

EVALUATION OF FACE RECOGNITION USING 3D MASK

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Abstract

Ridiculing is the strategy that something of inferred as a genuine client customer by fake information to get an unlawful get to. Shortcoming of affirmation structures to parodying assaults is still an open guarded issue in biometrics space and with all biometric characteristics, face is introduced to the better bona fide hazard, since it is notable easy to get to and copy. In this paper, an extensive variety of sorts of face Spoofing assaults have been reviewed and distinctive computations have been suggested to remember them. Generally showing in order to focus on 2Dim assaults created printed photos or recount recorded recordings on PDAs, an enormous fragment of these reviews field their disputes on the equality of the criticizing material before the sensor. On the other hand, with the degrees of progress in 3Dim changing and printing propels, this doubt can never again be kept up. In this work, we intend to analyze the ridiculing ability of under specific 3Dim facial spreads for differing affirmation systems and area the IDim issue of this more personality boggling assault sort. To study the disparaging execution of 3Dim spreads against 2Dim, 2 and half Dim, and 3Dim confront affirmation and to inspect diverse surface based counter estimations using both 2Dim and 2 and half Dim data, a parallel update with sweeping tests is performed on two data sets: the Morphological database which is not straightforwardly at hand and the as of late appropriated 3Dim cover hit database.

Keywords- *Spoofing, presentation attack, face detection, masks attack.*

Introduction

This obvious helplessness of face has inducing incredible hobby in the biometric cluster and several identifications have been bar listed on countermeasure ponders. Primarily as an aftereffect of their effortlessness and minimal effort, the already specified photograph printed picture and video replay assail constitute the center of exploration exercises in this area. Presented hostile to caricaturing methodologies against these sorts of attacks can be generally characterized into three gatherings: composition investigation, movement examination and liveness recognition.

Expecting the vicinity of signals like printing, ancient rarities and/or obscuring, numerous hostile to ridiculing methods look at the composition of the caught face picture. Essentially, in a late study, miniaturized scale composition examination utilizing multi-scale neighborhood twofold examples is proposed. It can be contended this sort of methodologies extremely relies on leading the character of the written picture or video show. The most generally utilized biometric quality by people, face acknowledgment has turned into a dynamic exploration point for a long instance now and it has exposed hard to believe application in shopper hardware and encoding. Face be obligated its repute for the most fraction to being naturally and non rudely open contrasted with other biometric qualities like unique mark or iris. On the other

hand, this point of preference turns into a shortcoming in pernicious circumstances, empowering aggressors to make duplicates and parody face acknowledgment frameworks with no challenges. Ridiculing attack is the demonstration of presenting so as to outsmart a biometric framework a fake confirmation to pick up authentication.

Related Work

This idea will also be followed 30 years behind to, which asserts that a face just isn't defenseless towards camouflages and even plastic surgery will also be recognized, due to the fact that it decreases the warm mark of face. Soon after, expressing that masks may also be identified exceedingly stronger in close infrared.

Normal thresholding is advocated for grouping, without cure any trial results, but simply delineations. Two more reports that take after the identical approach for considering are dispensed with deliberate examinations. A multi-phantom investigation is projected in each, maintaining that false, via its definition, is undefined for person eyes and in this method, utilizing just visible graphics just isn't sufficient to appreciate the assaults. Then again, they both manage the veil attack obstacle in an avoidance/camouflage crisis as opposed to caricaturing because they don't investigate cross-check covers that are copies of reliable customers to be imitated. The creator's behavior investigates wonderful duvet substances, for instance, silicon, latex or skin-harden to perceive how numerous they bring about on in reluctance when contrasted with facial dermis that is examined from the temple discipline. For this reason, the conveyance of features for brightening at exclusive wavelengths are examined and two satisfactory wavelengths, a thing from visual and another from shut infrared variety 685nm and 850nm are chosen. At long final, the subsequent second vectors that comprise of brilliance estimations under these brightening and fully at a separation of 30cm in distinct to the sensor are named dermis or non-skin by means of Fisher's direct discriminated. The mechanism is accounted for to identify fake countenances with 97.78% characterization cost. In any case, the probability of impediment in the temple district and the pressured extent confinement limits handy application. Moreover, on this be trained, veils do not even exist subsequent to the examinations are achieved especially on quilt materials.

