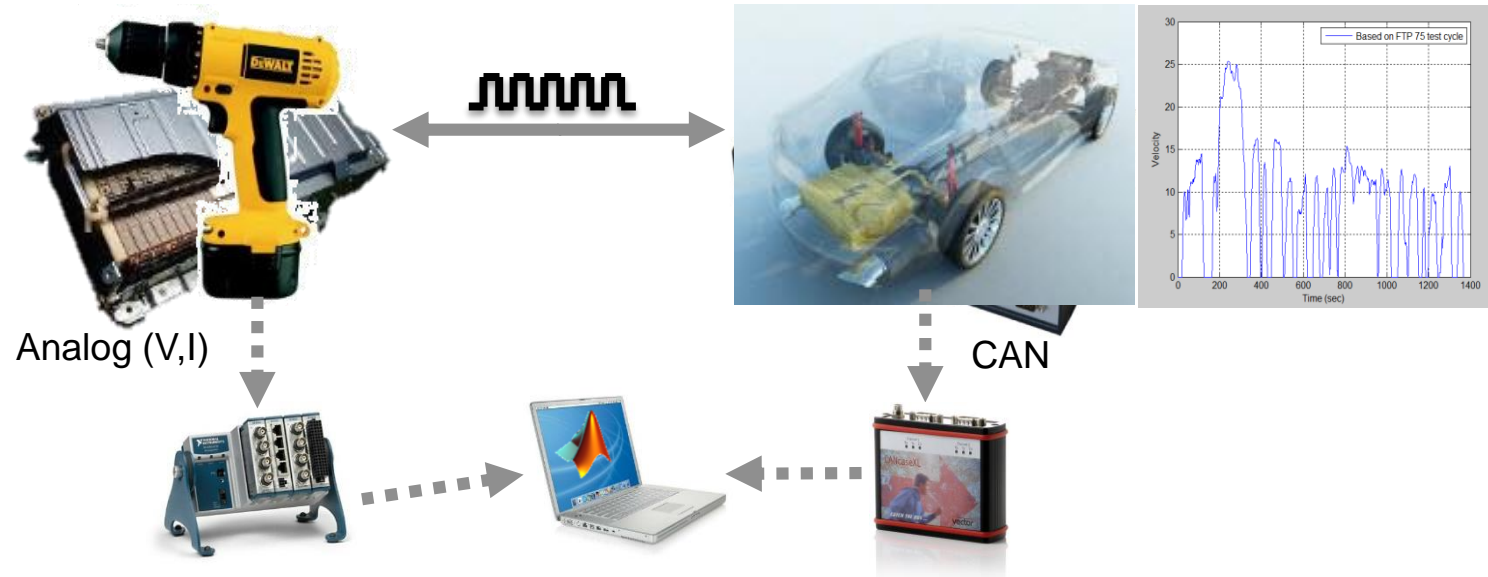
开发层



数据层



数据收集



- Data collection
 - Types of data
 - Analog/PWM/Digital
 - CAN
 - Data integrity
 - Detect intermittent connections
 - Signal threshold limits

从硬件设备获取数据

Data Acquisition Toolbox
 Plug-in data acquisition devices
 and sound cards



Vehicle Network Toolbox
 CAN bus interface devices



Instrument Control Toolbox
 Instruments and RS-232
 serial devices



Image Acquisition Toolbox
 Image capture devices

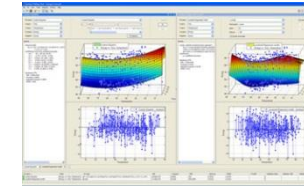
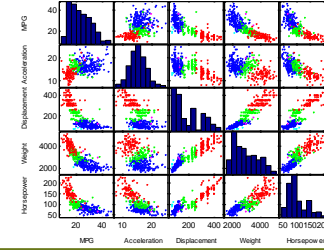


