

Bonsai Due

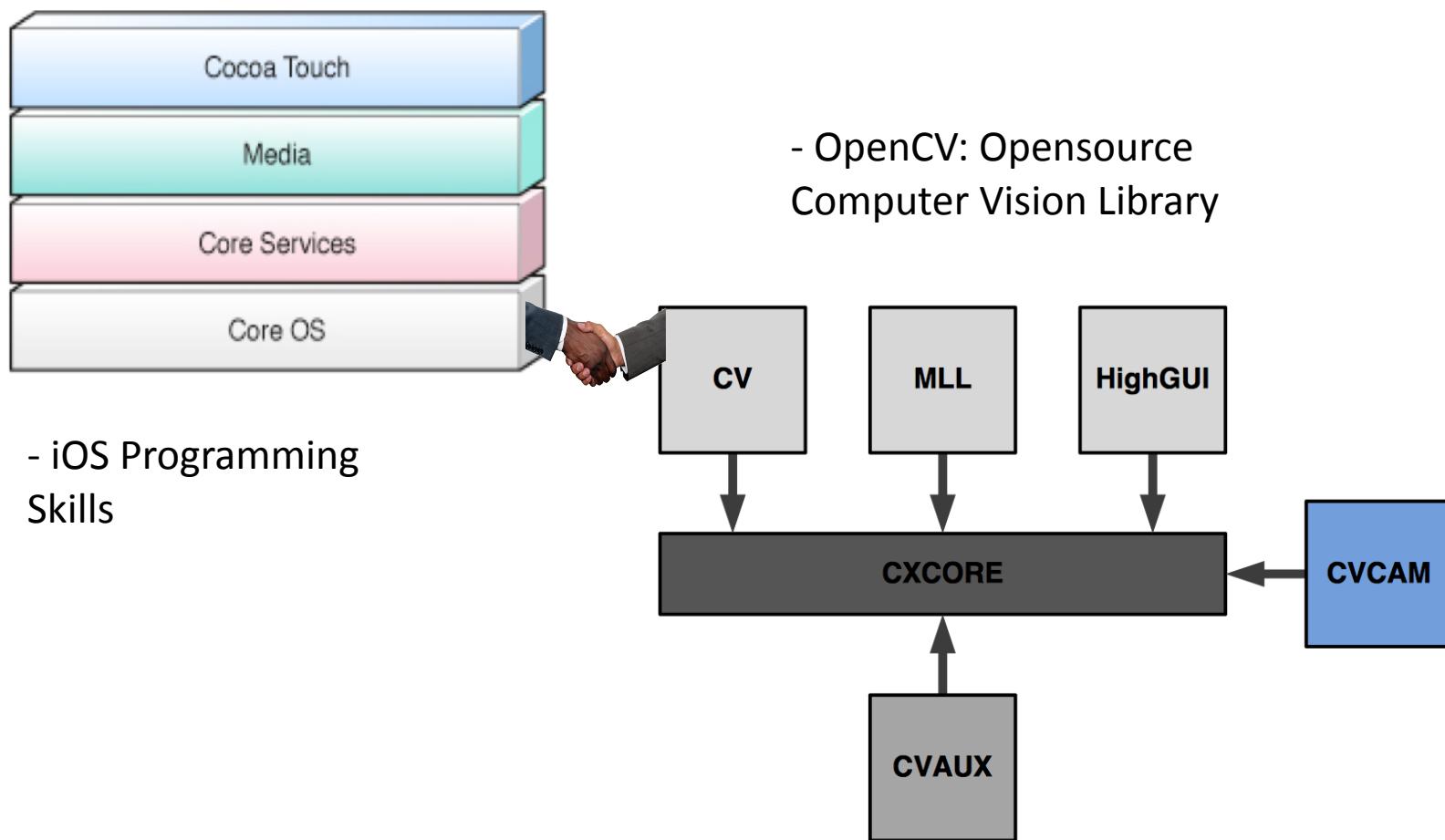
Growing Assistant for Bonsai Lovers

Cos'è Bonsai Due

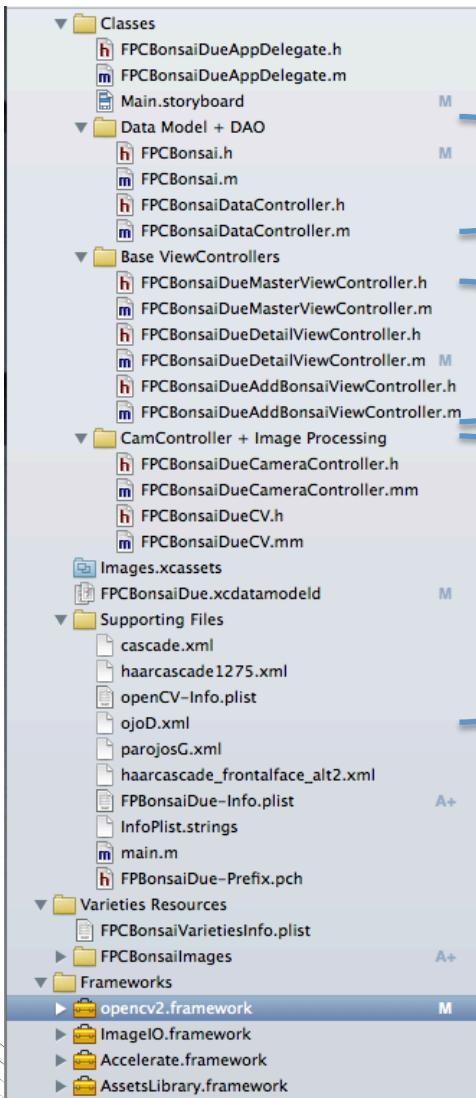


- Da dove nasce l'idea
- Per chi è pensato
- Come si rende utile

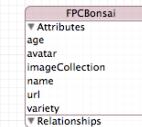
Con cosa è stato realizzato



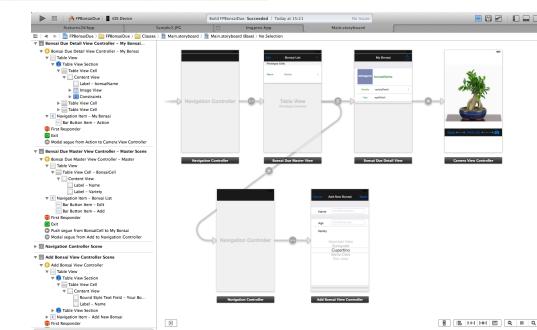
Come è stato realizzato



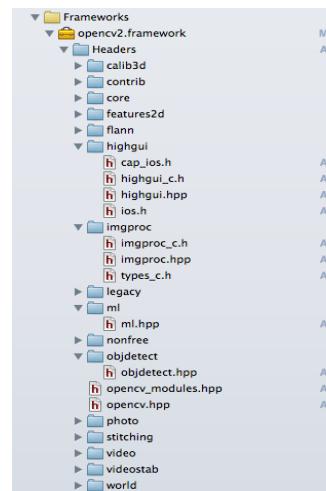
Modello



View Controllers

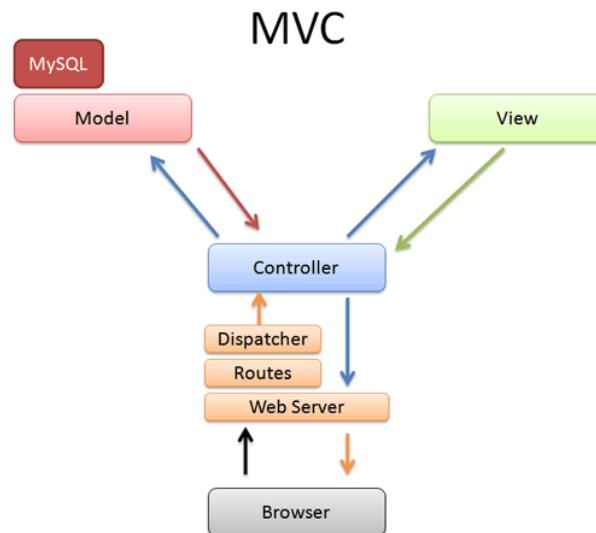


OpenCV



Pattern di Progettazione

- Model View Controller



- Delegation



- Target/Action



- Key-Value Coding/Observing

Objective-C coding

```
//  
// FPCBonsai.h  
// FPCBonsaiDue  
//  
// Created by Federico Paliotta on 04/10/13.  
// Copyright (c) 2013 Federico Paliotta. All rights reserved.  
  
#import <Foundation/Foundation.h>  
#import <CoreData/CoreData.h>  
  
@interface FPCBonsai : NSObject  
  
@property (nonatomic, copy) NSString * name;  
@property (nonatomic, copy) NSString * variety;  