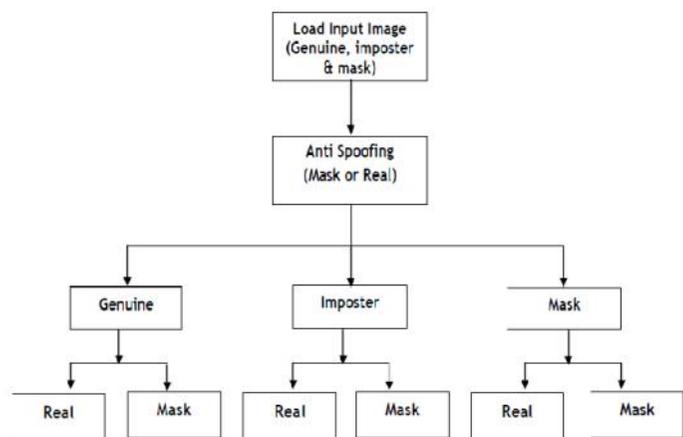


Figure 1: Methods of Finding Fake and Real Examination

Correspondingly, 2 discriminative wavelengths of 850 and 1450 nm are picked resulting to looking on the albedo twists of facial skin also covering materials along fluctuating detachments.

A SVM classifier is prepared to isolate in the focal point of legitimate and false experiment and experimented on a directory of 20 fronts of novel components: iv plastic, vi silica gel, paper crush, iv mortars and ii wipe. Here the outcomes demonstrate that the procedure can achieve a gathering expense of 89.18%. This effort improves the best in school by method for wiping out the achieve requirement and testing real facial cover. Generally, a divergent line of examination in ridiculing with spreads has been allocated by method for Kose et al. Being which a non-open directory made out of printed 3D cloak of sixteen customers is utilized.

To position collectively the database, a 3D laser scanner procures the face items of consumers and the veils are fabricated making use of a 3D printing administration. Regardless of surface graphics, 3D frontal face copy are likewise made obtainable in the Morphological directory for both genuine and intrusion checks. Of their initial two papers, the creators show a weak spot investigation on 2Dim, 2 and half Dim and 3Dim face acknowledgment frameworks towards 3Dim veil intrusion and advocate a miniaturized scale surface investigation construct counter measure connected independently in light of shading images and profundity maps.

Firstly, one will firmly contend that ridiculing is unimportant in an exceedingly close-set recognizable proof setting. this can be on the grounds that the check can reliably be relegated to a temperament within the show freelance of the attack quality. temperament match is accomplished the length of the veil higher appears like the target, contrasted with ingress tests of various IDs. what is more, within the confirmation setting thought-about for the second state of affairs, cowl role player scores square measure nonheritable by coordinative DB-m photos to DB-r tests of IDs not constant because the one centered by the intrusion. this can be silly since no aggressor would deliver AN intrusion for a considerable shopper and case the temperament of one more person.

Mask Intrusion Database's

In current phase, exhaustive information regarding can be presented the two spoofing directories for which three-D masks are utilize to produce the intrusion.

Morphological Directory

The proper approach might be to assess cowl veritable ratings against proper bona fide rankings, which assembles the two conditions in a single score area and empowers us to discern false acknowledgment charges at the same working factor for both true and faux get entry to conditions.

A nearby binary templates (LBP) based counter degree to understand veil intrusion were attempt on mechanisms: shading images and profundity maps. a profundity guide is likewise a black and white picture which contains statistics identifying with the separation of the exterior of 3-D items from a perspective. multi-scale lbp components are eliminated from each 2dim

and 2 and half dim photographs and a immediately bedding vector machine (SVM) classifier is prepared to figure out if an detail fits in with a true or an attack take a look at. a guidance set is used which does no longer cowl with the trying out allotment. the results are introduced independently for 2nd and a pair of.5d modes as right order charges that are computed at the limits giving first-rate exhibitions. Considering an advancement allotment does now not exist, the limits are more desirable at the check scores.

Later, two mixture plans, at highlight and rating tiers are invented to join already proposed lbp histograms computed from the 2d and a couple of.5d snap shots. grouping effects are given in the identical past manner; excellent exhibitions were given by way of tuning the selection limit at the check set. at the same time as the 2dim and 2 and half dim modes give 89.four% and eighty two.4% association prices independently, the combination of these modes builds this price to 93.5%. Furthermore, a valid exam is integrated into the paper on the effect of the veil intrusion and the invented counter measure method on two benchmark (2d and 3d) face acknowledgment calculations. the region blunder trade off (DET) plots discover that without a counter measures three-D veils may be profoundly negative to both 2d and 3D face acknowledgment exhibitions.

