



VIDEO CLASSIFICATION APPLY ML TECHNIQUES

Team 6

Instructor:

- + Hong Phan PhD

Our team:

- + Sam Tran
- + Cuong Do
- + Tam Vo
- + Cuong Khong



PROBLEM

01

03

**PERFORMANCE
EVALUATION**

PROCESS

02

04

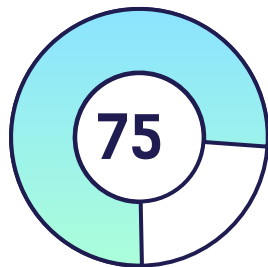
**DEMO
APPLICATION**

01 Problem

3500

cases/ 6 days

SOCIAL VIOLENCE



Hospitalize



1600

Cases / 1 year

SCHOOL VIOLENCE



Source: nguoilaodong.com.vn

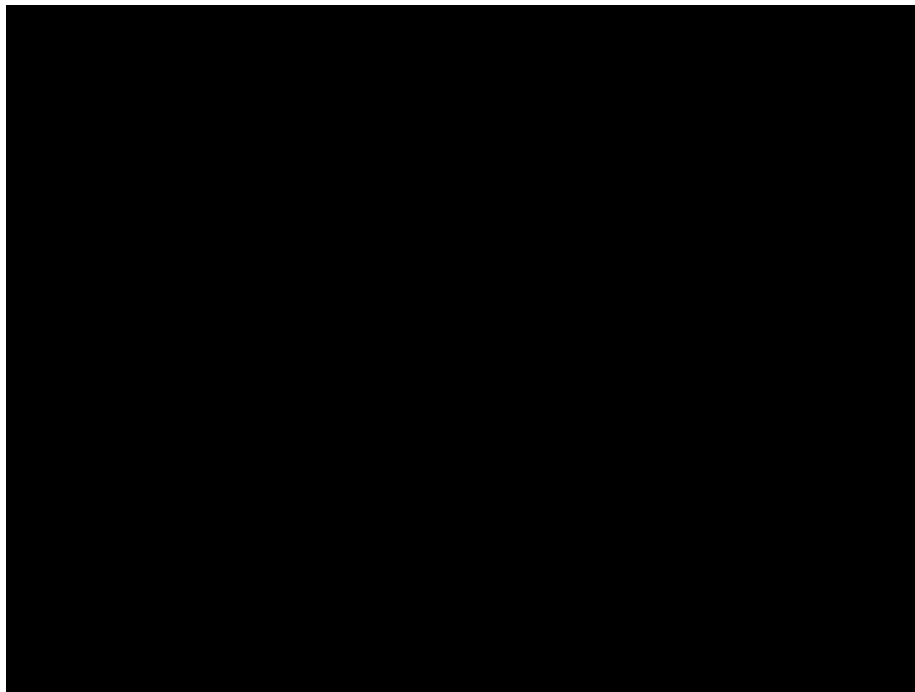
Source: baonghean.vn

01 Problem

ABNORMAL BEHAVIOR DETECTION IN VIDEOS USING MACHINE LEARNING

ABNORMAL BEHAVIOR

- + Fighting
- + Tracing
- + Violence

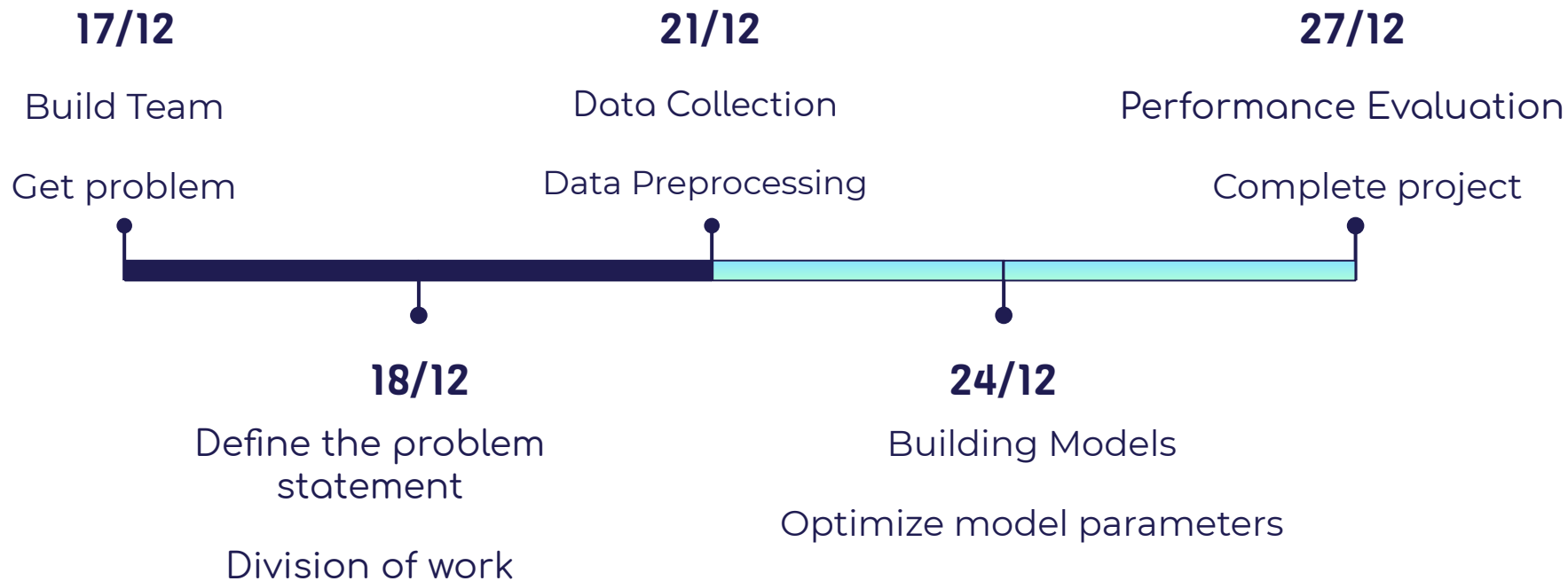


02 Process



02 Process

TIMELINE



02 Data Collection

Dataset name: Surveillance Camera Fight Dataset

Source: Vision-based Fight Detection from Surveillance Cameras

TRAINING DATA:

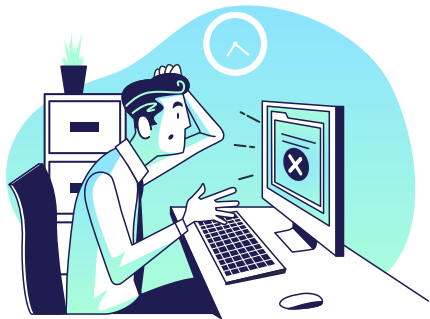
- + Fighting Data: 130 videos.
- + NonFighting Data: 130 videos.
- + Rates: 1:10 - 10:10

TESTING DATA:

- + Fighting Data: 20 videos.
- + NonFighting Data: 20 videos.

