



Assignment 1: QA4Camera : Quality Assessment for Smartphone Cameras

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上海交通大学
SHANGHAI JIAO TONG UNIVERSITY

1

Background

2

ICME2020 Grand Challenge

3

Solutions and Results

4

Assignment Requirements



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1

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2

ICME2020 Grand Challenge

3

Solutions and Results

4

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Background



Traditional IQA



JPEG Compression



White Noise

QA for Smartphone Cameras



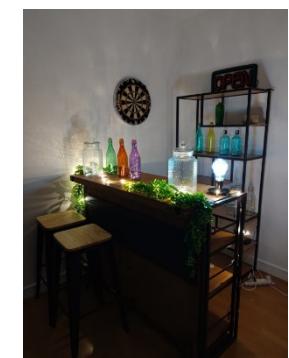
Exposure



JP2K Compression



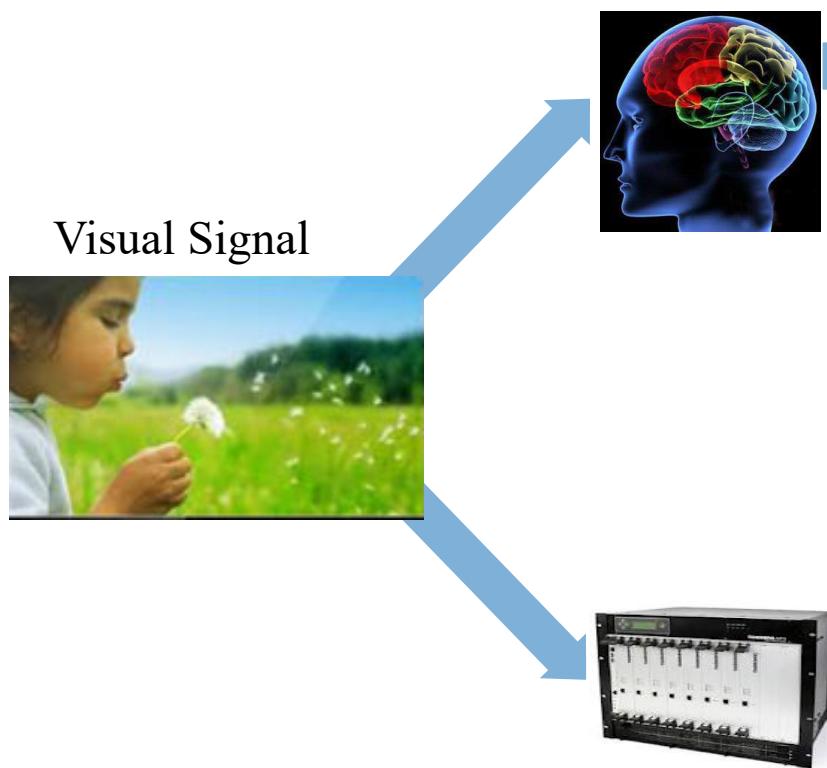
Gaussian Blur



HDR



Background



Subjective IQA

- Rated by a groups of subjects
- Accurate and reliable
- Time-consuming and expensive