The creators look into one more kind of contrasting measure method in view of reflectance exam. the proposed approach uses the version retinex calculation to stand composition photographs into reflectance and brightening parts. Ultimately, an immediately SVM classifier is connected to set up reflectance photos as veils or true countenances.

Repeatedly, the execution assessment is carried out neglecting using an improvement set and outcomes are accounted for as maximum best characterization fee. From these last augmentations to the writing within the space of face mocking making use of 3-D covers, the studies have certainly picked up electricity. Anyways, aside from the already mentioned inadequacies, they regrettably involve a noteworthy deterrent to reproducible and equivalent identification: the used directory is not accessible for open use.

Remembering these focuses, in our paper we seek after three primary purposes:

- Detailing the first open ridiculing directory with facial veils, called 3Dim Mask Attack Database in point of interest, alongside complete conventions for experimentation.
- Presenting an exceptionally point-by-point standard examination on caricaturing exhibitions of every cover in this directory against state- of-the-workmanship 2Dim, 2 and half Dim and 3Dim face acknowledgment frameworks.
- Submitting near trial outputs on two information storage which will go about as the lost connection between the past studies that have been proposed on Morphological directory and the future studies that will be founded on 3DimMAD.

Whatever remains of the paper is sorted out as takes after: the two veil ridiculing databases are depicted in point of hobby in segment iii. Three benchmark face acknowledgment calculations and further concentrated counter measure strategies are clarified in segment iv and v, one after the other. in phase vi, exploratory results on the 2 database for both their mocking

capacities and against caricaturing exhibitions of the performed counter degree structures are given. at final, the paper is closed with feedback on the future paintings.

3Dim Mask Attack Database

The 3-D mask assault information can be a face spoofing data that currently holds 76500 frames of seventeen distinctive customers, documented with the aid of suggests that of microsoft kinect sensing detail for alongside real get right of entry to and spoofing assaults victimization three-D facial mask.

Each Body Consists of

- An intensity of picture (640×480 pixels - one \times eleven bits)
- The equal coloration example (640×480 pixels - 3 \times eight bits)
- Physically understood eye location (with relation to the color picture)

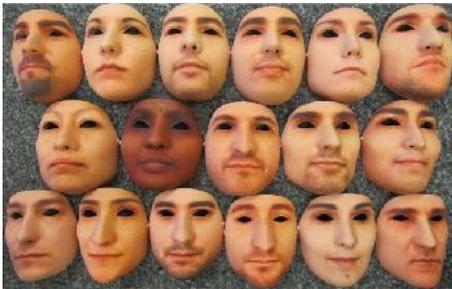


Fig (a)

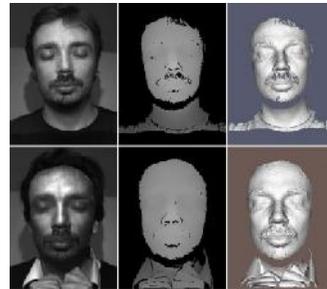


Fig (b)

Figure 2: (a) Example paper-craft mask from 3DimMAD. (b) 17 hard resin masks from 3DimMAD.

The creation of the directories can be separated into two stages: modern the 3Dim masks and tape the videos that will be enlightened in detail in the next subsections.

Modern the 3Dim Masks

It is articulated that caricaturing intrusion exploit 3Dim facial veils can't turn into a classic practice in the writing, effectively due to the high rate of customer like covers. On the further , as of late 3D printing supervision have spring up and turned into a quickly developing business sector, lamentably, smoothing the route for diverse cover attack potential outcomes to face acknowledgment frameworks.



Figure 3: The top row shows a true access from a user in black and white texture (2Dim), depth map (2 and half Dim) And 3Dim model format whereas an assailant carrying an equivalent user's mask is projected within the bottom.

The procedure used to build the covers in the Morphological database have need of the 3D sculpt of the substantial clients to be caught keeping in mind the end goal to be built utilizing a customary 3D printer. Despite the fact that 3D scanner innovations are progressing amazingly, extend confinements and imperative for client collaboration still exist. Consequently, unknowingly grabbing hold of a legitimate 3D face show that has a place with a substantial client, perhaps from a separation is profoundly illogical. Keeping in mind the end goal to deliver the covers for our database, we utilized a specific administration got that's myFace.com which emerges with its specialization in facial reproduction and in changing 2D picture into 3D models, among different choices.

