

3rd Face Anti-Spoofing Workshop and Challenge@ICCV2021

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Background



Print photo attack



Bending the
print attack



3D Mask attack



Video replay attack

**Face recognition system would be
attacked in different ways**

Previous Competitions

■ IJCB 2011

- 2D Attacks (RGB)
- Dataset: **Relayattack**

■ ICB 2013

- 2D Attacks (RGB)
- Dataset: **Relayattack**

■ IJCB 2017

- 2D Attacks (RGB)
- Dataset: **Oulu-NPU**



Idiap

Figure 1: Examples of real accesses and attacks in different scenarios. In the top row, samples from *controlled* scenario. In the bottom row, samples from *adverse* scenario. Columns from left to right show examples of real access, printed photograph, mobile phone and tablet attacks.

Relayattack



(a) Samsung

(b) HTC

(c) MEIZU

(d) ASUS

(e) Sony

(f) OPPO

Fig. 3: Sample images showing the image quality of the different camera devices.

Oulu-NPU

Previous Competitions@CVPR2019

- CVPR workshop 2019
 - Multi-modal Attacks (RGB,depth, infraed)
 - dataset: CASIA-SURF

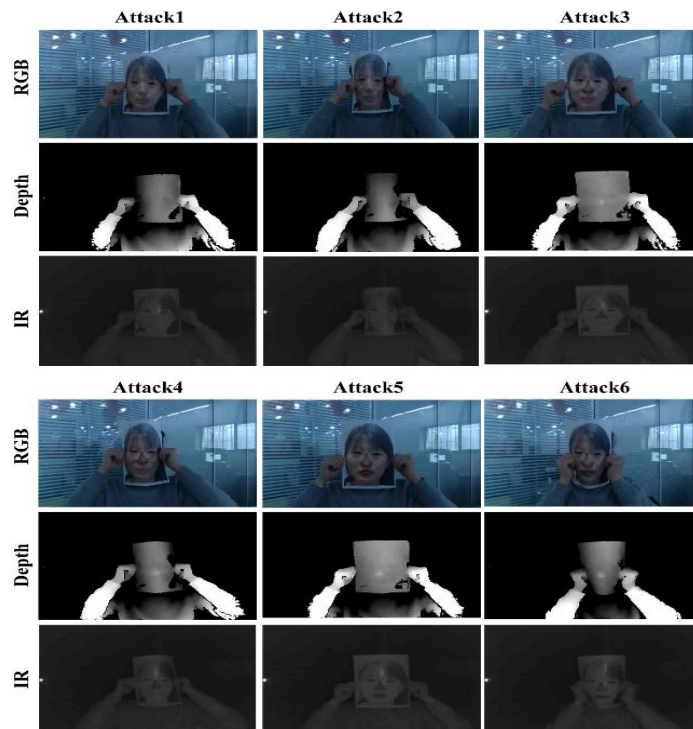


Figure 2. Keynote Speakers: IEEE Fellow Stan Z. Li (CASIA), Abdenour Hadid (University of Oulu), Xiaoming Liu (MSU), Guodong Guo (IDL, Baidu).

CASIA-SURF

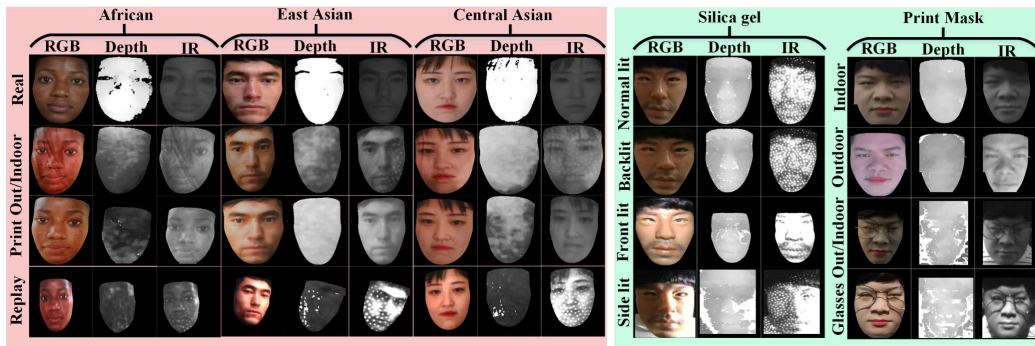
Previous Competitions

■ CVPR workshop 2020

- Multi-modal Attacks (RGB, depth, infraed)
- Multi-ethnic Attacks (African, East/ Central Asian)
- dataset: CASIA-SURF **CeFA**

- Protocol 1 (cross-ethnicity)
- Protocol 2 (cross-PAI)
- Protocol 3 (cross-modality)
- **Protocol 4 (cross-ethnicity & PAI)**