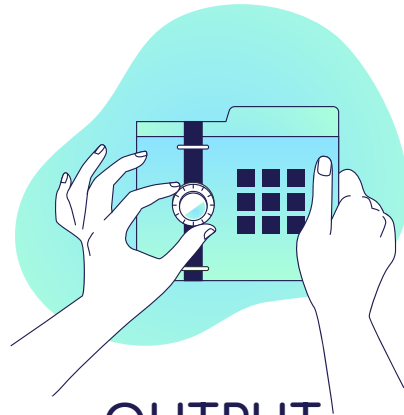


02 Input - Output



INPUT

+ video

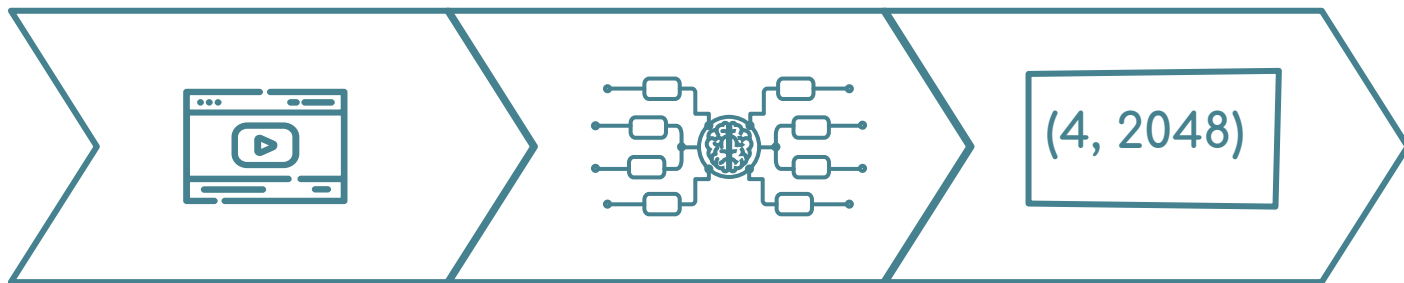


OUTPUT

Classify the video as
fighting or non-fighting

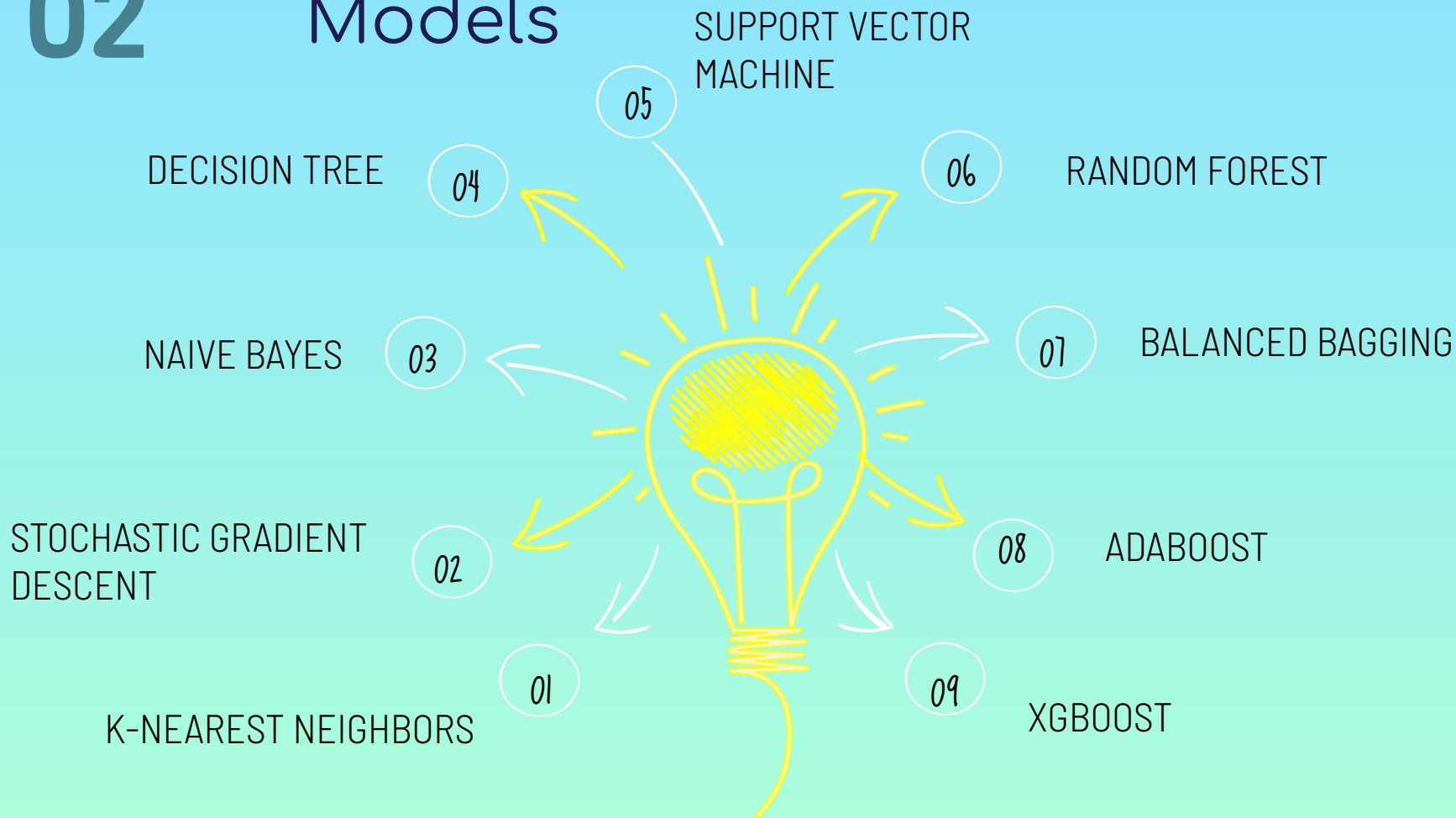
02 Video Feature Extraction

- + Using 3D Resnet
- + After extraction, a video has feature shape as (4,2048)