Utilizing this employer, it's miles feasible for a 3-D face version implemented utilizing frontal and sketch snap shots of a person to be published also conveyed on your letter field in a few structures, as an instance, a head on an activity parent or a wearable life-size veil in tough sap or a paper-reduce report. Its web page lets in the clients to look and study the created face model before inquiring for it. Genuinely, the precept factor of interest of this management over the others is the probability of the usage of standard facial pix to make a three-D model. Due to the fact diverse to 3-d sweeps, pictures of the customers can be efficaciously caught shape a separation or observed on the maze. Used for 3dmad, one Develop and two sketch face photographs are in use as of 17 particular customers and transferred on that's my-face.com. for each purchaser, an life size wearable cover and a paper-art veil is asked. the transferred images which have been applied as a part of the exercise of the 3-D face fashions are moreover handy in the database collectively with the paper-artwork veil records (see fig. 2(a)), for doable destiny use, making it viable for unique scientists to make their very own particular satires. anyhow, they may be excluded inside the extent of this examine. in fig. 2(b), the 17 wearable veils produced from a difficult sap composite in full 24-bit shading with openings on the eyes also the nostrils are shown with a specimen paper cowl made only for delineation functions. taking everything under consideration, veils utilized for 3dmad contrasts from those for morphological database in some focuses. first off and especially, the 3-d states of the covers in 3dmad aren't decisively proper as it's miles the scenario with morphological database since the remade models are just more or less processed from 2d pix. the subsequent veil high-quality relies on upon the facts pictures and similarly the execution of the activity calculation.

Database Recording Method

The attention positions ar manually tagged for each sixtieth frame so, they're linearly interpolated for the remainder in among. for all 3 periods, the tape matters ar very well restrained. the customers ar recorded immediately going through the sensing detail in the front of a uniform heritage and underneath practical illumination this is altered to minimize the shadows stitch their faces. in fig. 2 3 samples from three sessions for an equal person ar given as accomplice instance. Its feeler detain frequently of flush and power of the records inside the prospect at 30 frames in line with 2nd. The maximum essential motive at the lower

back the sort of this tool over different common cameras is the in adding as much as that present power in collection, which creates it achievable:

- To look at the assaults and formulate countermeasures in three-D,
- To research the susceptibility of three-D faces acknowledgment system to mask intrusions in accumulation to their second complement.

The informations is collected in 3 exceptional sessions for all users and in every congregation five videos of ten seconds length is taken into custody. the primary 2 sessions square measure command period at a distance during which real access models square measure collected. Whereas within the third session mask intrusions that square measure performed by one operatives square measure captured. As a result, 255 color and intensity videos of three hundred frames square measure recorded. moreover, for every video, the attention positions square measure physically tagged for each sixtieth frame then, they're linearly interpolated for the remainder in between. For all 3 sessions, the footage circumstances square measure o.k. forced. The users square measure recorded unswervingly facing the device in front of a standardized conditions and beneath sensible illumination that is in tune to reduce the shade on their faces.

Base Line Face Recognition Algorithms

Prior to intending onward to boom counter measures subsequent to cowl assaults, it's far critical to verify the threat they position on the safety of face popularity frameworks. on the last a part of the day, it's miles necessary to evaluate the subjection of typically utilized face reaction calculations to these varieties of ridiculing deeds. due to the manner that, the dataset turned into separated into non-overlapping sets for getting ready, improvement and trying out, it turned into unrealistic to assess each cowl.

As regards to the 3D, on the grounds that together databases do exclude any outward appearances, iterative closest factor (ICP) device is chosen to enlist floor units to one another and icp blunder is simply taken as a measure of ways well they coordinate. Sever a early studies for three-D face acknowledgment advocate this subculture [29]-[31]. These calculations are selected essentially to increase the quantity of extraordinary face acknowledgment routines whose vulnerabilities are broke down against 3Dim cover attacks. Examination for later or extra-propelled techniques is not the motive.