Protocol of the challenge used



Ethnicity	Real & Attack styles	# RGB	# Depth	# IR	Subtotal
African East Asian Central Asian	Real	500	500	500	6000
	Cloth-indoor attack	500	500	500	6000
	Cloth-outdoor attack	500	500	500	6000
	Replay attack	500	500	500	6000
Total: 1500 subjects, 18000 videos					

3D Mask Attack	Attack styles	# RGB	# Depth	# IR	Subtotal
Print mask 99 Subjects & 6 Lighting	Only mask	594	594	594	5346
	Wig without glasses	594	594	594	
	Wig with glasses	594	594	594	
Silica gel mask 8 Subjects & 4 Lighting	Wig without glasses	32	32	32	192
	Wig with glasses	32	32	32	
Total: 107 subjects, 5538 videos					

- Intel RealSense SR300
- Covering 3 ethnicities, 3 modalities, 1, 607 subjects, and 2D plus 3D attack types.
- Five protocols are introduced to measure the affect under varied evaluation conditions.

Statistics of the 2D/3D attack subset

3D High-Fidelity Mask Face Presentation Attack Detection Challenge@ICCV 2021

■ CASIA-SURF HiFiMask Dataset

Table 1. Comparison of the public 3D face anti-spoofing datasets. Y, W, and B are shorthand for yellow, white, and black, respectively. ‘Sub.’, ‘Mask Id.’ and ‘Light. Cond.’ denote ‘Live subjects’, ‘Mask identity numbers’ and ‘Lighting Condition’, respectively. Number with ‘*’ denotes this number is statistically inferred and there may be inaccuracies.

Dataset, Year	Skin tone	#Sub.	#Mask Id.	Material	Scenes	Light. Cond.	Devices	#Videos (#Live/#Fake)
3DMAD [39], 2013	W/B	17	17	Paper, hard resin	Controlled	Adjustment	Kinect	255(170/85)
3DFS-DB [11], 2016	Y	26	26	Plastic	Office	Adjustment	Kinect, Carmine 1.09	520(260/260)
BRSU [42], 2016	Y/W/B	137	6	Silicone, Plastic Resin, Latex	Disguise Counterfeiting	Adjustment.	SWIR, Color	141(0/141)
MARsV2 [31], 2016	Y	12	12	ThatsMyFace REAL-F	Office	Room light, Low light Bright light, Warm light Side light, Up side light	Logitech C920, Industrial Cam EOS M3, Nexus 5, iPhone 6 Samsung S7, Sony Tablet S	1008 (504/504)
SMAD [38], 2017	-	Online	Online	Silicone	-	varying lighting	Varying cam.	130(65/65)
MLFP [1], 2017	W/B	10	7	Latex, Paper	Indoor, Outdoor	Daylight	Visible Near infrared, Thermal	1350 (150/1200)
ERPA [3], 2017	W/B	5	6	Resin, Silicone	Indoor	Room light	Xenics Gobi, thermal cam. Intel Realsense SR300	86
WMCA [14], 2019	Y/W/B	72	7*	Plastic Silicone, Paper	Indoor	Office light LED lamps, day-light	Intel RealSense SR 300 Seek Thermal, Compact PRO.	1679 (347/1332)
CASIA-SURF 3DMask [47], 2020	Y	48	48	Plaster	Indoor, Outdoor	Normal light, Back light Front light, Side light Sunlight, Shadow	Apple, Huawei Samsung	1152 (288/864)
HiFiMask (ours), 2021	Y/W/B	75	75	Transparent Plaster, Resin	White, Green Tricolor, Sunshine Shadow, Motion	NormalLight, DimLight BrightLight, BackLight SideLight, TopLight	iPhone11, iPhoneX MI10, P40, S20 Vivo, HJIM	54,600 (13,650/40,950)

3D High-Fidelity Mask Detection Challenge

■ CASIA-SURF **HiFiMask** Dataset



- 6 kinds of imaging sensors.
- 6 kinds of appendages.
- 6 kinds of illuminations.
- 6 deployment scenarios.
- HiFiMask is the largest 3D face mask dataset, which contains 54,600 videos.
- HiFiMask provides 3 high-fidelity masks with the same identity.
- We repeatedly shoot 6 videos under different lighting directions.
- 7 main-stream imaging devices are utilized for video recording.

3D High-Fidelity Mask Detection Challenge

Table 2. Statistical information for each protocol of the proposed HiFiMask dataset. Note that 1, 2 and 3 in the fourth column mean Transparent, Plaster and Resin mask, respectively.