MATLAB
 Interfaces for communicating
 with everything

分析的内容

Statistics

- Summary Statistics
- Regression, ANOVA, Machine Learning



Signal Processing

- Sound quality analysis
- LIDAR analysis

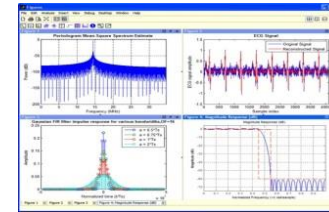


Image Processing

- Active Safety

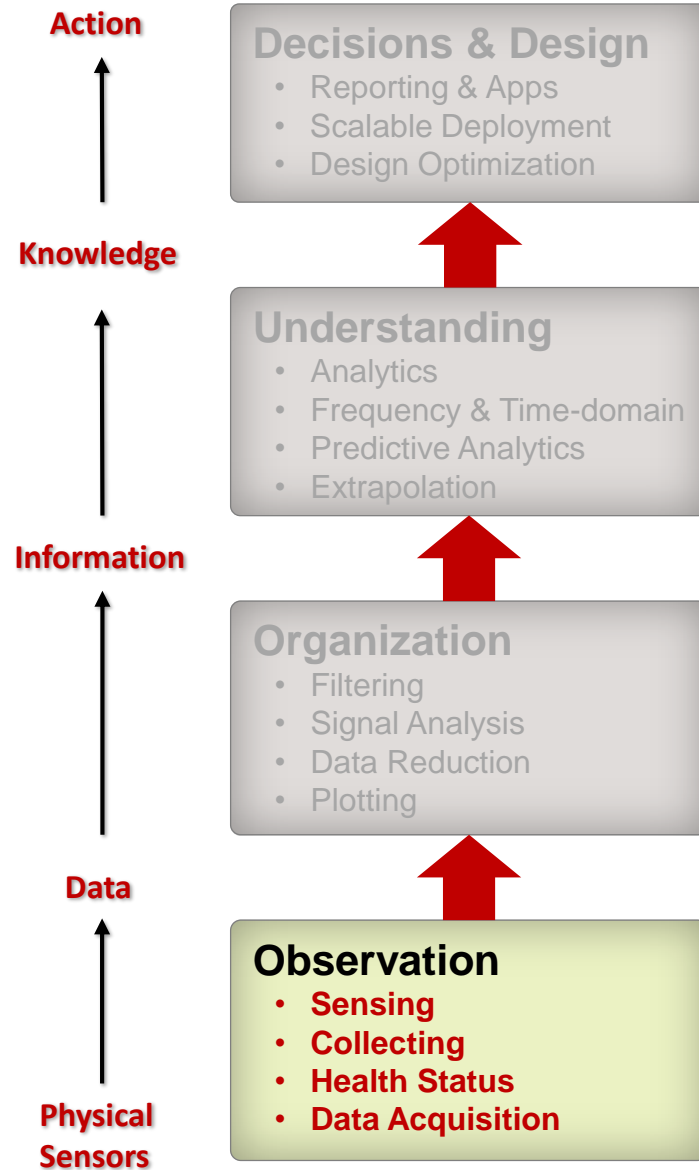


Location/Mapping

- Analyzing GPS Data
- Custom Visualizations



分析流程



Database Access

- Financial Data
- ODBC
- JDBC
- HDFS (Hadoop)

File I/O

- Text
- Spreadsheet
- XML
- CDF/HDF
- Image
- Audio
- Video
- Geospatial
- Web content



Hardware Access

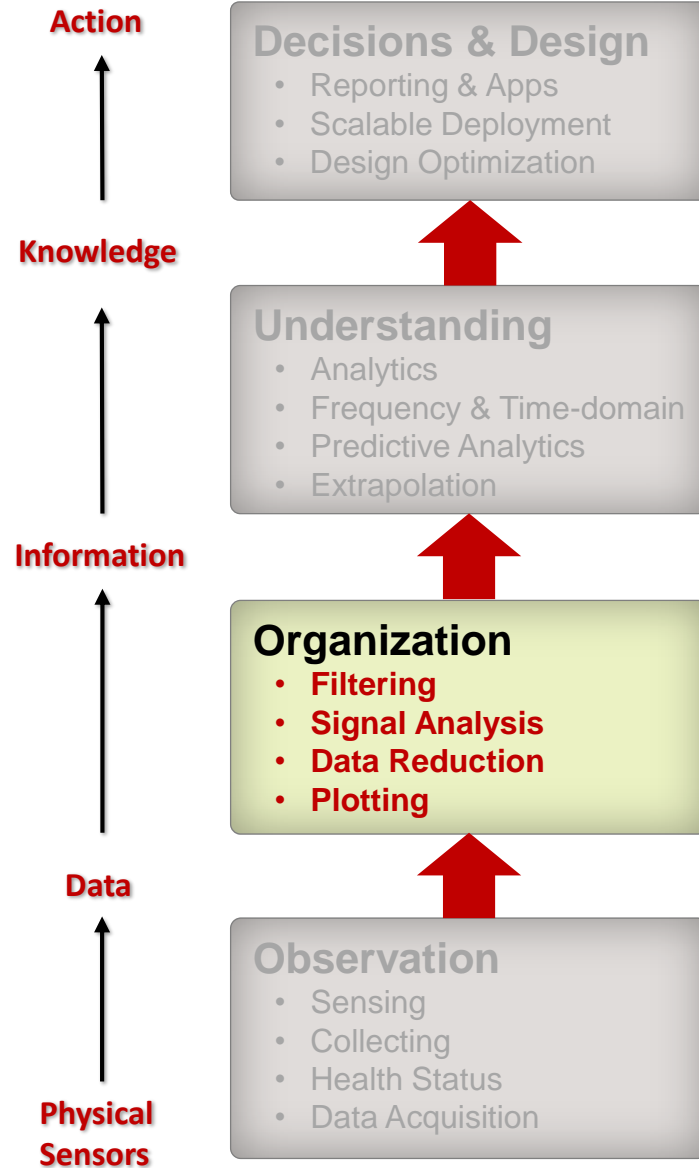
- Data acquisition
- Image capture
- GPU
- Lab instruments



Communication Protocols

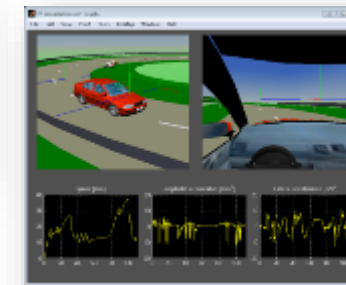
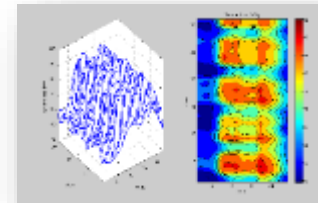
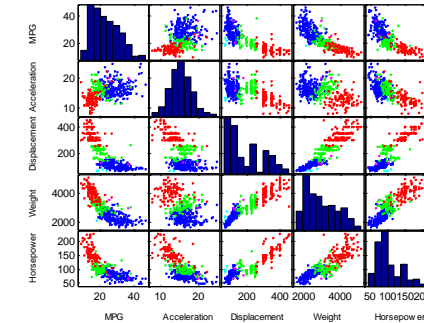
- CAN (Controller Area Network)
- DDS (Data Distribution Service)
- OPC (OLE for Process Control)
- XCP (eXplicit Control Protocol)

