

*****Draft*****

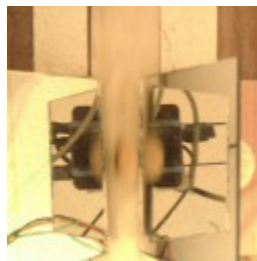
Principal component analysis (PCA)

09/05/19

*****Draft*****

exe1.c

- rows = 19;
+ rows = 17;



r2thumb0000.bmp cracked



r3thumb0000.bmp not cracked



r2thumb0000.pgm cracked



r3thumb0000.pgm not cracked



r2feat1.ppm cracked



r3feat1.ppm not cracked
Feel free to place comments here.

!!
!!! Warning: This is a KLT data file. Do not modify below this line !!!

KLT Feature List

nFeatures = 10

feature (x,y)=val	
-----+-----	
0	(25, 25)= 274
1	(-1, -1)= -1
2	(-1, -1)= -1
3	(-1, -1)= -1
4	(-1, -1)= -1
5	(-1, -1)= -1
6	(-1, -1)= -1
7	(-1, -1)= -1
8	(-1, -1)= -1
9	(-1, -1)= -1

r2feat1.txt cracked

Feel free to place comments here.

!!
!!! Warning: This is a KLT data file. Do not modify below this line !!!

KLT Feature List

nFeatures = 10

feature (x,y)=val	
-----+-----	
0	(25, 25)= 74

```

1 | ( -1, -1)= -1
2 | ( -1, -1)= -1
3 | ( -1, -1)= -1
4 | ( -1, -1)= -1
5 | ( -1, -1)= -1
6 | ( -1, -1)= -1
7 | ( -1, -1)= -1
8 | ( -1, -1)= -1
9 | ( -1, -1)= -1

```

r3feat1.txt not cracked

There are several variables the control the extraction of the image

where the feature is tested from the original image.

As can be seen below if the cracked image is placed correctly the value increases to 0 | (24, 25)= 402

```

offset = 30;
endofline = headInfo.width - offset - ncols;
ncols = 50;//number of cols to be extracted
nrows = 50;//number of rows to be extracted
rows = 19;
rowsdn = (headInfo.width * rows) + offset;
pr = pr + rowsdn; //rows + 1 lines dn + offset
for (j = (rows+1); j <(rows+1+nrows);j++) {
    for (i = offset; i <ncols+offset ; i++) {
        *prwr = *pr;
        pr++;
        prwr++;
    }
    pr = pr + endofline;//headInfo.width - offset - ncols
    pr = pr + offset;
}
pr = pr - rowsdn - ((50*50)+(78*50));
prwr = prwr - (50*50);

```

Feel free to place comments here.

!!

!!! Warning: This is a KLT data file. Do not modify below this line !!!

KLT Feature List

nFeatures = 10

feature | (x,y)=val

```
-----+-----  
0 | ( 24, 25)= 402  
1 | ( -1, -1)= -1
```

diff --git a/C/klt/exe1.c b/C/klt/exe1.c

index b60fa95..a0eff20 100644

--- a/C/klt/exe1.c

+++ b/C/klt/exe1.c

@@ -46,7 +46,7 @@ int main(void) {

 KLT_FeatureList fl;

 int nFeatures = 10;

 int ncols, nrows;

-

+ int rowsdn, rows, offset, endoffline;

 wiringPiSetup();

 pinMode(PIN_SW, INPUT);

@@ -156,17 +156,23 @@ int main(void) {

 }

 //before free the memory need to restore the pointers

 pr = pr - headInfo.width*headInfo.height;

- pr = pr + 2462; //19 lines dn + 60

- for (j = 20; j < 70; j++) {

- for (i = 30; i < 80; i++) {

+ offset = 30;

+ endoffline = headInfo.width - offset - ncols;

+ ncols = 50; //number of cols to be extracted

+ offset = 30;

+ endoffline = headInfo.width - offset - ncols;

+ ncols = 50; //number of cols to be extracted

+ nrows = 50; //number of rows to be extracted

+ rows = 19;

+ rowsdn = (headInfo.width * rows) + offset;

+ pr = pr + rowsdn; //rows + 1 lines dn + offset

+ for (j = (rows+1); j < (rows+1+nrows); j++) {

+ for (i = offset; i < ncols+offset; i++) {

 *prwr = *pr;

 pr++;

 prwr++;

 }

- pr = pr + 48; //110 -128 end of row

- pr = pr + 30;

+ pr = pr + endoffline; //headInfo.width - offset - ncols

+ pr = pr + offset;

 }

- pr = pr - 2462 - ((50*50)+(78*50));

+ pr = pr - rowsdn - ((50*50)+(78*50));

```

prwr = prwr - (50*50);
pg = pg - headInfo.width*headInfo.height;
pb = pb - headInfo.width*headInfo.height;

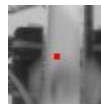
```



r1thumb0000.bmp



r1thumb0000.pgm



r1feat1.ppm

Feel free to place comments here.

!!