Pro.	Subset	subject	Masks	# live	# mask	# all
1	Train	45	1&2&3	8,108	24,406	32,514
	Dev	6	1&2&3	1,084	3,263	4,347
	Test	24	1&2&3	4,335	13,027	17,362
2.1	Train	45	2&3	8,108	16,315	24,423
	Dev	6	2&3	1,084	2,180	3,264
	Test	24	1	4,335	4,326	8,661
2.2	Train	45	1&3	8,108	16,264	24,372
	Dev	6	1&3	1,084	2,174	3,258
	Test	24	2	4,335	4,350	8,685
2.3	Train	45	1&2	8,108	16,233	24,341
	Dev	6	1&2	1,084	2,172	3,256
	Test	24	3	4,335	4,351	8,686

■ testing protocols

- Protocol 1 (*seen*)
- Protocol 2 (unseen)
- Protocol 3 (openset)

■ Metrics

- ACER: Average Classification Error Rate
- AUC : Area Under Curve

3D High-Fidelity Mask Detection Challenge



Chalearn 3D High-Fidelity Mask Face Presentation Attack Detection Challenge@ICCV2021

Organized by gesture_challenge

Face presentation attack detection (PAD) is essential to secure face recognition systems primarily from high-fidelity mask attacks. Most existing 3D ...

Apr 19, 2021-Jun 20, 2021

195 participants

Statistics of teams

- Participates Teams (registered): 195
- Code submissions: 18 Teams



Ranking	Team Name	Leader Name, Affiliation
1	VisionLabs	Oleg Grinchuk, visionlabs.ai
2	WeOnlyLookOnce	Ke-Yue Zhang, Tencent Youtu Lab
3	CLFM	Samuel Huang, FaceMe
4	oldiron666	Zezheng Wang, Kuaishou Technology
5	Reconova-AI-LAB	Mingmu Chen, Reconova Technology
6	inspire	Jiang Hao, Bytedance Ltd.
7	Piercing Eyes	Hyokong, National University of Singapore
8	msxf_cvas	Liang Gao, MaShang Consumer Finance Co.,Ltd
9	VIC_FACE	Cheng Zhen, Meituan
10	DXM-DI-AI-CV-TEAM	Weitai Hu, Du Xiaoman Financial
11	fscr	Artem Petrov, Peter the Great St. Petersburg Polytechnic University
12	VIPAI	Yao Xiao, Zhejiang University
13	reconova-ZJU	Zhishan Li, Zhejiang University
14	sama.cmb	Yifan Chen, Chinese Merchants Bank(CMB)
15	Super	Yu He, Technische Universität München, mytum
16	ReadFace	Zhijun Tong, ReadFace
17	LsyL6	Dongxiao Li, Zhejiang University
18	HighC	Minzhe Huang, Akuvox (Xiamen) Networks Co., Ltd.

3D High-Fidelity Mask Detection Challenge

Challenge winners:

Place	Team Name	Team Leader	Affiliation	Awards
1	VisionLabs [1]	Oleg Grinchuk,Aleksandr Parkin, Evgenija Glazistova	VisionLabs	1000 \$ + Certificate
2	WeOnlyLookOnce[2]	Ke-Yue Zhang, Shen Chen, Ke Sun, Yang Chen, Zhihao Gu	Tencent Youtu Lab	500 \$ + Certificate
3	CLFM[3]	Samuel Huang,	FaceMe	300 \$ + Certificate

Best workshop Paper:

Title	Authors	Affiliation	Awards
On Improving Temporal Consistency for Online Face Liveness Detection System	Xiang Xu Yuanjun Xiong Wei Xia	Amazon	500\$ + Certificate

[1] Oleg Grinchuk et al., 3D mask presentation attack detection via high resolution face parts, ICCVW, 2021

https://github.com/AlexanderParkin/chalearn_3d_hifi

[2] Shen Chen et al., A Dual-stream Framework for 3D Mask Face Presentation Attack Detection, ICCVW, 2021

[3] Samuel Huang et al., Single Patch Based 3D High-Fidelity Mask Face Anti-Spoofing, ICCVW, 2021