02

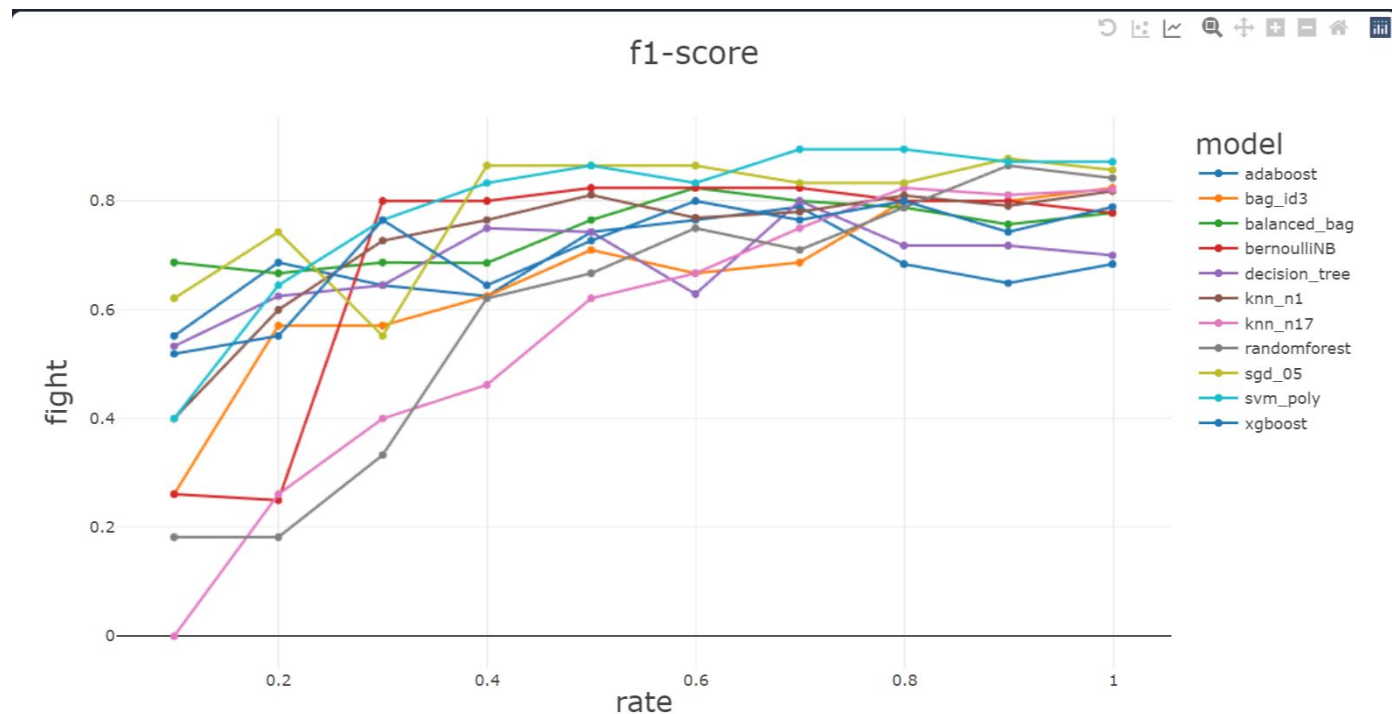
Models



03

Models Performance

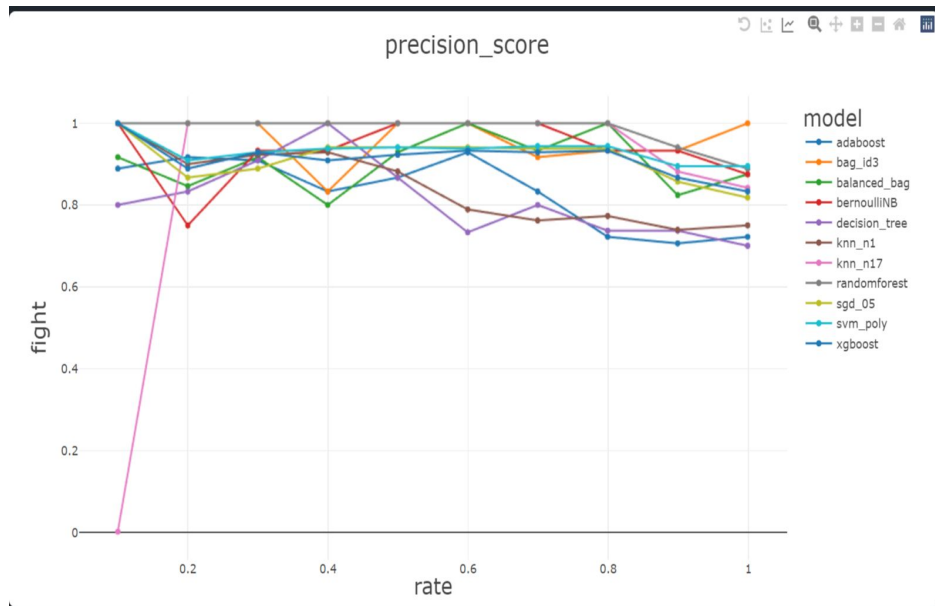
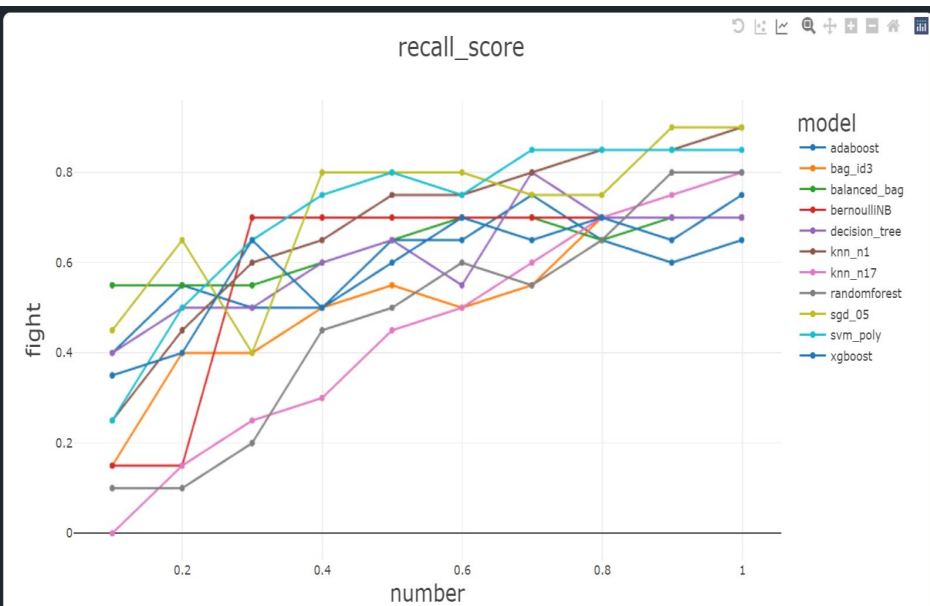
f1-score



03

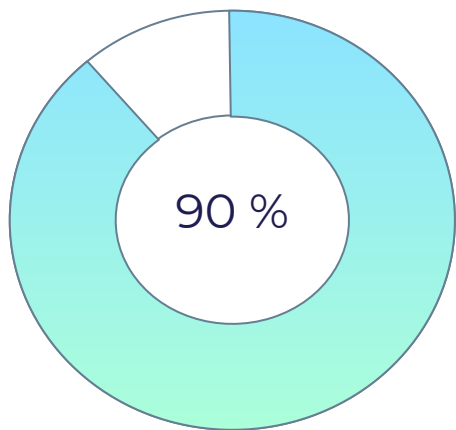
Models Performance

Recall and Precision-score

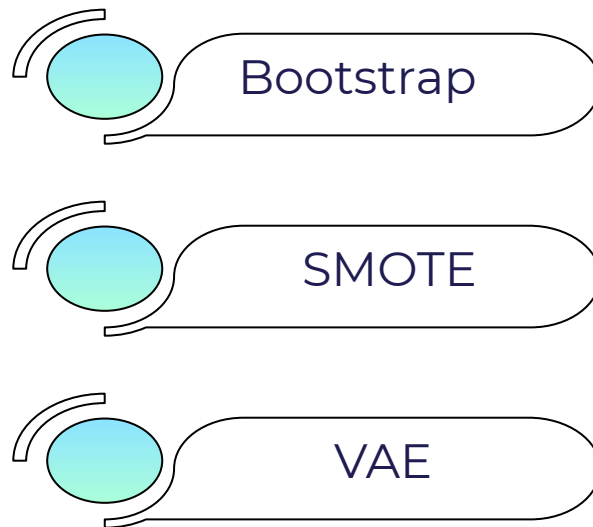


03 Imbalanced data

Compare the number of abnormal videos and normal videos in reality



Solution



03

Imbalanced data

Synthetic Minority Oversampling Technique

Step 1

A: minority class, $x \in A$

The k-nearest neighbors of x: Euclidean distance between x and every other sample in set A.

Step 2

The sampling rate N.