!!! Warning: This is a KLT data file. Do not modify below this line !!!

KLT Feature List

nFeatures = 10

feature | (x,y)=val

-----+-----
0 | (24, 25)= 402
1 | (-1, -1)= -1
2 | (-1, -1)= -1
3 | (-1, -1)= -1
4 | (-1, -1)= -1
5 | (-1, -1)= -1
6 | (-1, -1)= -1
7 | (-1, -1)= -1
8 | (-1, -1)= -1
9 | (-1, -1)= -1

r1feat1.txt

*****Draft*****

Principal component analysis (PCA)

09/04/19

*****Draft*****

Test run Tue 03 Sep 2019 09:26:52 PM MDT

The files subimg.m & im1.m are needed to determine the values needed to extract from the 128 x 128 to 50 x 50. when determining the thumb0000.pgm from thumb0000.bmp. This needs to be run on a stretch version of octave.

The number of cables causes a problem positioning and keeping the camera in the correct position.

Belt speed, and camera position are very critical in determining the feature value obtained.

Feature #0: (24.000000,25.000000) with value of 125.

```
diff --git a/C/klt/exe1.c b/C/klt/exe1.c
index 62cd705..b60fa95 100644
--- a/C/klt/exe1.c
+++ b/C/klt/exe1.c
@@ -85,7 +85,7 @@ int main(void) {

    while (flag == 1) {
//      0123456789012345678901234567890123456789012345678901234567
-      char cam_pre[] = "sudo raspistill -e bmp -vf -h 128 -w 128 -t 300 -o thumb";
+      char cam_pre[] = "sudo raspistill -e bmp -vf -h 128 -w 128 -t 275 -o thumb";
        char s3[] = "thumb";
        printf("%s %d\n",cam_pre,sizeof(cam_pre));
        sprintf(pframe_suf, "%04d.bmp",count);
@@ -156,17 +156,17 @@ int main(void) {
    }

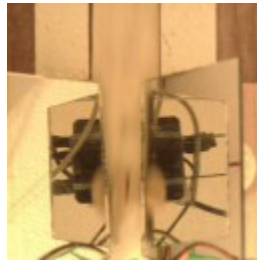
    //befor free the memory need to restore the pointers
    pr = pr - headInfo.width*headInfo.height;
-    pr = pr + 2492; //19 lines dn + 60
+    pr = pr + 2462; //19 lines dn + 60
    for (j = 20; j <70;j++) {
@@ -156,17 +156,17 @@ int main(void) {
    }

    //befor free the memory need to restore the pointers
    pr = pr - headInfo.width*headInfo.height;
-    pr = pr + 2492; //19 lines dn + 60
+    pr = pr + 2462; //19 lines dn + 60
    for (j = 20; j <70;j++) {
-      for (i = 60; i <110 ; i++) {
```

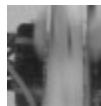
```

+           for (i = 30; i < 80 ; i++) {
+               *prwr = *pr;
+               pr++;
+               prwr++;
+           }
-           pr = pr + 18; //110 -128 end of row
-           pr = pr + 60;
+           pr = pr + 48; //110 -128 end of row
+           pr = pr + 30;
+           }
-           pr = pr - 2492 - ((50*50)+(78*50));
+           pr = pr - 2462 - ((50*50)+(78*50));
+           prwr = prwr - (50*50);
pg = pg - headInfo.width*headInfo.height;
pb = pb - headInfo.width*headInfo.height;

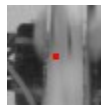
```



r1thumb0000.bmp



r1thumb0000.pgm



r1feat1.ppm

Feel free to place comments here.

!!

!!! Warning: This is a KLT data file. Do not modify below this line !!!

KLT Feature List

nFeatures = 10

```
feature | (x,y)=val
-----+-----
0 | ( 24, 25)= 125
1 | ( -1, -1)= -1
2 | ( -1, -1)= -1
3 | ( -1, -1)= -1
4 | ( -1, -1)= -1
5 | ( -1, -1)= -1
6 | ( -1, -1)= -1
7 | ( -1, -1)= -1
8 | ( -1, -1)= -1
r1feat1.txt
```

*****Draft*****

Principal component analysis (PCA)

09/02/19

*****Draft*****

Took the 128 x 128 from the camera and wrote a subimage of 50 x 50 to the file thumb0000.pgm.