@property (nonatomic) NSInteger age;  
@property (nonatomic, copy) UIImage * avatar;  
@property (nonatomic, copy) NSURL *url;  
@property (nonatomic, copy) NSMutableDictionary * imagesCollection;  
  
- (id)initWithName:(NSString *)name variety: (NSString *)variety age:(NSInteger)years;  
- (id)initWithName:(NSString *)name variety: (NSString *)variety age:(NSInteger)years image:(UIImage *) avatar;  
- (id)initWithDictionary:(NSDictionary *)data;  
  
@end
```

- La classe FPCBonsai (Model)

```
#import "FPCBonsaiDataController.h"
#import "FPCBonsai.h"

@interface FPCBonsaiDataController()

@property (nonatomic, readwrite) NSMutableArray *varietiesList;

-(void)initializeDefaultFPCBonsaiList;

@end
@implementation FPCBonsaiDataController

-(void)initializeDefaultFPCBonsaiList{
    NSMutableArray * newFPCBonsaiList = [[NSMutableArray alloc] init];
    self.masterFPCBonsaiList = newFPCBonsaiList;
}


```

- Data Access Object (Controller)

```
- (NSUInteger)countOfList{
    return [self.masterFPCBonsaiList count];
}

- (FPCBonsai *)objectInListAtIndex:(NSUInteger)theIndex{
    return [self.masterFPCBonsaiList objectAtIndex:theIndex];
}

- (void)addFPCBonsai:(FPCBonsai *)aFPCBonsai{
    [self.masterFPCBonsaiList addObject:aFPCBonsai];
}
```

Embedding OpenCV

```
#pragma mark BACKGROUND REMOVAL
```

```
#ifdef __cplusplus
-(UIImage *)bgRemove:(UIImage *) image
{
    cv::Mat present = [self cvMatFromUIImage:image];
    cv::Mat src = [self cvMatGrayFromUIImage:image];
    cv::Mat foreground;
    vector< vector <cv::Point>> contours;

    threshold(src,foreground,179,255,THRESH_BINARY);
    medianBlur(foreground,foreground,9);
    erode(foreground,foreground,cv::Mat());
    dilate(foreground,foreground,cv::Mat());

    findContours(foreground, contours, CV_RETR_EXTERNAL, CV_CHAIN_APPROX_SIMPLE);

    drawContours(present, contours, -1, CV_RGB(0, 0, 255), 16);

    return [self UIImageFromCVMat:present];
}

#endif
```

- Image Processing (Imgproc.hpp)