For each $x \in A$, N samples are randomly selected from its k-nearest neighbors. $\Rightarrow A1$

Step 3

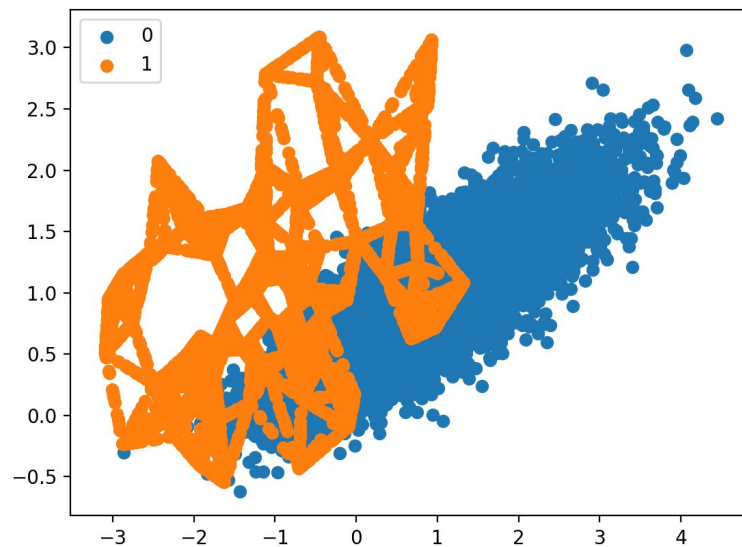
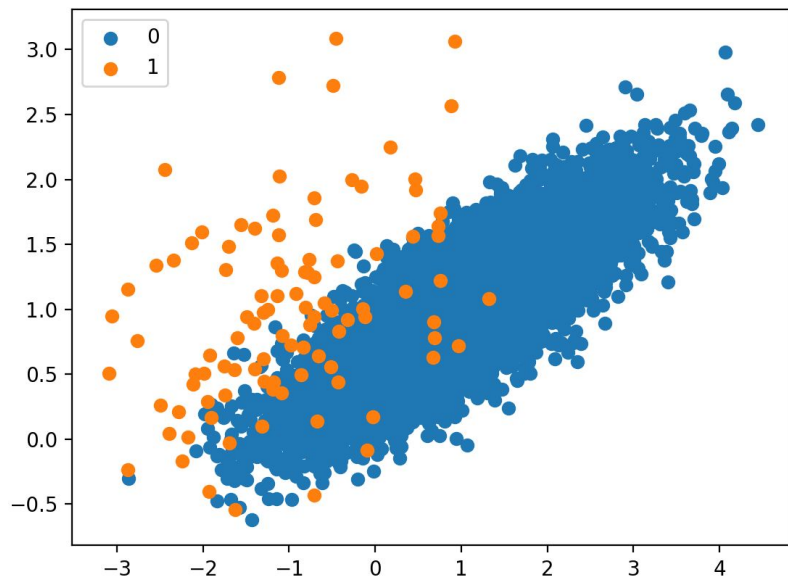
For each $x_k \in A1$, generate a new example:

$$x' = x + \text{rand}(0, 1) * |x - x_k|$$

03

Imbalanced data

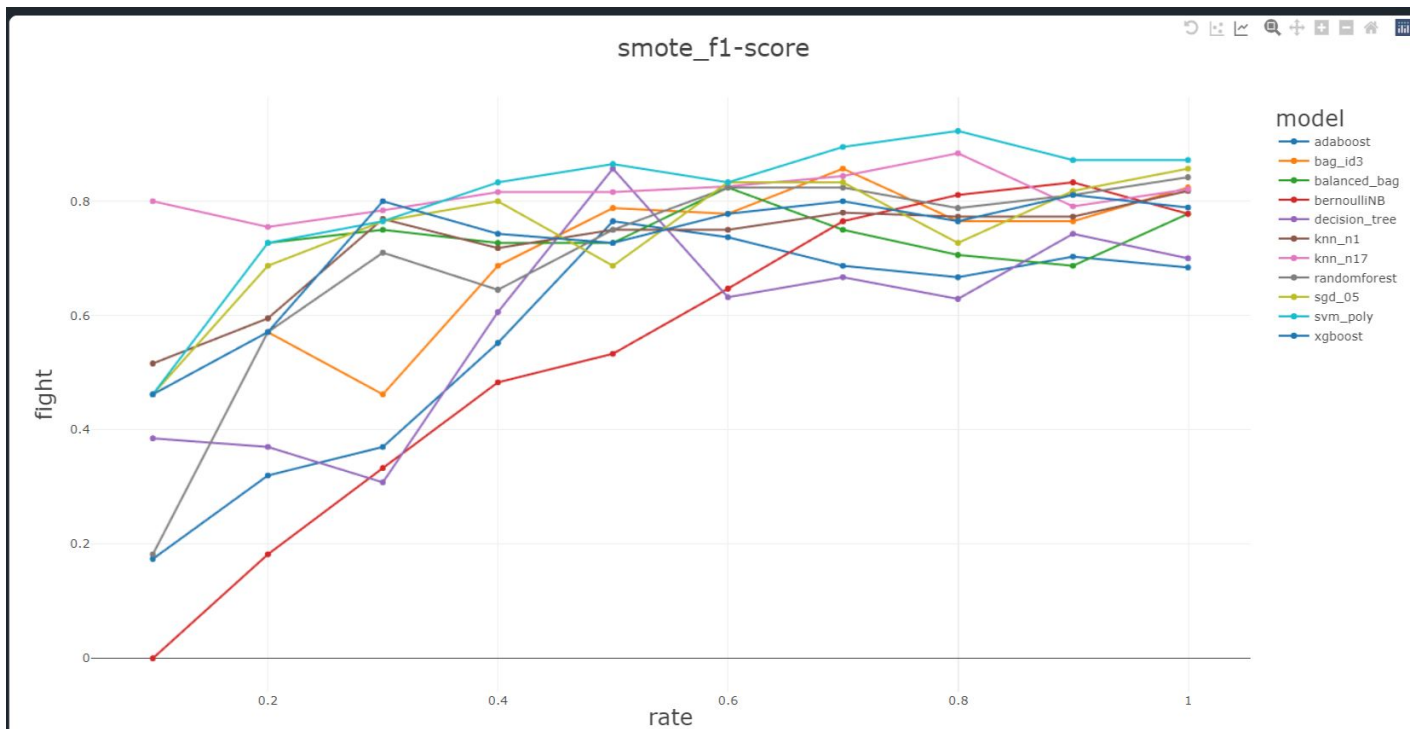