This 50 x 50 image was processed with example1.c which both img1 & img2 used thumb0000.pgm.

the images in data/savedklt090219 r1* are with a cracked pistachio crack is on the right.

```
0 | ( 25, 24)= 285
```

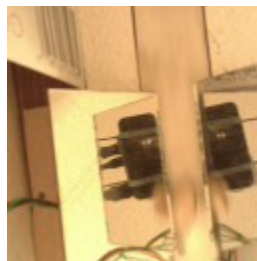
the images in data/savedklt090219 r2* are with a not cracked pistachio

```
0 | ( 24, 24)= 45
```

the images in data/savedklt090219 r3* are with a cracked pistachio crack is on the left.

```
0 | ( 24, 25)= 101
```

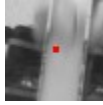
the image in data/savedklt090219 r4* are with a cracked pistachio now the code from example1.c is included in exe1.c increased the -t variable from 275 to 300 msec which moves the pistachio into the field of view.



r1Thumb0000.bmp



r1Thumb0000.pgm



r1feat1.ppm

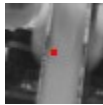
feature | (x,y)=val
-----+-----
0 | (25, 24)= 285
r1feat1.txt



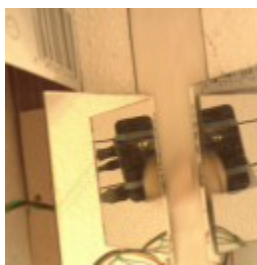
r2Thumb0000.bmp



r2Thumb0000.pgm



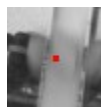
r2feat1.ppm
feature | (x,y)=val
-----+-----
0 | (24, 24)= 45
r2feat1.txt



r3Thumb0000.bmp



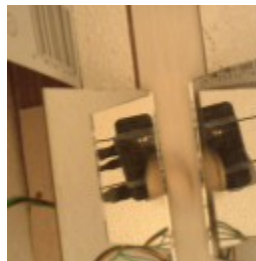
r3Thumb0000.pgm



r3feat1.ppm

feature | (x,y)=val
-----+-----
0 | (24, 25)= 101

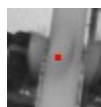
r3feat1.txt



r4Thumb0000.bmp



r4Thumb0000.pgm



r4feat1.ppm
feature | (x,y)=val
-----+-----

0 | (25, 24)= 152
r4feat1.txt

*******Draft*******

Principal component analysis (PCA)

08/31/19

*******Draft*******

Created a smaller set of images which were a cut from thumb0000yes1.pgm & thumb0000no1.pgm.
These were then used in example1.c.



Thumb0000yes1sm.pgm



Thumb0000no1sm.pgm



!!! Warning: This is a KLT data file. Do not modify below this line !!!

KLT Feature List

```
nFeatures = 100
```

```
feature | (x,y)=val
```

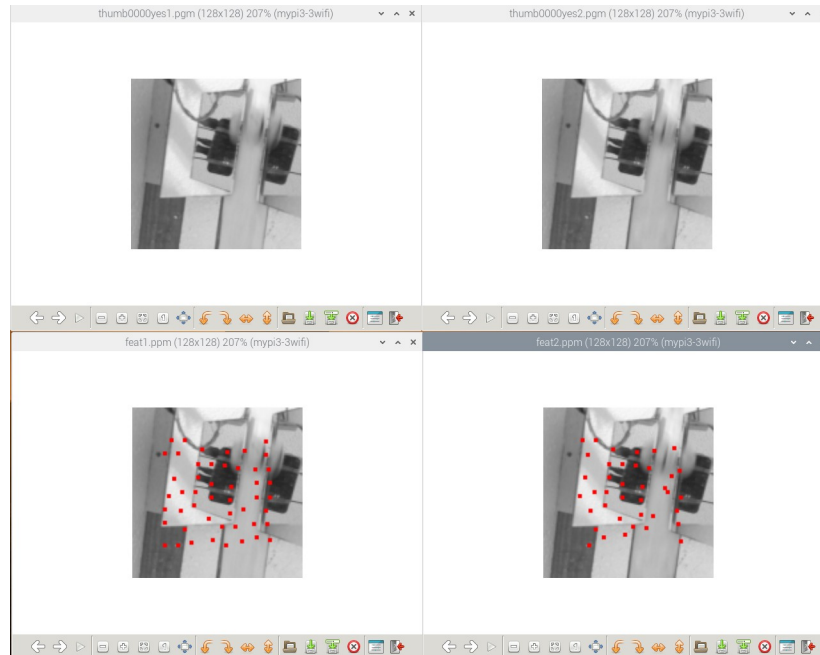
$$0 \mid (50, 24) = 2280$$

1 | (34, 24) = 747

$$2 \mid (24, 24) = 635$$

*****Draft*****

Modified example1.c to use thumb0000yes1.pgm and thumb0000yes2.pgm



Feel free to place comments here.

!!! Warning: This is a KLT data file. Do not modify below this line !!!