3D High-Fidelity Mask Detection Challenge

Challenge results and winners

Chalearn 3D High-Fidelity Mask Face Presentation Attack Detection Challenge Results (Rank by ACER) at ICCV 2021					
Leader Name, Affiliation	Team	APCER	BPCER	ACER	Rank
Oleg Grinchuk, visionlabs.ai	VisionLabs	3.777	2.33	3.053	1/56
Ke-Yue Zhang, Tencent Youtu Lab	We Only Look Once	1.858	4.452	3.155	2/56
Samuel Huang, FaceMe	CLFM	3.708	2.722	3.215	3/56
Zezheng Wang, Kuaishou Technology	oldiron666	4.944	2.653	3.798	4/56
Mingmu Chen, Reconova Technology	Reconova-AI-LAB	2.126	6.367	4.247	5/56
Jiang Hao, Bytedance Ltd.	inspire	5.834	4.06	4.947	6/56
Hyokong, National University of Singapore	Piercing Eyes	3.669	7.313	5.491	7/56
Liang Gao, MaShang Consumer Finance Co.,Ltd	msxf_cvas	5.773	5.352	5.562	8/56
Cheng Zhen, Meituan	VIC_FACE	8.843	2.399	5.621	9/56
Weitai Hu, Du Xiaoman Financial	DXM-DI-AI-CV-TEAM	8.444	4.175	6.31	10/56
Artem Petrov, Peter the Great St.Petersburg Polytechnic University	fscr	6.095	7.52	6.808	11/56
Xiao Yao, Zhejiang University	VIPAI	7.968	6.182	7.075	12/56
Zhishan Li, Zhejiang University,	reconova-ZJU	10.21	4.221	7.216	13/56
Yifan Chen, Chinese Merchants Bank(CMB)	sama_cmb	11.891	4.337	8.114	14/56
Yu He, Technische Universität München, mytum	Super	5.988	10.473	8.23	15/56
Zhijun Tong, ReadFace	ReadFace	11.944	4.66	8.302	16/56
Dongxiao Li, Zhejiang University	LsyL6	15.591	3.183	9.387	17/56
Minhe Huang, Akuvox (Xiamen) Networks Co., Ltd.	HighC	12.712	7.843	10.278	18/56

Conclusion and Future Plans

■ Conclusion

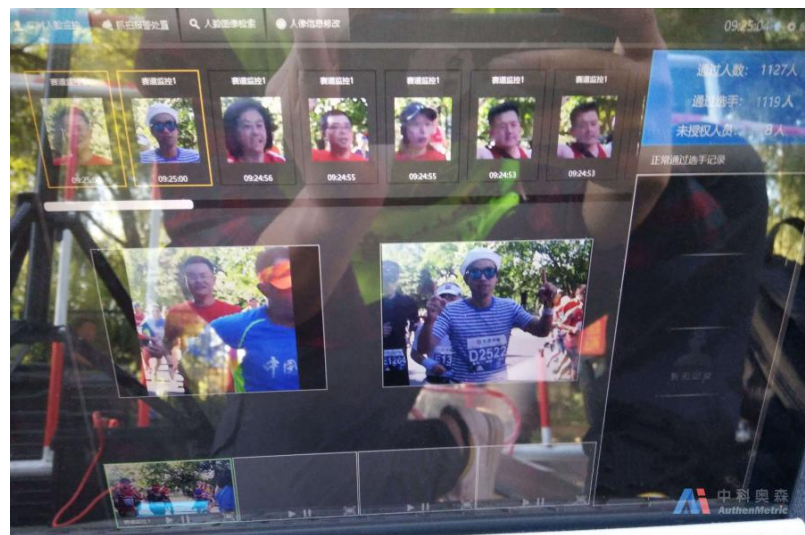
- ◆ A large-scale High-Fidelity Mask dataset, namely CASIA-SURF HiFiMask (briefly HiFiMask).
- ◆ An influential competition, which has attracted nearly 200 participates.
- ◆ Enable high-performance algorithms(Top 3 winners).

Conclusion and Future Plans

■ Future Plans

The 4th Face anti-spoofing challenge

- ◆ Face anti-spoofing in surveillance scene.



Acknowledgments

■ Awards Sponsor



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■ Data Sponsor



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References

- [1] Ajian Liu, Chenxu Zhao, Zitong Yu, Jun Wan, Anyang Su, Xing Liu, Zichang Tan, Sergio Escalera, Junliang Xing, Yanyan Liang, Guodong Guo, Zhen Lei, Stan Z. Li, Du Zhang, "Contrastive Context-Aware Learning for 3D High-Fidelity Mask Face Presentation Attack Detection", arxiv, 2021.

---This paper introduces the CASIA-SURF HiFiMask dataset.

- [22] Ajian Liu and Chenxu Zhao and Zitong Yu and Anyang Su and Xing Liu and Zijian Kong and Jun Wan and Sergio Escalera and Hugo Jair Escalante and Zhen Lei and Guodong Guo, "3D High-Fidelity Mask Face Presentation Attack Detection Challenge", 2021 IEEE/CVF Conference on International Conference on Computer Vision Workshops (ICCVW). IEEE, 2021.

---This paper introduces the face anti-spoofing attack challenge, including winner's information, method, performances and so on.

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Thanks!