分析流程



Exploratory Analysis

Derived metrics, events, conditions

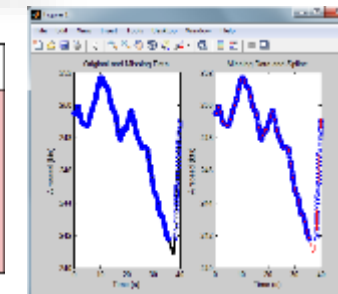


Visualization

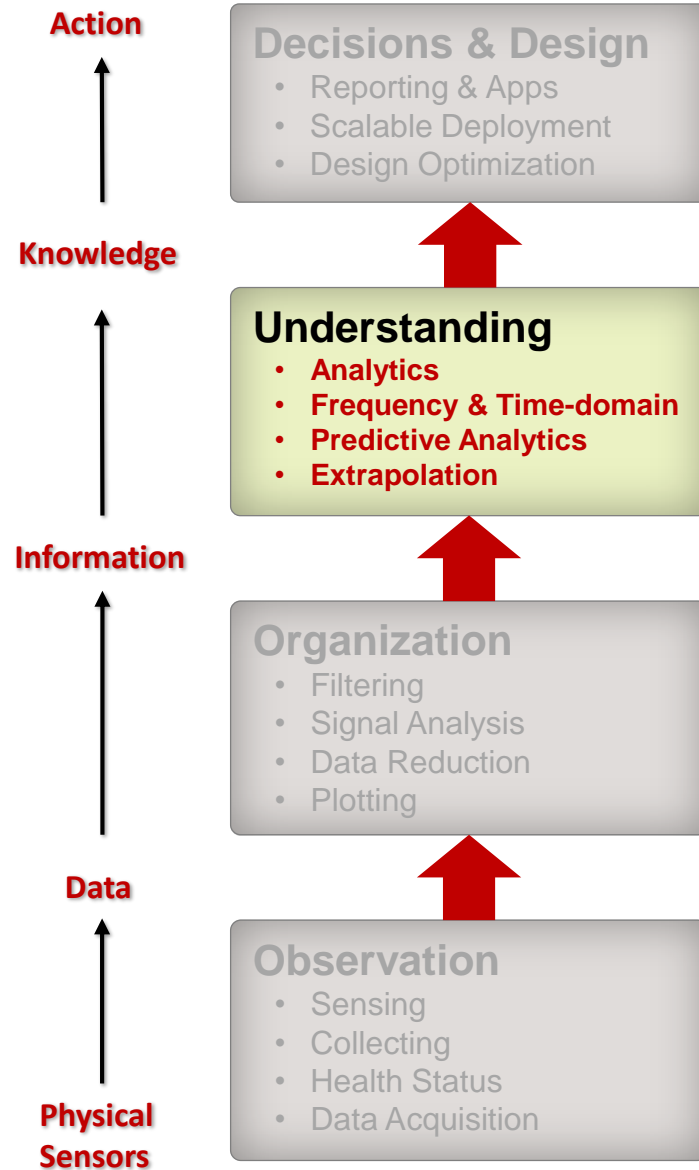
Data Processing

Convert, Sync, Clean, Reduce

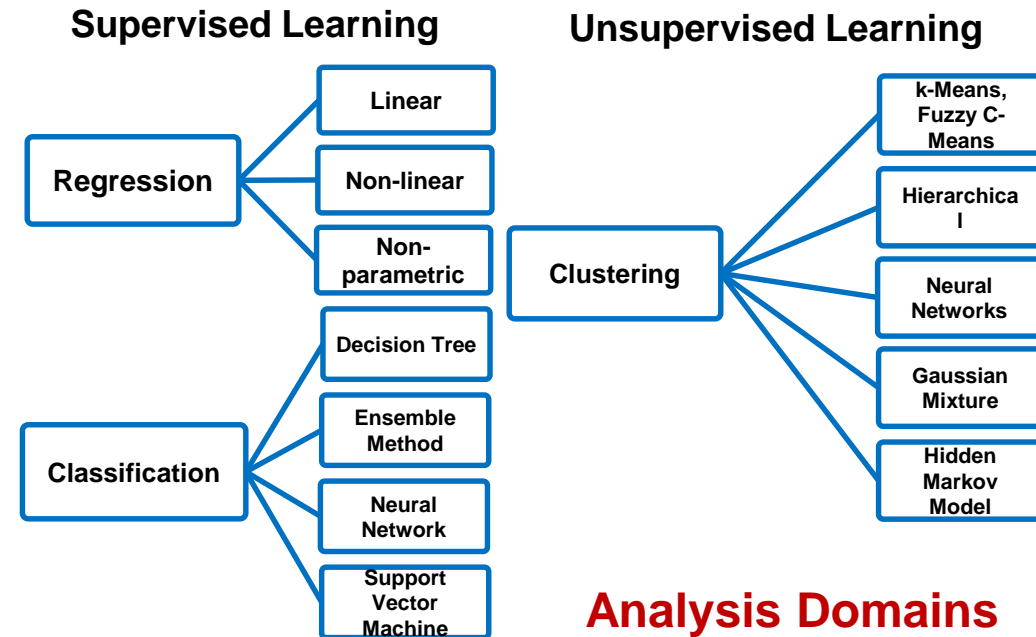
Key	B	Y	Z
1	1.1	0.1	0.2
4	1.4	NaN	NaN
7	1.7	0.7	0.8
9	1.9	NaN	NaN