$$0 \mid (59, 42) = 12494$$

1 | (49, 52)=11437
2 | (71, 33)=11096
3 | (39, 91)=10412
4 | (59, 67)=10405
5 | (100, 77)= 9171
6 | (73, 69)= 8453
7 | (24, 86)= 8441
8 | (52, 31)= 7226
9 | (49, 42)= 5225
10 | (67, 89)= 3450
11 | (74, 59)= 3192
12 | (100, 35)= 2280
13 | (101, 87)= 2264
14 | (59, 57)= 1547
15 | (103, 99)= 1533
16 | (100, 25)= 1514
17 | (46, 73)= 1183
18 | (103, 67)= 1166
19 | (79, 45)= 1089
20 | (84, 32)= 1085
21 | (47, 63)= 906
22 | (102, 46)= 836
23 | (39, 24)= 757
24 | (34,103)= 730
25 | (69, 43)= 473
26 | (57, 83)= 468
27 | (31, 53)= 407
28 | (24, 34)= 270
29 | (24, 76)= 236
30 | (92, 46)= 210
31 | (73, 79)= 168
32 | (103, 56)= 145
33 | (27, 66)= 130
34 | (29, 24)= 97
35 | (93, 56)= 80
36 | (24,103)= 65
37 | (93, 97)= 52
38 | (36, 77)= 44
39 | (77, 89)= 40
40 | (44,101)= 28
41 | (60, 99)= 25
42 | (34, 34)= 21
43 | (93, 67)= 15
44 | (91, 87)= 13
45 | (70,103)= 5
46 | (82,100)= 4
47 | (83, 76)= 4
48 | (37, 63)= 1
49 | (-1, -1)= -1

50 | (-1, -1)= -1
51 | (-1, -1)= -1
52 | (-1, -1)= -1
53 | (-1, -1)= -1
54 | (-1, -1)= -1
55 | (-1, -1)= -1
56 | (-1, -1)= -1
57 | (-1, -1)= -1
58 | (-1, -1)= -1
59 | (-1, -1)= -1
60 | (-1, -1)= -1
61 | (-1, -1)= -1
62 | (-1, -1)= -1
63 | (-1, -1)= -1
64 | (-1, -1)= -1
65 | (-1, -1)= -1
66 | (-1, -1)= -1
67 | (-1, -1)= -1
68 | (-1, -1)= -1
69 | (-1, -1)= -1
70 | (-1, -1)= -1
71 | (-1, -1)= -1
72 | (-1, -1)= -1
73 | (-1, -1)= -1
74 | (-1, -1)= -1
75 | (-1, -1)= -1
76 | (-1, -1)= -1
77 | (-1, -1)= -1
78 | (-1, -1)= -1
79 | (-1, -1)= -1
80 | (-1, -1)= -1
81 | (-1, -1)= -1
82 | (-1, -1)= -1
83 | (-1, -1)= -1
84 | (-1, -1)= -1
85 | (-1, -1)= -1
86 | (-1, -1)= -1
87 | (-1, -1)= -1
88 | (-1, -1)= -1
89 | (-1, -1)= -1
90 | (-1, -1)= -1
91 | (-1, -1)= -1
92 | (-1, -1)= -1
93 | (-1, -1)= -1
94 | (-1, -1)= -1
95 | (-1, -1)= -1
96 | (-1, -1)= -1
97 | (-1, -1)= -1
98 | (-1, -1)= -1

99 | (-1, -1)= -1

feat2.txt

Feel free to place comments here.

!!

!!! Warning: This is a KLT data file. Do not modify below this line !!!

KLT Feature List

nFeatures = 100

feature | (x,y)=val

-----+-----
0 | (59.1, 42.1)= 0
1 | (49.2, 52.0)= 0
2 | (70.3, 33.2)= 0
3 | (38.9, 91.1)= 0
4 | (59.1, 66.9)= 0
5 | (100.0, 76.9)= 0
6 | (73.0, 68.8)= 0
7 | (-1.0, -1.0)= -4
8 | (52.2, 31.1)= 0
9 | (49.1, 42.1)= 0
10 | (66.9, 89.2)= 0
11 | (74.0, 58.9)= 0
12 | (-1.0, -1.0)= -4
13 | (101.0, 87.1)= 0
14 | (59.1, 56.9)= 0
15 | (102.8, 99.5)= 0
16 | (98.0, 29.9)= 0
17 | (46.2, 72.8)= 0
18 | (103.0, 66.9)= 0
19 | (79.3, 45.3)= 0
20 | (83.2, 32.1)= 0
21 | (47.2, 62.8)= 0
22 | (102.1, 47.5)= 0
23 | (39.2, 24.2)= 0
24 | (33.8,102.9)= 0
25 | (68.7, 43.5)= 0
26 | (57.5, 82.9)= 0
27 | (31.0, 52.1)= 0
28 | (-1.0, -1.0)= -4
29 | (-1.0, -1.0)= -4
30 | (95.9, 50.8)= 0
31 | (73.5, 80.0)= 0