Done ANALYZE

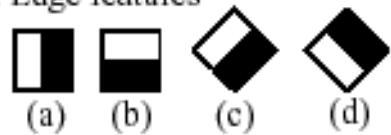
Object Detection

```
//  
// FPCBonsaiDueCV.m  
// FPCBonsaiDue  
//  
// Created by Federico Paliotta on 13/10/13.  
// Copyright (c) 2013 Federico Paliotta. All rights reserved.  
  
#import "FPCBonsaiDueCV.h"  
#import <opencv2/opencv.hpp>  
#import <Foundation/Foundation.h>  
#import <CoreGraphics/CoreGraphics.h>  
  
NSString* const CascadeFilename = @"cascade";  
const int HaarOptions = CV_HAAR_FIND_BIGGEST_OBJECT | CV_HAAR_DO_ROUGH_SEARCH ;  
  
@implementation FPCBonsaiDueCV  
  
-(void)viewDidLoad  
{  
    [super viewDidLoad];  
  
    self.videoCamera = [[CvVideoCamera alloc] initWithParentView:self.imageView];  
    self.videoCamera.defaultAVCaptureDevicePosition = AVCaptureDevicePositionBack;  
    self.videoCamera.defaultAVCaptureSessionPreset = AVCaptureSessionPreset352x288;  
    self.videoCamera.defaultAVCaptureVideoOrientation = AVCaptureVideoOrientationPortrait;  
    self.videoCamera.defaultFPS = 30;  
    self.videoCamera.grayscaleMode = NO;  
    self.videoCamera.delegate = self;  
  
    NSString *CascadePath =[[NSBundle mainBundle] pathForResource:CascadeFilename ofType:@"xml"];  
    cascade.load([CascadePath UTF8String]);  
}
```

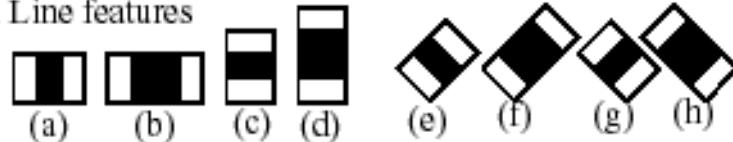
- HAAR-feature like Classifier
- Cascade for Object Detection
- By P. Viola & M. Jones and
- R. Lienhart & J. Maydt

Alfréd Haar

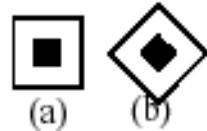
1. Edge features



2. Line features



3. Center-surround features



- Move and scale the search windows
- “Cascade” of simpler classifier
- Boosted
- Until at some stage the candidate is rejected or all the stages are passed
- Feature shape, position, scale
- Response calculated by difference in image pixel (evaluating feature areas)

Haar Training



• • •

- Collecting and Packing Training Images

- Creating Positive Samples

```
$ createsamples -img face.png -num 10 -bg negatives.dat -vec samples.vec -maxxangle 0.6 -  
maxyangle 0 -maxzangle 0.3 -maxidev 100 -bgcolor 0 -bgthresh 0 -w 20 -h 20
```