分析流程



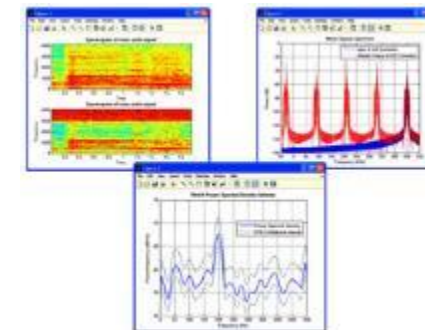
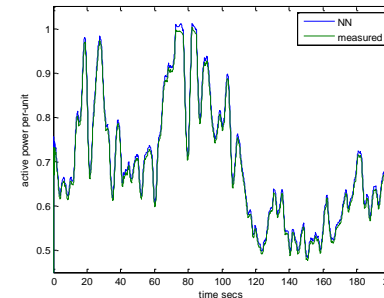
Machine Learning



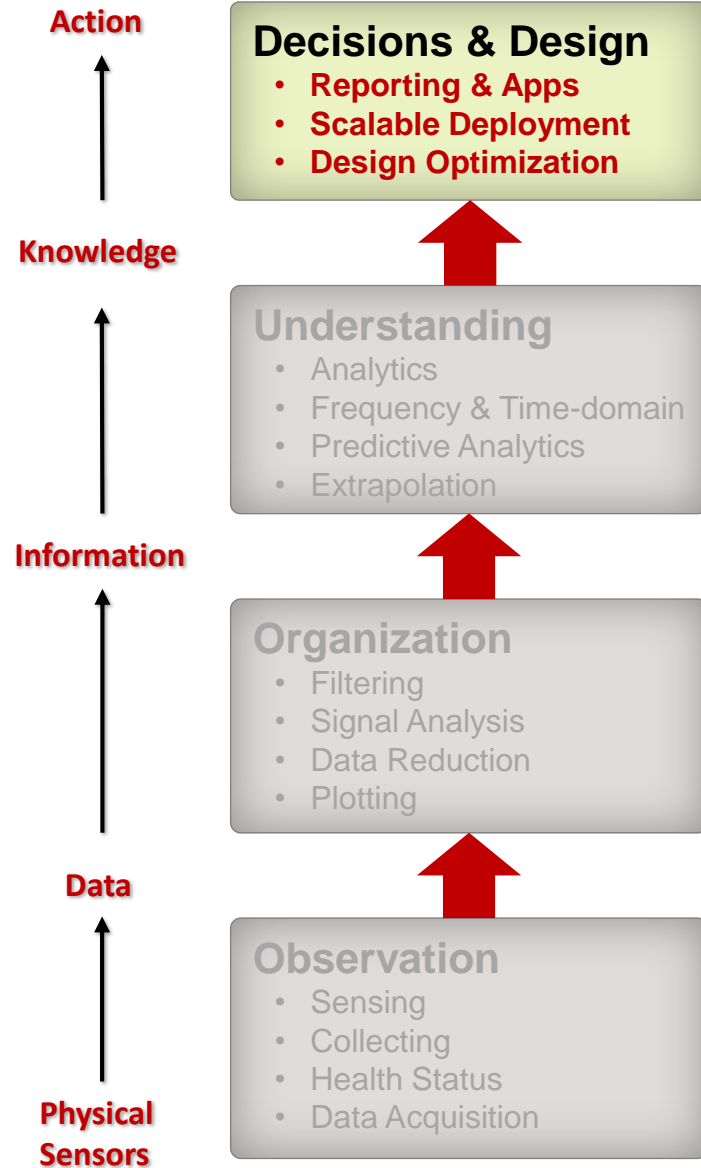
Analysis Domains

- Time & Frequency
- Image, video
- Location, mapping
- Custom

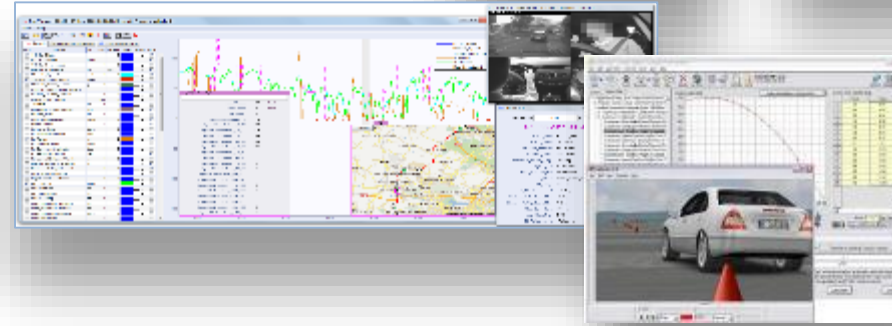
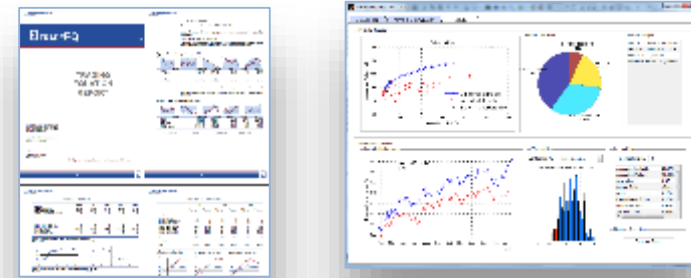
Predictive Analytics