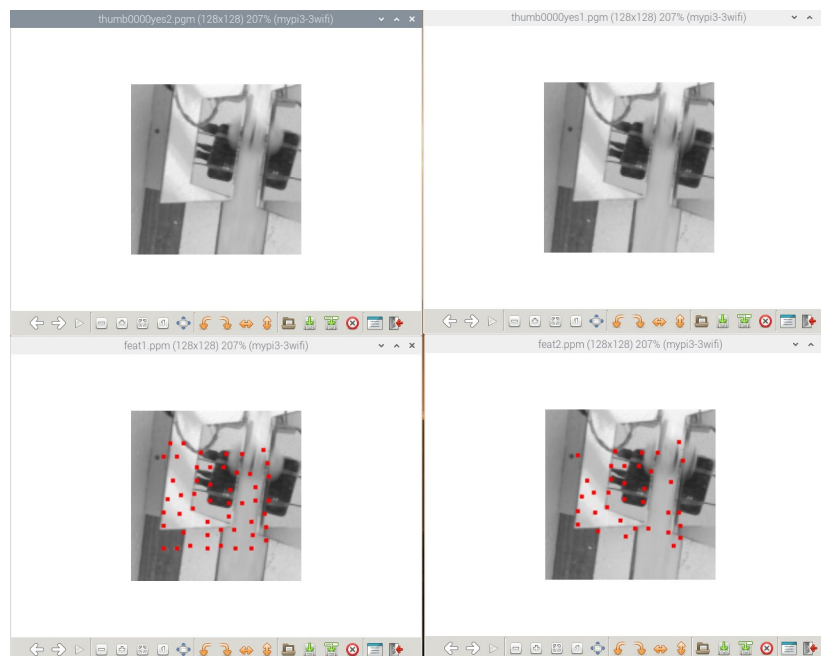
32 | (-1.0, -1.0)= -4
33 | (26.9, 66.3)= 0
34 | (28.9, 24.4)= 0
35 | (90.7, 59.8)= 0
36 | (-1.0, -1.0)= -4
37 | (-1.0, -1.0)= -3
38 | (35.3, 77.3)= 0
39 | (77.3, 89.6)= 0
40 | (44.9, 96.9)= 0
41 | (60.9, 95.4)= 0
42 | (33.3, 35.3)= 0
43 | (93.0, 62.8)= 0
44 | (-1.0, -1.0)= -3
45 | (-1.0, -1.0)= -4
46 | (-1.0, -1.0)= -4
47 | (81.6, 81.2)= 0
48 | (37.8, 63.2)= 0
49 | (-1.0, -1.0)= -1
50 | (-1.0, -1.0)= -1
51 | (-1.0, -1.0)= -1
52 | (-1.0, -1.0)= -1
53 | (-1.0, -1.0)= -1
54 | (-1.0, -1.0)= -1
55 | (-1.0, -1.0)= -1
56 | (-1.0, -1.0)= -1
57 | (-1.0, -1.0)= -1
58 | (-1.0, -1.0)= -1
59 | (-1.0, -1.0)= -1
60 | (-1.0, -1.0)= -1
61 | (-1.0, -1.0)= -1
62 | (-1.0, -1.0)= -1
63 | (-1.0, -1.0)= -1
64 | (-1.0, -1.0)= -1
65 | (-1.0, -1.0)= -1
66 | (-1.0, -1.0)= -1
67 | (-1.0, -1.0)= -1
68 | (-1.0, -1.0)= -1
69 | (-1.0, -1.0)= -1
70 | (-1.0, -1.0)= -1
71 | (-1.0, -1.0)= -1
72 | (-1.0, -1.0)= -1
73 | (-1.0, -1.0)= -1
74 | (-1.0, -1.0)= -1
75 | (-1.0, -1.0)= -1
76 | (-1.0, -1.0)= -1
77 | (-1.0, -1.0)= -1
78 | (-1.0, -1.0)= -1
79 | (-1.0, -1.0)= -1
80 | (-1.0, -1.0)= -1

```

81 | ( -1.0, -1.0)= -1
82 | ( -1.0, -1.0)= -1
83 | ( -1.0, -1.0)= -1
84 | ( -1.0, -1.0)= -1
85 | ( -1.0, -1.0)= -1
86 | ( -1.0, -1.0)= -1
87 | ( -1.0, -1.0)= -1
88 | ( -1.0, -1.0)= -1
89 | ( -1.0, -1.0)= -1
90 | ( -1.0, -1.0)= -1
91 | ( -1.0, -1.0)= -1
92 | ( -1.0, -1.0)= -1
93 | ( -1.0, -1.0)= -1
94 | ( -1.0, -1.0)= -1
95 | ( -1.0, -1.0)= -1
96 | ( -1.0, -1.0)= -1
97 | ( -1.0, -1.0)= -1
98 | ( -1.0, -1.0)= -1
99 | ( -1.0, -1.0)= -1

```

end of feat.txt



Modified example1.c to use thumb0000yes2.pgm and thumb0000yes1.pgm

feat1.txt

Feel free to place comments here.

!!

!!! Warning: This is a KLT data file. Do not modify below this line !!!