Criticità

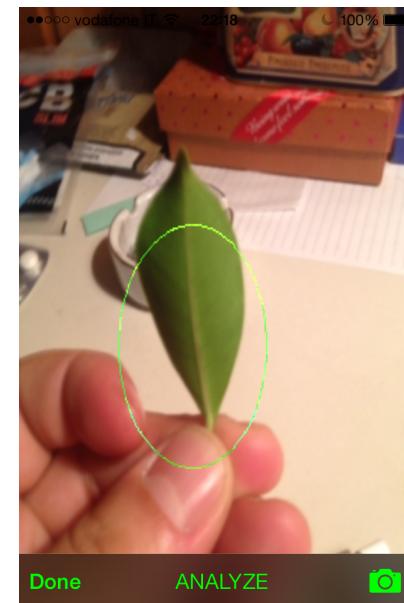
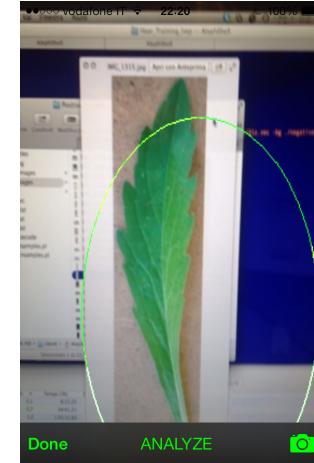
```
MacBook-Pro-di-Federico-Paliotta:HaarTrainingImp Aleph$ opencv_traincascade -data traincascade -vec samples/samples1501x.vec -bg ./negative.dat -numPos 30 -numNeg 300 -numStages 16 -featureType HAAR -w 80 -h 80 -bt LB -minHitRate 0.999 -maxFalseAlarmRate 0.5 -baseFormatSave  
PARAMETERS:  
cascadedDirName: traincascade  
vecFileName: samples/samples1501x.vec  
bgFileName: ./negative.dat  
numPos: 30  
numNeg: 300  
numStages: 16  
precalcValBufSize[Mb]: 256  
precalcIdxBufSize[Mb]: 256  
stageType: BOOST  
featureType: HAAR  
sampleWidth: 80  
sampleHeight: 80  
boostType: LB  
minHitRate: 0.999  
maxFalseAlarmRate: 0.5  
weightTrimRate: 0.95  
maxDepth: 1  
maxWeakCount: 100  
mode: BASIC  
  
===== TRAINING 0-stage =====  
<BEGIN  
POS count : consumed 30 : 30  
NEG count : acceptanceRatio 300 : 1  
Precalculation time: 10  
+-----+  
| N | HR | FA |  
+-----+  
| 1| 1| 1|  
+-----+  
| 2| 1| 0.0633333|  
+-----+  
END>  
  
===== TRAINING 1-stage =====  
<BEGIN  
POS count : consumed 30 : 30  
NEG count : acceptanceRatio 300 : 0.239425  
Precalculation time: 18  
+-----+  
| N | HR | FA |  
+-----+  
| 1| 1| 1|  
+-----+  
| 2| 1| 1|  
+-----+  
| 3| 1| 1|  
+-----+  
| 4| 1| 1|  
+-----+  
| 5| 1| 1|  
+-----+  
| 6| 1| 1|  
+-----+  
| 7| 1| 1|  
+-----+  
| 8| 1| 1|  
+-----+  
| 9| 1| 1|  
+-----+  
| 10| 1| 1|
```

- Documentazione OpenCV
- Condizioni di luce
- Eterogeneità dei campioni
- Quantità di dati da elaborare
- Tempo