分析流程



Custom Reports

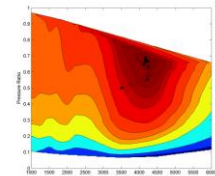


MATLAB Apps

Integration into Existing Systems & Production Deployment



MATLAB Excel
.NET C/C++
.exe Java .dll

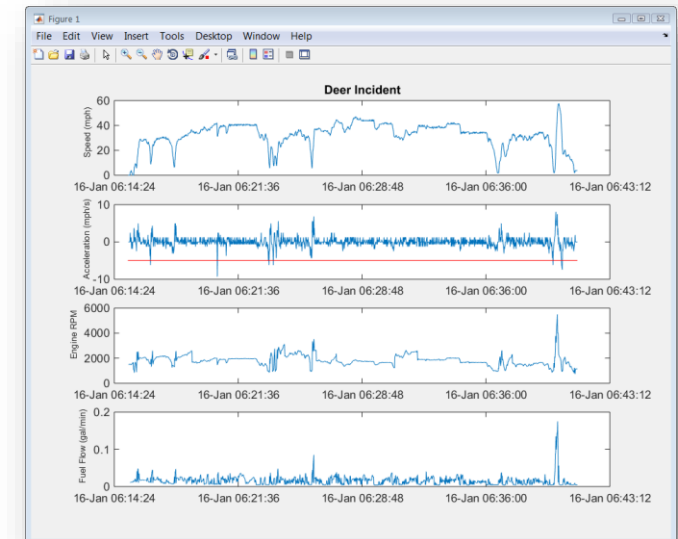


Design Optimization

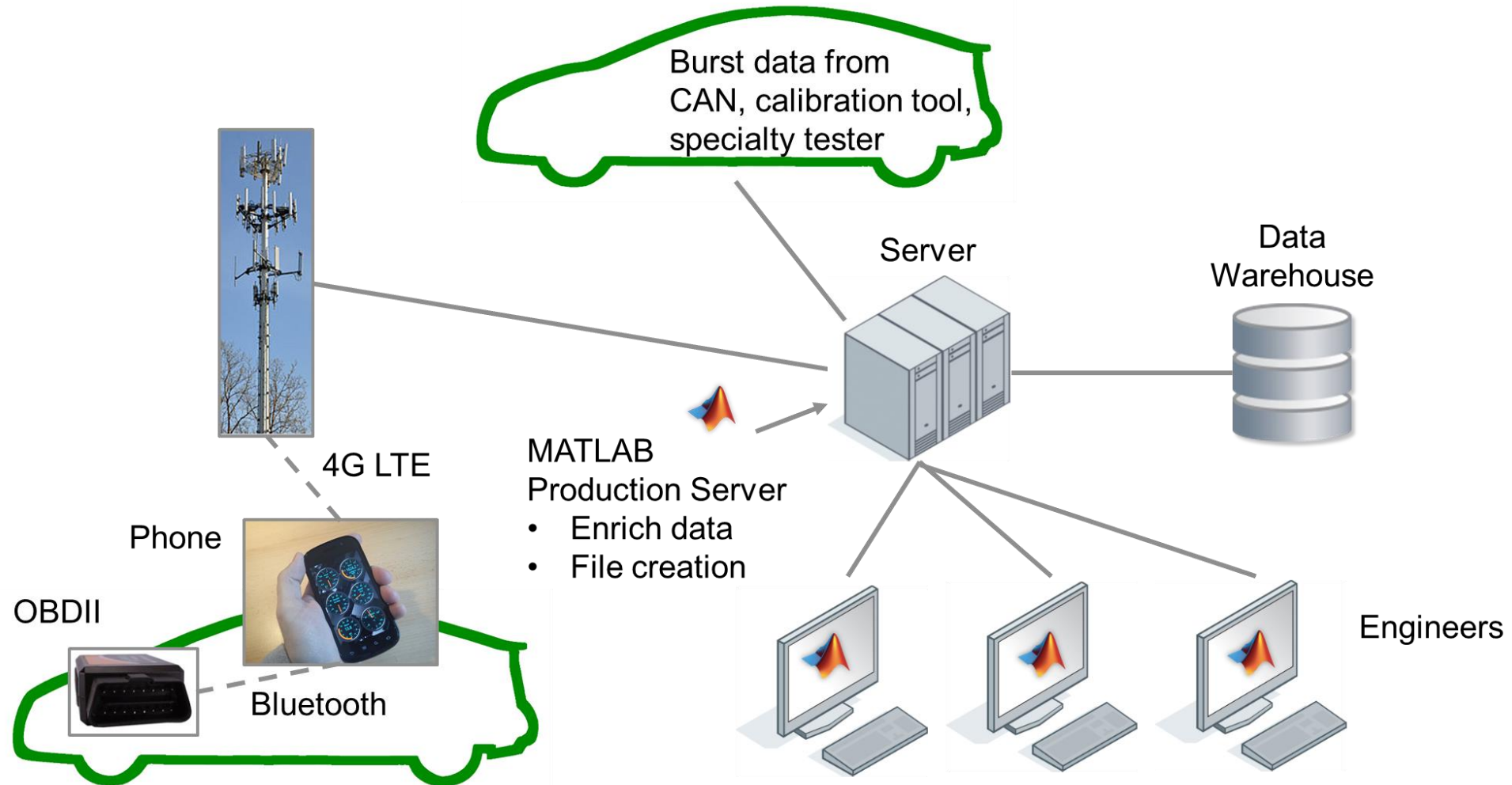
- Maximize Fuel Efficiency
- Minimize Risk
- Maximize Profits