KLT Feature List

nFeatures = 100

feature | (x,y)=val

-----+-----
0 | (59, 42)=12951
1 | (71, 32)=11510
2 | (49, 52)=11472
3 | (59, 67)=10930
4 | (39, 91)=10416
5 | (100, 77)= 9166
6 | (73, 69)= 8837
7 | (24, 86)= 8779
8 | (52, 31)= 7268
9 | (49, 42)= 5364
10 | (74, 59)= 3307
11 | (67, 89)= 2881
12 | (101, 87)= 2445
13 | (83, 32)= 1920
14 | (102, 39)= 1830
15 | (101, 97)= 1785
16 | (103, 49)= 1728
17 | (59, 55)= 1637
18 | (103, 67)= 1183
19 | (46, 73)= 1097
20 | (79, 46)= 1035
21 | (69, 42)= 974
22 | (47, 62)= 929
23 | (89, 47)= 928
24 | (99, 29)= 804
25 | (39, 24)= 781
26 | (34,103)= 731
27 | (57, 83)= 470
28 | (31, 52)= 415
29 | (24, 34)= 256
30 | (73, 79)= 253
31 | (24, 76)= 232
32 | (93, 57)= 121
33 | (27, 66)= 121
34 | (29, 24)= 93
35 | (91, 93)= 60
36 | (24,103)= 57
37 | (36, 77)= 54
38 | (77, 89)= 42
39 | (67,101)= 33
40 | (34, 34)= 24

41 | (44,101)= 23
42 | (90,103)= 23
43 | (78,103)= 19
44 | (93, 67)= 15
45 | (57, 93)= 8
46 | (90, 83)= 7
47 | (57,103)= 7
48 | (37, 63)= 2
49 | (83, 69)= 2
50 | (-1, -1)= -1
51 | (-1, -1)= -1
52 | (-1, -1)= -1
53 | (-1, -1)= -1
54 | (-1, -1)= -1
55 | (-1, -1)= -1
56 | (-1, -1)= -1
57 | (-1, -1)= -1
58 | (-1, -1)= -1
59 | (-1, -1)= -1
60 | (-1, -1)= -1
61 | (-1, -1)= -1
62 | (-1, -1)= -1
63 | (-1, -1)= -1
64 | (-1, -1)= -1
65 | (-1, -1)= -1
66 | (-1, -1)= -1
67 | (-1, -1)= -1
68 | (-1, -1)= -1
69 | (-1, -1)= -1
70 | (-1, -1)= -1
71 | (-1, -1)= -1
72 | (-1, -1)= -1
73 | (-1, -1)= -1
74 | (-1, -1)= -1
75 | (-1, -1)= -1
76 | (-1, -1)= -1
77 | (-1, -1)= -1
78 | (-1, -1)= -1
79 | (-1, -1)= -1
80 | (-1, -1)= -1
81 | (-1, -1)= -1
82 | (-1, -1)= -1
83 | (-1, -1)= -1
84 | (-1, -1)= -1
85 | (-1, -1)= -1
86 | (-1, -1)= -1
87 | (-1, -1)= -1
88 | (-1, -1)= -1
89 | (-1, -1)= -1

```

90 | ( -1, -1)= -1
91 | ( -1, -1)= -1
92 | ( -1, -1)= -1
93 | ( -1, -1)= -1
94 | ( -1, -1)= -1
95 | ( -1, -1)= -1
96 | ( -1, -1)= -1
97 | ( -1, -1)= -1
98 | ( -1, -1)= -1
99 | ( -1, -1)= -1

```

feat2.txt

Feel free to place comments here.

```

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!! Warning: This is a KLT data file. Do not modify below this line !!!

```

```

-----
KLT Feature List
-----

```

nFeatures = 100

```

feature | (x,y)=val
-----+-----
 0 | ( 58.8, 41.9)=  0
 1 | ( 71.7, 31.9)=  0
 2 | ( 48.8, 52.0)=  0
 3 | ( 58.9, 67.0)=  0
 4 | ( 39.1, 90.9)=  0
 5 | (100.0, 77.1)=  0
 6 | ( 73.0, 69.1)=  0
 7 | ( 24.1, 85.9)=  0
 8 | ( 51.9, 30.9)=  0
 9 | ( 49.0, 41.9)=  0
10 | ( 74.0, 59.1)=  0
11 | ( 67.1, 88.8)=  0
12 | (101.0, 86.9)=  0
13 | ( 83.7, 31.9)=  0
14 | (102.8, 38.2)=  0
15 | (101.3, 96.2)=  0
16 | ( -1.0, -1.0)= -4
17 | ( 58.9, 55.0)=  0
18 | ( -1.0, -1.0)= -4
19 | ( 45.9, 73.2)=  0
20 | ( 78.7, 45.7)=  0