SMOTE



03

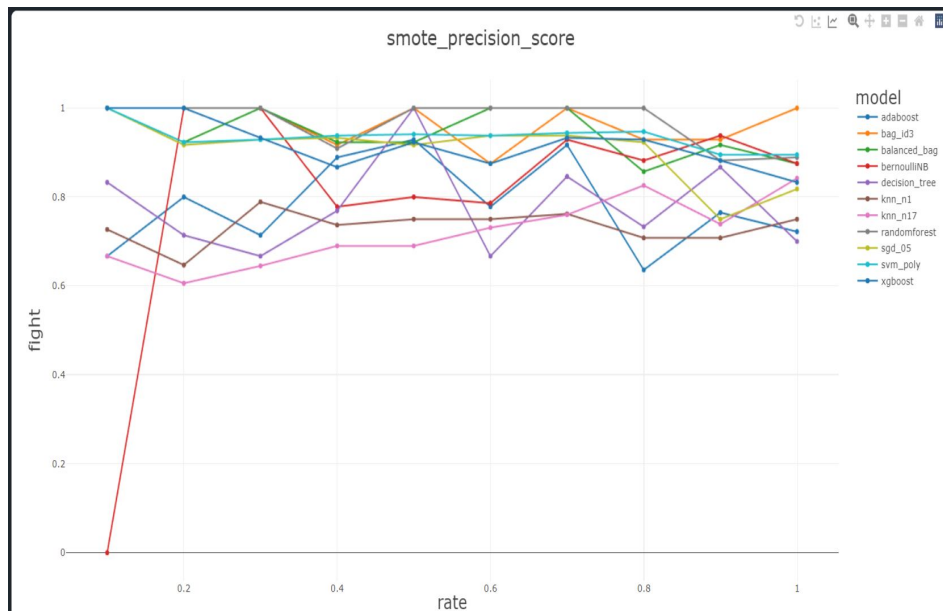
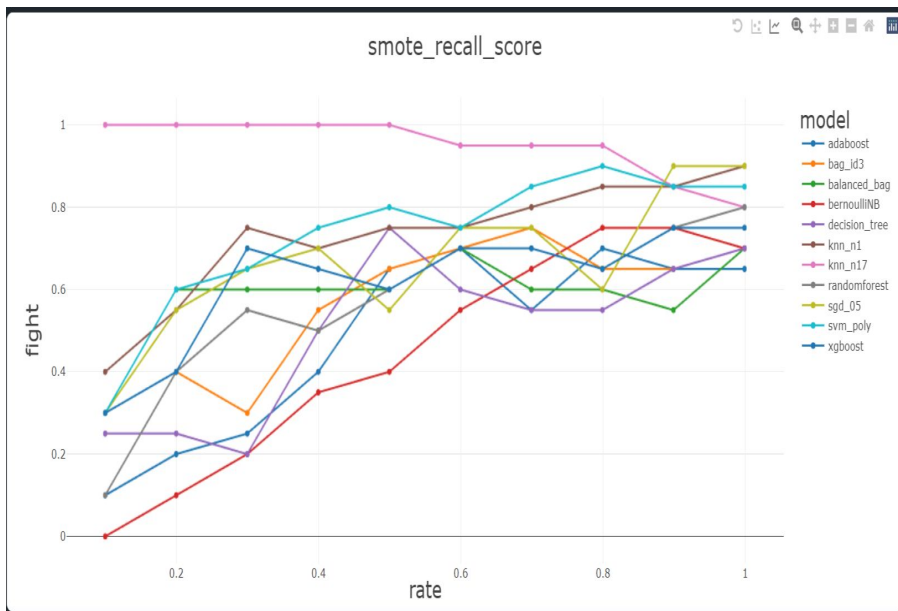
Testing Models