案例1: 汽车运行参数分析

- Leverage fleet data for design decisions
 - Emissions, fuel economy, prognostics, vehicle dynamics, ride and handling, durability, ...
- Reproduce full range of real-world conditions in MIL/HIL tests
 - Engine, prognostics, active safety, hybrid/EV, ...



构建数据收集系统



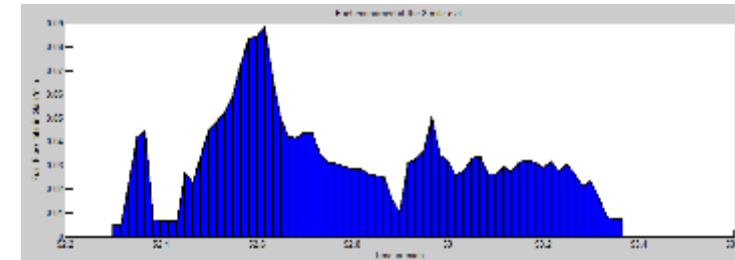
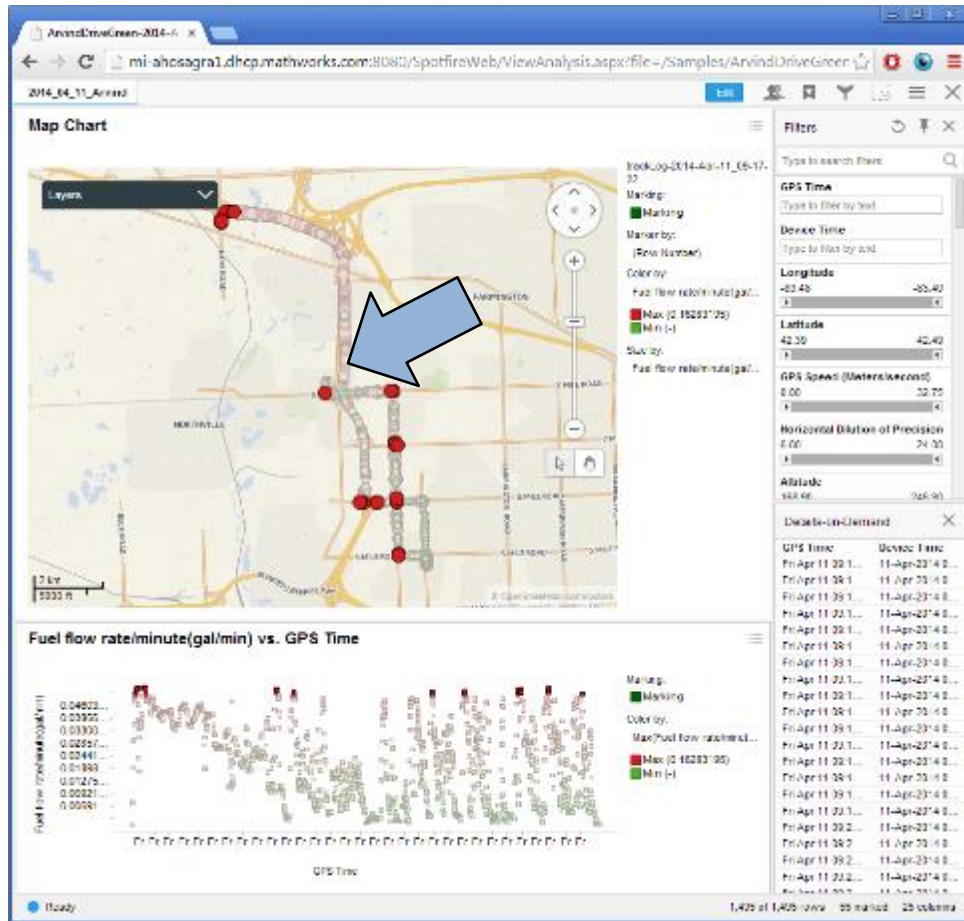
汽车设置

- OBD2 Data from a variety of automobiles.
- COTS hardware (\$8-10)
- Off-the-shelf logging software
Torque-BHP (Android)
- Samsung Galaxy Note[®] II
- AT&T[™] 4G, Amazon[™] EC2[™],
Apache[™] Hadoop[®]



分析内容 (8 mile traffic)

- Traffic Patterns (the case for roundabouts)