```

21 | (69.6, 41.8)= 0
22 | (46.9, 62.3)= 0
23 | (-1.0, -1.0)= -5
24 | (100.3, 24.0)= 0
25 | (-1.0, -1.0)= -4
26 | (-1.0, -1.0)= -4
27 | (56.4, 83.0)= 0
28 | (31.0, 52.9)= 0
29 | (24.1, 33.9)= 0
30 | (-1.0, -1.0)= -3
31 | (24.1, 75.6)= 0
32 | (93.8, 54.0)= 0
33 | (27.2, 65.4)= 0
34 | (-1.0, -1.0)= -4
35 | (92.4, 92.2)= 0
36 | (-1.0, -1.0)= -4
37 | (36.7, 76.6)= 0
38 | (76.7, 88.6)= 0
39 | (-1.0, -1.0)= -4
40 | (-1.0, -1.0)= -3
41 | (-1.0, -1.0)= -4
42 | (96.3,102.3)= 0
43 | (-1.0, -1.0)= -3
44 | (-1.0, -1.0)= -3
45 | (59.7, 94.7)= 0
46 | (91.6, 77.4)= 0
47 | (-1.0, -1.0)= -4
48 | (35.9, 62.4)= 0
49 | (-1.0, -1.0)= -3
50 | (-1.0, -1.0)= -1
51 | (-1.0, -1.0)= -1
52 | (-1.0, -1.0)= -1
53 | (-1.0, -1.0)= -1
54 | (-1.0, -1.0)= -1
55 | (-1.0, -1.0)= -1
56 | (-1.0, -1.0)= -1
57 | (-1.0, -1.0)= -1
58 | (-1.0, -1.0)= -1
59 | (-1.0, -1.0)= -1
60 | (-1.0, -1.0)= -1
61 | (-1.0, -1.0)= -1
62 | (-1.0, -1.0)= -1
63 | (-1.0, -1.0)= -1
64 | (-1.0, -1.0)= -1
65 | (-1.0, -1.0)= -1
66 | (-1.0, -1.0)= -1
67 | (-1.0, -1.0)= -1
68 | (-1.0, -1.0)= -1
69 | (-1.0, -1.0)= -1

70 | (-1.0, -1.0)= -1
71 | (-1.0, -1.0)= -1
72 | (-1.0, -1.0)= -1
73 | (-1.0, -1.0)= -1
74 | (-1.0, -1.0)= -1
75 | (-1.0, -1.0)= -1
76 | (-1.0, -1.0)= -1
77 | (-1.0, -1.0)= -1
78 | (-1.0, -1.0)= -1
79 | (-1.0, -1.0)= -1
80 | (-1.0, -1.0)= -1
81 | (-1.0, -1.0)= -1
82 | (-1.0, -1.0)= -1
83 | (-1.0, -1.0)= -1
84 | (-1.0, -1.0)= -1
85 | (-1.0, -1.0)= -1
86 | (-1.0, -1.0)= -1
87 | (-1.0, -1.0)= -1
88 | (-1.0, -1.0)= -1
89 | (-1.0, -1.0)= -1
90 | (-1.0, -1.0)= -1
91 | (-1.0, -1.0)= -1
92 | (-1.0, -1.0)= -1
93 | (-1.0, -1.0)= -1
94 | (-1.0, -1.0)= -1
95 | (-1.0, -1.0)= -1
96 | (-1.0, -1.0)= -1
97 | (-1.0, -1.0)= -1
98 | (-1.0, -1.0)= -1
99 | (-1.0, -1.0)= -1
end of feat.txt

*****Draft*****

Principal component analysis (PCA)

08/29/19

*****Draft*****

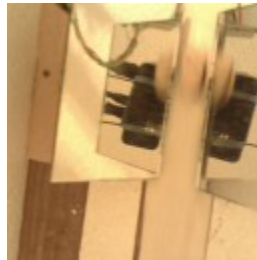
Principal component analysis (PCA) is a statistical procedure that uses an orthogonal transformation to convert a set of observations of possibly correlated variables (entities each of which takes on various numerical values) into a set of values of linearly uncorrelated variables called principal components.

Machine Learning — Singular Value Decomposition (SVD) & Principal Component

Analysis (PCA)

Analysis of 4 images 2 cracked and 2 not cracked. The (SVD) or (PCA) does appears to track that pistachios that are cracked do have a higher (PCA) than pistachios that are not cracked.

Thumb0000yes1.bmp



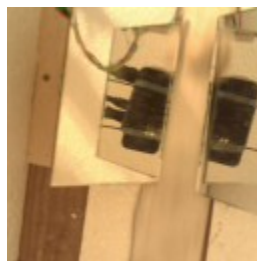
thumb0000no1.bmp



Thumb0000yes2.bmp



thumb0000n2.bmp



thumb0000yes1.bmp thumb0000no1.bmp thumb0000yes2.bmp thumb0000n2.bmp
pca1(1:20)
ans =

2.5118e+04	2.4510e+04	2.5212e+04	2.4252e+04
4.1047e+03			
1.7342e+03			
1.3414e+03			
1.3223e+03			
1.0863e+03			
8.6049e+02			
7.6984e+02			
6.8771e+02			
6.0650e+02			
5.2599e+02			
4.5459e+02			
4.4436e+02			
3.8315e+02			
3.7725e+02			
3.3203e+02			
3.1981e+02			
2.7991e+02			
2.7412e+02			
2.5770e+02			

pca2(1:20)
ans =

2.0217e+04	1.9552e+04	2.0434e+04	1.9248e+04
3.8104e+03			
1.5775e+03			
1.3825e+03			
1.1628e+03			
1.0376e+03			
7.8174e+02			
7.4592e+02			
6.8873e+02			
5.8089e+02			
5.1885e+02			
4.6897e+02			
4.5024e+02			
4.0410e+02			
3.6088e+02			
3.2620e+02			
3.0089e+02			
2.8690e+02			
2.6073e+02			