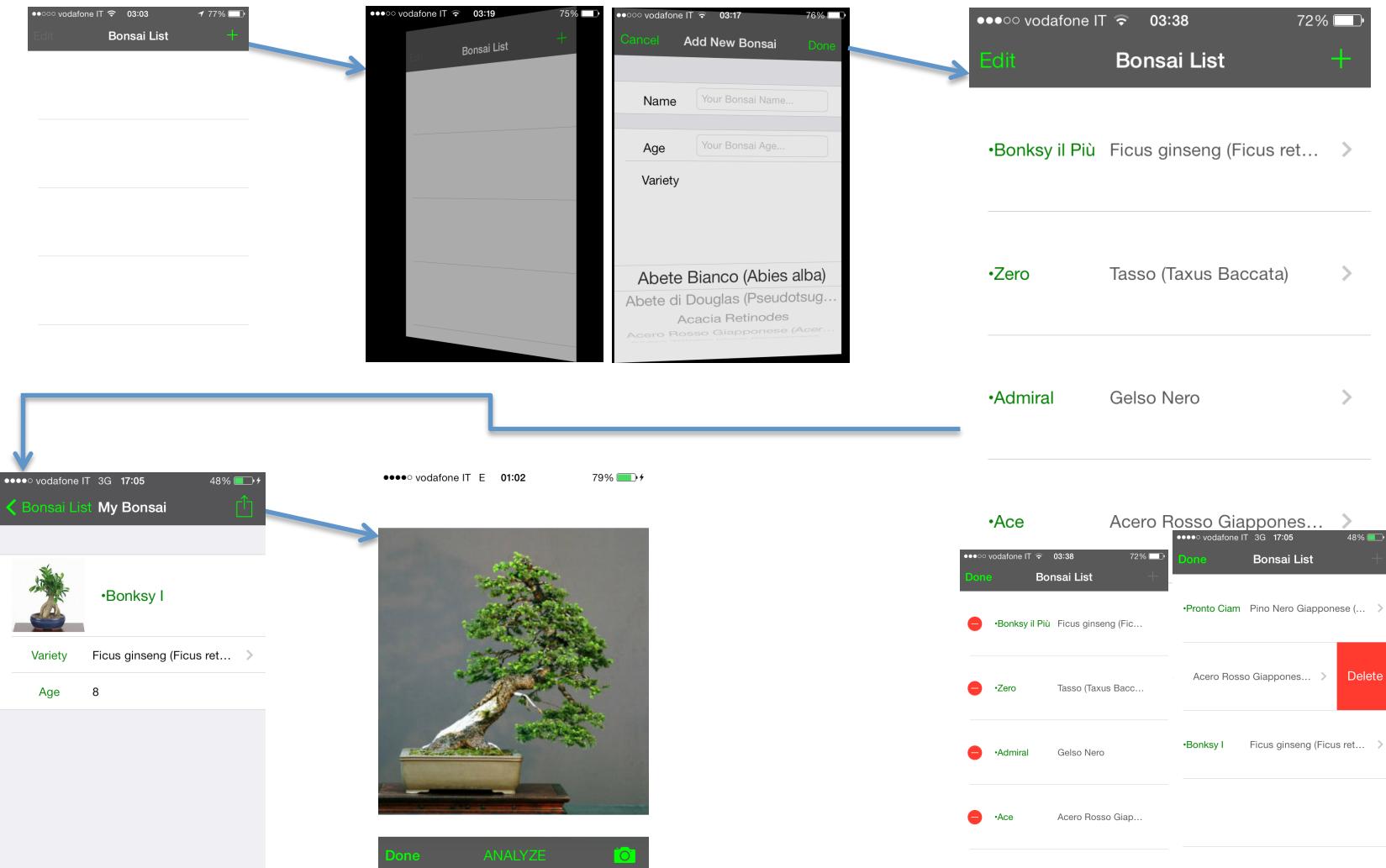
- Haar Training

Risultati

```
920<feature>
921    <rects>
922        <_>
923            39 33 2 18 -1.</_>
924        <_>
925            39 42 2 9 2.</_></rects>
926    <tilted>0</tilted></feature>
927    <threshold>2.2750105927116238e-05</threshold>
928    <left_val>6.5732628107070923e-01</left_val>
929    <right_val>-1.4627612829208374e+00</right_val></_></_>
930<_>
931    <_>
932        <feature>
933            <rects>
934                <_>
935                    12 71 1 6 -1.</_>
936                <_>
937                    12 74 1 3 2.</_></rects>
938        <tilted>0</tilted></feature>
939    <threshold>7.6147273648530245e-04</threshold>
940    <left_val>-3.0567952990531921e-01</left_val>
941    <right_val>10.</right_val></_></_>
942<_>
943    <_>
944        <feature>
945            <rects>
946                <_>
947                    0 64 62 10 -1.</_>
948                <_>
949                    0 69 62 5 2.</_></rects>
950        <tilted>0</tilted></feature>
951    <threshold>-6.5568098798394203e-03</threshold>
952    <left_val>1.2104363441467285e+00</left_val>
953    <right_val>-6.4077866077423096e-01</right_val></_></_></trees>
954    <stage_threshold>-1.8642107248306274e+00</stage_threshold>
955    <parent>8</parent>
956    <next>-1</next></_></stages>
957</haarcascade>
958</opencv_storage>
959
```



Showcase





Grazie a tutt*

1.3.1.2.