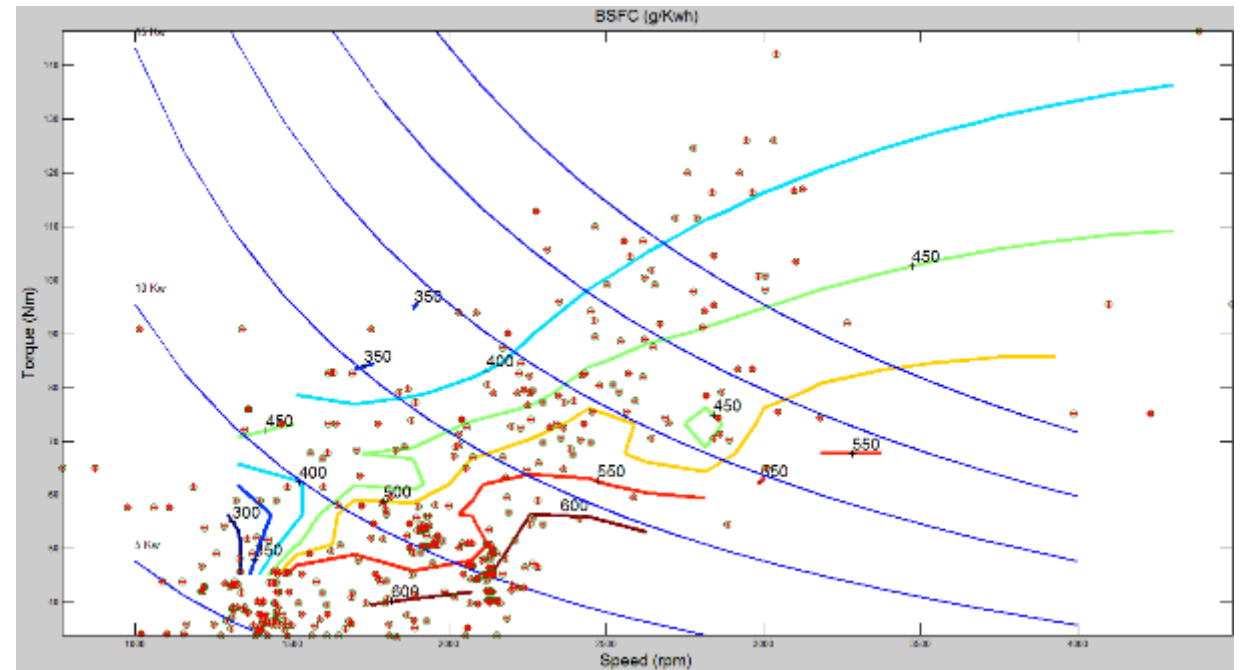
- 0.0351 Gal/car at the intersection
- 12 cars a minute on the average



- A saving of 121.3 gallons of gasoline per day if the traffic lights were replaced with a round-about.
- A rough saving of 4.5 million pounds of CO2 per year.

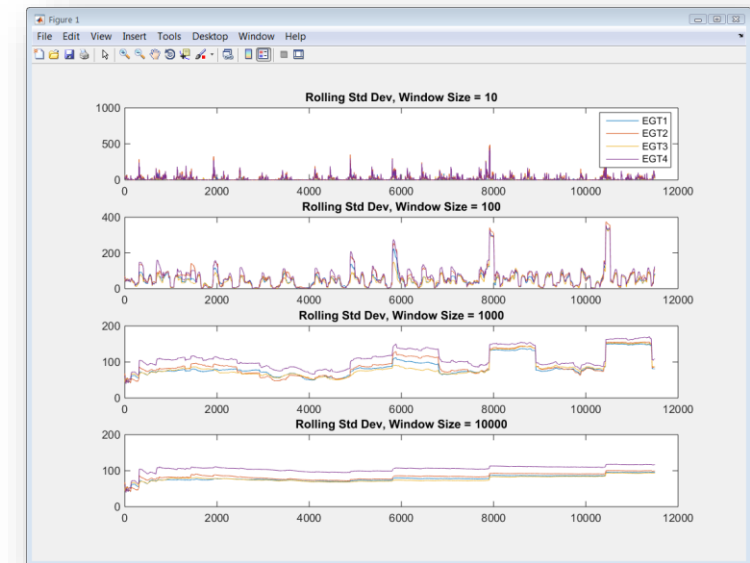
分析内容 (Engine Fuel Consumption and Efficiency)

- Understanding of Real-world driving patterns
- Design Value based on calibration driven by real world data
- Optimization of Fuel Consumption and Shift Schedules
- Driver Variability (FFT of Throttle Position)