2.4677e+02

pca3(1:20)
ans =

1.3455e+04	1.2802e+04	1.3600e+04	1.2537e+04
2.7543e+03			
1.2505e+03			
1.0014e+03			
8.8897e+02			
7.7139e+02			
6.2903e+02			
5.8134e+02			
5.3249e+02			
4.6860e+02			
4.0902e+02			
3.9088e+02			
3.6356e+02			
3.4791e+02			
3.0013e+02			
2.6766e+02			
2.5222e+02			
2.3809e+02			
2.1705e+02			
2.0159e+02			

thumb0000no1.bmp
pca1(1:20)
ans =

2.4510e+04
4.0433e+03
1.9649e+03
1.4272e+03
1.3475e+03
9.9684e+02
8.2375e+02
7.9589e+02
6.8341e+02
5.8102e+02
5.0413e+02
4.6857e+02
4.2710e+02
4.0367e+02
3.7746e+02
3.4601e+02
3.3557e+02
2.9683e+02
2.8394e+02

2.5602e+02

pca2(1:20)
ans =

1.9552e+04
3.6803e+03
1.6822e+03
1.4549e+03
1.1840e+03
9.1180e+02
7.5005e+02
7.1683e+02
6.8642e+02
5.3968e+02
4.8279e+02
4.4007e+02
4.3046e+02
4.0756e+02
3.5801e+02
3.3369e+02
3.1684e+02
2.8013e+02
2.6143e+02
2.4284e+02

pca3(1:20)
ans =

1.2802e+04
2.6358e+03
1.2603e+03
1.1070e+03
8.7383e+02
7.0593e+02
5.8519e+02
5.8225e+02
5.2708e+02
4.2259e+02
3.9897e+02
3.7471e+02
3.5758e+02
3.3290e+02
3.1216e+02
2.7739e+02
2.5960e+02
2.3723e+02
2.1209e+02
2.0476e+02

thumb0000yes2.bmp

pca1(1:20)

ans =

2.5212e+04

4.0210e+03

1.8347e+03

1.4258e+03

1.3558e+03

1.0733e+03

8.3836e+02

7.6427e+02

6.8187e+02

6.1109e+02

5.2345e+02

4.8893e+02

4.5993e+02

4.1018e+02

4.0371e+02

3.5510e+02

3.3618e+02

2.9982e+02

2.6943e+02

2.5862e+02

pca2(1:20)

ans =

2.0434e+04

3.7564e+03

1.6314e+03

1.4176e+03

1.2380e+03

1.0131e+03

7.6505e+02

7.4708e+02

6.7221e+02

5.7194e+02

5.2257e+02

4.7293e+02

4.6234e+02

4.2547e+02

3.7508e+02

3.3221e+02

3.3095e+02

2.8798e+02

2.6839e+02

2.5635e+02

```
pca3(1:20)  
ans =
```

```
1.3600e+04  
2.7226e+03  
1.2751e+03  
1.0553e+03  
9.2998e+02  
7.9118e+02  
6.0423e+02  
5.9610e+02  
5.1626e+02  
4.6031e+02  
4.2646e+02  
4.0938e+02  
3.8739e+02  
3.5952e+02  
3.1919e+02  
2.8066e+02  
2.6825e+02  
2.4342e+02  
2.2798e+02  
2.1238e+02
```

```
thumb0000n2.bmp
```

```
pca1(1:20)  
ans =
```

```
2.4252e+04  
4.3798e+03  
1.6566e+03  
1.4539e+03  
1.2313e+03  
9.4545e+02  
8.6362e+02  
7.0752e+02  
6.3207e+02  
5.8339e+02  
5.0927e+02  
4.6314e+02  
4.3968e+02  
3.7103e+02  
3.2726e+02  
3.1503e+02  
2.9399e+02  
2.7929e+02  
2.6932e+02
```

2.6126e+02

```
>> pca2(1:20)  
ans =
```

1.9248e+04
3.8751e+03
1.6063e+03
1.3434e+03
1.0795e+03
8.8676e+02
7.6481e+02
6.9949e+02
5.9415e+02
5.6022e+02
4.9497e+02
4.3213e+02
4.0966e+02
3.5401e+02
3.1833e+02
2.9621e+02
2.8560e+02
2.7431e+02
2.5903e+02
2.4629e+02

```
>> pca3(1:20)  
ans =
```

1.2537e+04
2.7423e+03
1.2570e+03
1.0034e+03
7.9929e+02
6.7685e+02
5.8549e+02
5.6615e+02
4.7492e+02
4.3317e+02
4.0130e+02
3.5044e+02
3.3603e+02
3.0458e+02
2.7552e+02
2.5449e+02
2.4492e+02
2.2631e+02
2.1090e+02
2.0487e+02