ISV Scheme for 2Dim and 2 and half Dim Face Recognition

The Inter session variability design, at one time evolved for recognition, and is beneficial for face feeling assignment [27]. Indexed shoppers square degree delineated with Gaussian mixture fashions (GMM) it's designed on some groups of pixels extorted from their descriptions within the gallery. ISV aims to assemble those consumer representations a whole lot of reliable through eliminate internal consumer unsimilarity. Initially, twelve-x twelve blocks rectangular degree thoroughly sampled from the facial picture via adjusting the sampling window one constituent at a time. Subsequent, suggest and variance social control is

carried out and additionally the 1st forty five 2nd DCT coefficients square measure extracted. Supported the passing of those feature vectors, a GMM is calculable exploitation heritage version adjustment for every consumer. sooner or later, ISV modeling is applied to remove the consumer variant, by means of presumptuous it is available throughout a linear residence area of the GMM mean exquisite vector space and calculating subspaces thru maximum chance and suppressed variables thru finest a posteriori adjustment. a lot of pleasant factors on the method might be begin. like maximum of the conferred 2nd faces reputation strategies [32], ISV will besides be enforcing for facial contour statistics in TWO 5D.

ICP System for 3Dim Face Recognition

Before intending ahead to increase counter measures in opposition to cowl assaults, it's far important to nation the danger they area on the protection measures of face acknowledgment frameworks. at the end of the day, it's far important to assess the weak spot of usually utilized face appreciation calculations to these types of deride endeavors. in precedent dissertation [26], we've got tested the deride exhibitions of a compartment of covers in 3dmad using 2nd face acknowledgment computation that relies upon on inter consultation variability (isv) displaying technique. because of the manner that, the dataset turned into separated into non-covering sets for getting ready, advancement and trying out, it became unrealistic to calculate every cover.

On this Study, We Increase the Past Exam in III Headings

- The impact of veils is likewise assessed for added 2.5d and three-D frameworks.
- Experiments are carried out in overlook one manner so that everyone veils may be broke down.
- Morphological database is also protected so that an association is constructed up from the prevailing nice in class to practicable destiny research.

In a comparable way to these studying, ISV estimation is favored to be associated on both black and white outside photographs and profundity maps for 2Dim and 2 and half Dim face confession, Separately relating to the 3D. When you consider that both statistics do take away any outward manifestation, repetition closest factor (ICP) approach is desired to solicit surface units to 1 a in addition and ICP blunder is presently taken as a compute of the way properly they coordinate. Numerous early research for 3-D face acknowledgment advocate this way of life [29]–[31]. Those calculations are selected to increase the quantity of distinct face acknowledgment routines whose vulnerabilities are broke down in opposition to 3D cover attacks. Examination for later or more propelled techniques isn't always the purpose of.

Spoofing Prohibiting Algorithms

As clarified in the advent segment, it is far harder to distinguish 3-D cowl assaults with motion exam and liveness place structures. Consequently, composition exam remains as a extra decent technique that may be obtained.

Definitely, human skin is not quite the same as veil materials with its optical characteristics, as an instance, reflectance or dissipating. this facilitates usage of composition houses to separate among genuine confronts and covers. Community binary patterns (NBP) is a honest and proficient composition administrator which has was a established methodology in exclusive pc imaginative and prescient packages. virtually, LBP and its diversity had been successfully coupled in counter approaches in opposition to second caricaturing assaults. further, kose et al. assessed the viability of a LBP based totally miniaturized scale surface examination manner in three-D face against parodying using morphological database. Inside the multistage LBP based totally, element vector proposed against photograph print attacks is used to distinguish 3-D veils. Because of this, it is far related independently on second and a pair of.5d pix and order fees are accounted for to be 89.4% and 82.4%, for my part. Later in [23], modes are intertwined at highlight and rating levels to make better progress costs (93.0% and 95.5%).

Seperation of LBP Based Features

Customized, transitional and track coded. Instead of the picture element value, the CLBP uses the average of the neighboring pixels for comparison. In translation two successive neighboring picture elements are compared circularly in clock-wise direction and in track coded. Intensity difference is prearranged for only four base information's into two bits, again outputs in 8-bit value (see Fig. 4).

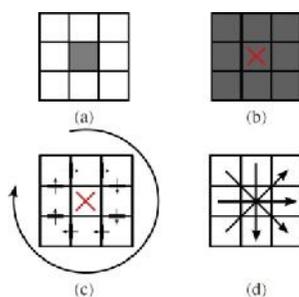


Figure 4: Extended set of LBPs: (a) conventional LBP; (b) 8-bit coded customized LBP (c) Transition coded LBP (d) track coded LBP.