f1-score after using SMOTE



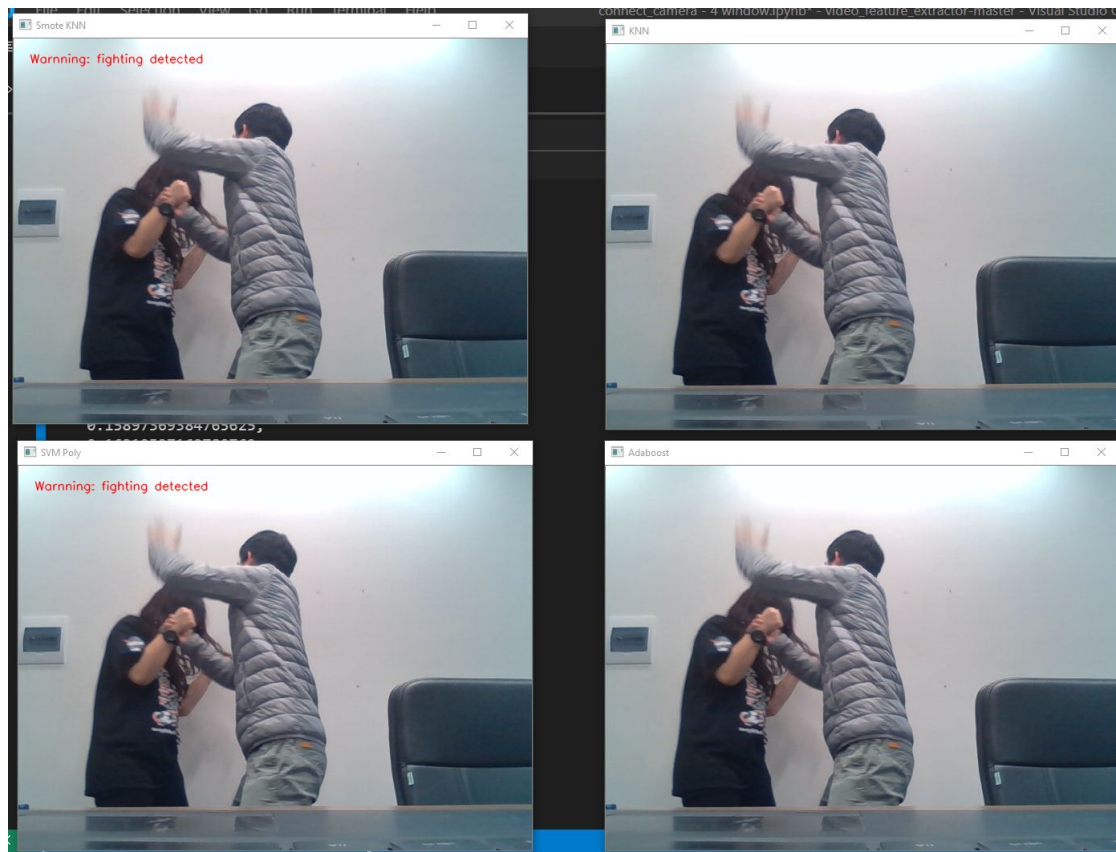
03 Testing Models

Recall and Precision-score after using SMOTE



04

Demo



04 Application



- + Intrusion detection
- + Violent behavior detection in public areas, schools, prison...
- + Tracing crime
- + Warning and preventing children from unsuitable videos

Team 6

Tran Bao Sam

Modeling, Testing, Bootstrap,
Slides

Do Quoc Cuong

Video Feature Extraction,
Demo, Visualize testing
parameter

Vo Minh Tam

Ensemble Model, Testing,
Report

Khong Huu Cuong

Modeling, Smote, Visualize
testing parameter



THANK YOU FOR
LISTENING!