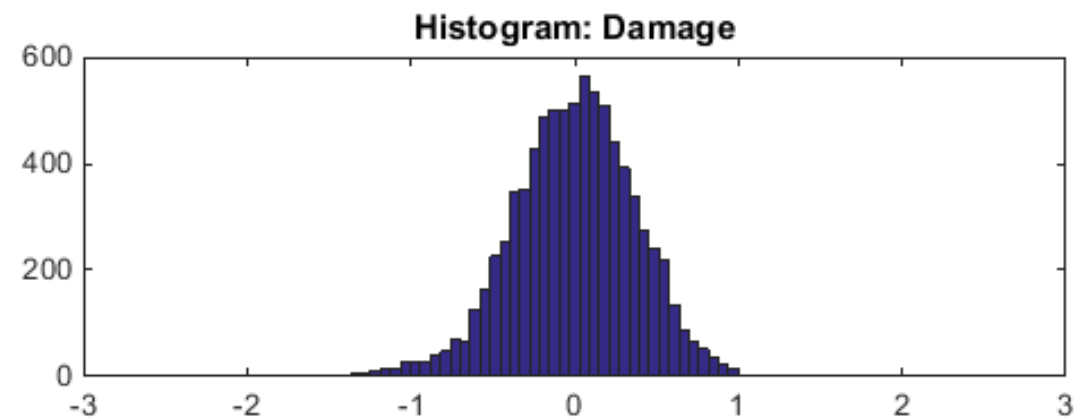
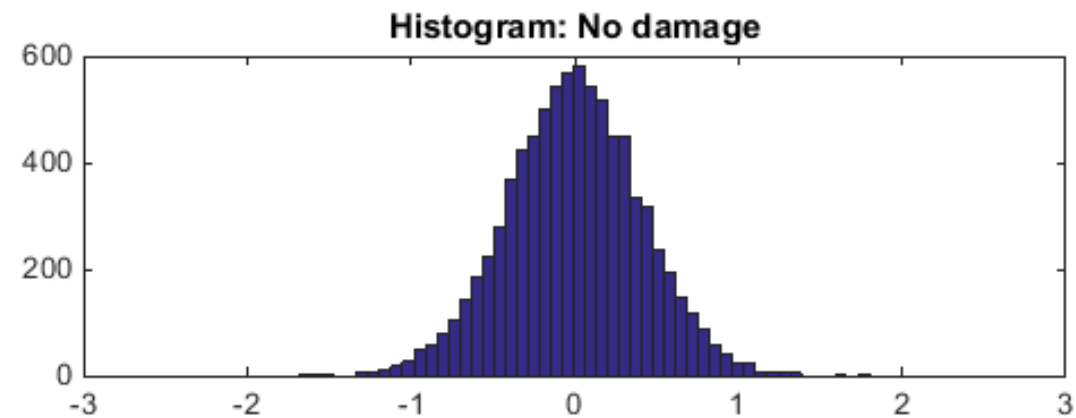
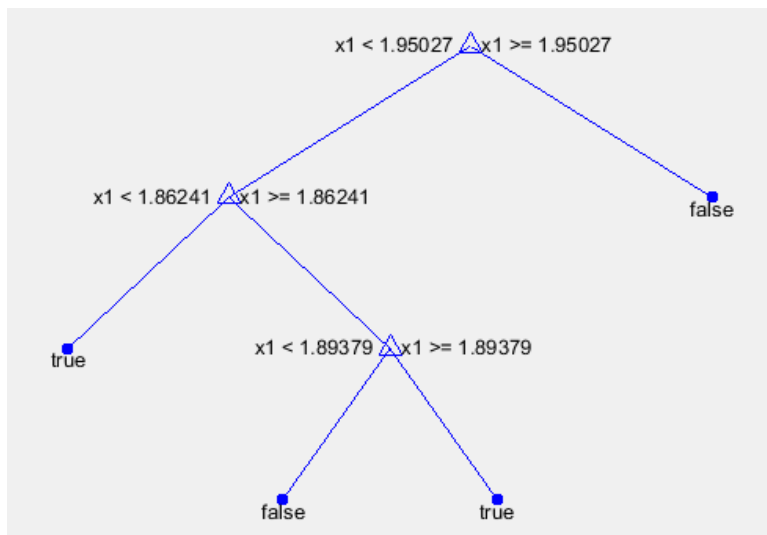
案例2：汽缸缺陷预警

- Data logged from car engine
- Goal: Identify the bad cylinder
- Challenges:
 - Import data spread across several files
 - Identify best algorithm to detect failure

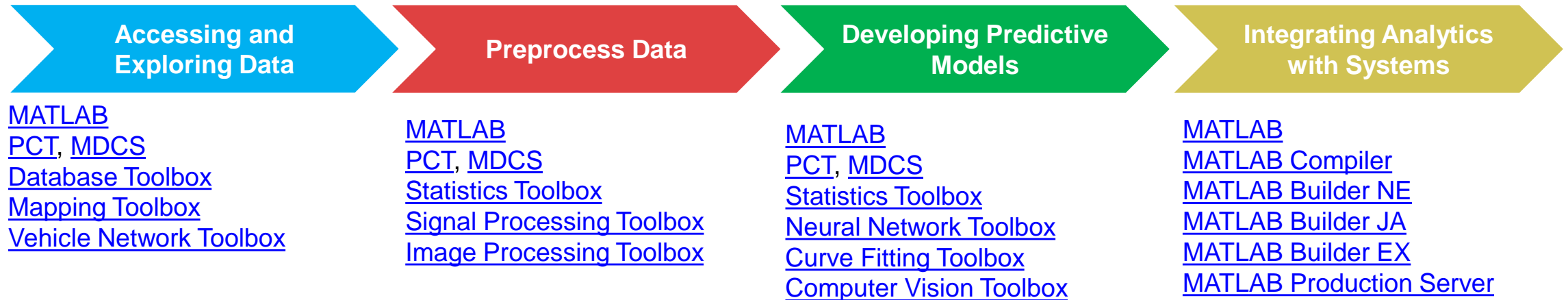


机器学习故障预警

- 衍生特征变量
- 训练分类树模型
- 用模型进行预测



总结：MATLAB汽车大数据平台相关工具箱



Questions?