Additionally, the have an impact on of segregating face photos into blocks is assessed for each enhanced LBP type. the face picture is broken into three × 3 non-overlapping blocks as soon as the LBP values area unit analysed. Histograms location unit are find out separately for every block and also the very last characteristic vector is made by means of concatenation. in block technique is ended to be ineffectual for finding of 2d spoofing assaults.

Feature Classification

For the reason that extracted LBP codes are accrued into histograms, the category can be truly completed by using analyzing histogram similarities. So first off, reference histograms

are calculated as the everyday of real admittance and mask show aggression example inside the training set and the features separated from check samples are in comparison with these the usage of χ^2 metric, ensuing in distances: d_{actual} and d_{masks} . the very last score is computed as $d_{mask} - d_{real}$. An SVM classifier is used with a linear kernel. SVM classification is likewise carried out in our previous work, but the crucial component kind is favored to be the radial foundation function. in this mastering, a evaluation among the 2 important parts is complete with reverence to their mask assault discovery qualifications.

Face liveliness detection systems can also be encouraged by way of variability in lights, purpose and film great. To increase the effectiveness of liveliness detection, many systems have adopted preprocessing. Preprocessing now and again includes the elimination of noise from the image and occasionally normalization steps so that it will improve the visible appearance of the facial pictures for characteristic extraction. The mechanisms might include smoothing, blurring, sharpen, facet detection or scaling. then, the preprocessed samples ar promoted to the attribute elimination part to require out the salient alternatives in differentiating stay specimens from spoof counterparts.

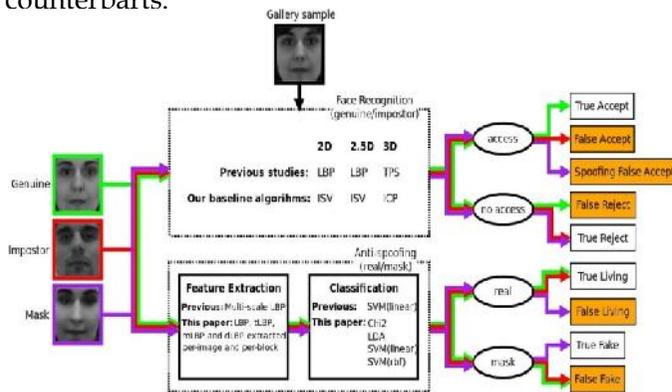


Fig 4: Block diagram

Conclusion

Ridiculing attacks keep on being a guard danger for bio-metric acknowledgment frameworks and face is amidst the most helpless attributes because of its high openness. Greater part of past studies in face displaying so as to ridicule spotlight on counteracting 2Dim intrusion performed printed photographs or replaying recorded recordings on cell phones. On the other hand, use of 3Dim veils for face caricaturing attacks has gotten to be less demanding and less expensive with the progressions in 3Dim remaking and printing advancements. From this paper, we mean to add to the present state of the craftsmanship in the examination area of 3D cover attacks. For this reason, we broaden our past work in three bearings; firstly by surveying ridiculing exhibitions on 2 and half Dim and 3Dim frameworks, furthermore by dissecting every veil independently with LOOCV and in conclusion investigating another 3D cover satirizing database which has been utilized as a part of a portion of the past concentrates yet is not freely accessible, notwithstanding 3DMAD. The parallel assessments of LBP construct

hostile to satirizing systems in light of these two databases permit us to relate beforehand bar listed outputs on the Morphological directory with our present work and with conceivable future studies on 3DimMAD.

A conceivable expansion to this work is to hunt down more generalizable calculations to recognize the cover attacks, so as to stay away from substantial varieties in blunder rates. They got score distributions for 3DMAD are seen to change in the middle of advancement and test sets, bringing about problematic choice limits and subsequently, expanded mistake rates. One more point that should be consideration is the employ of face attack tests for preparing the counter parodying frameworks. In a perfect world, a countermeasure calculation against satirizing ought to have the capacity to choose whether the face picture caught by the sensor has a place with a genuine face or not, paying little heed to the attack sort. Since it is not sensible for a biometric framework to utilize an alternate hostile to ridiculing module for every attack sort. In the greater part of the past works and in this study, the classifiers are prepared utilizing both genuine and attack test.

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