Opinion Scores

Excellent
80-100

Good
60-80

Fair
40-60

Poor
20-40

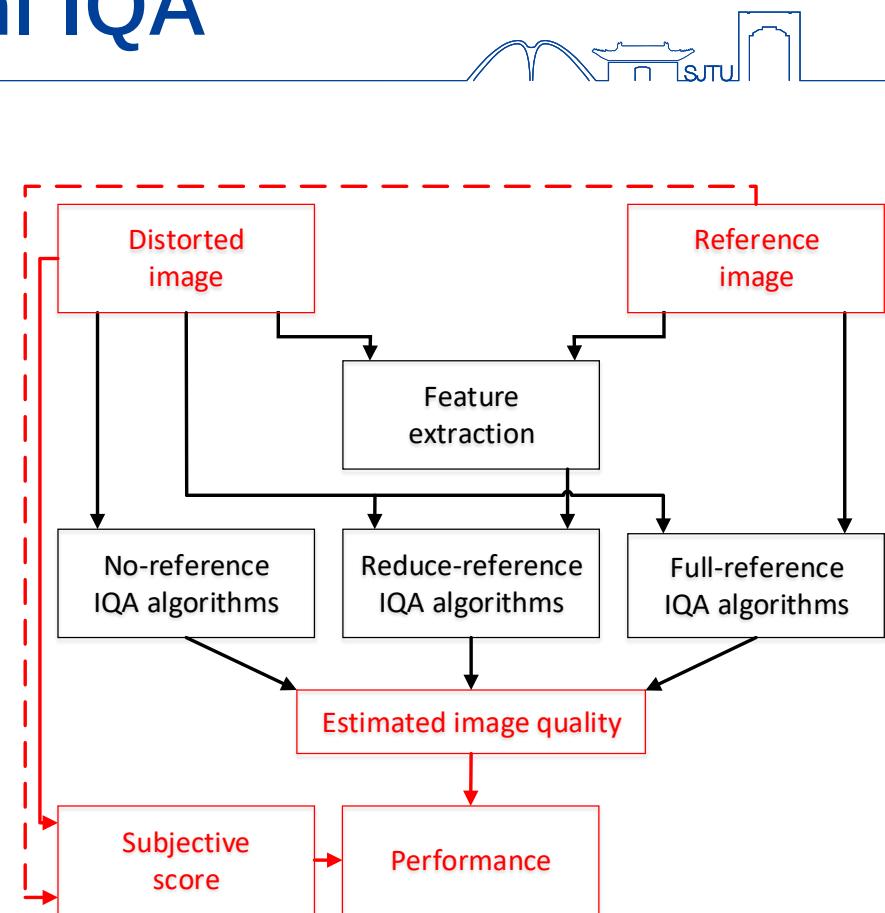
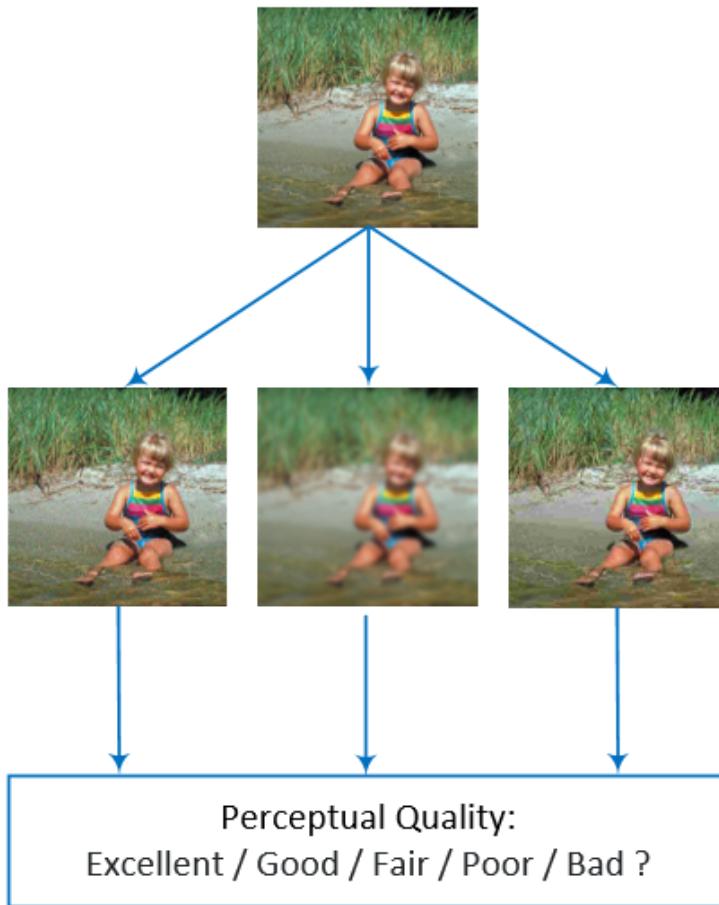
Bad
0-20

Objective IQA

- Predict the quality automatically
- High efficiency
- Real-time

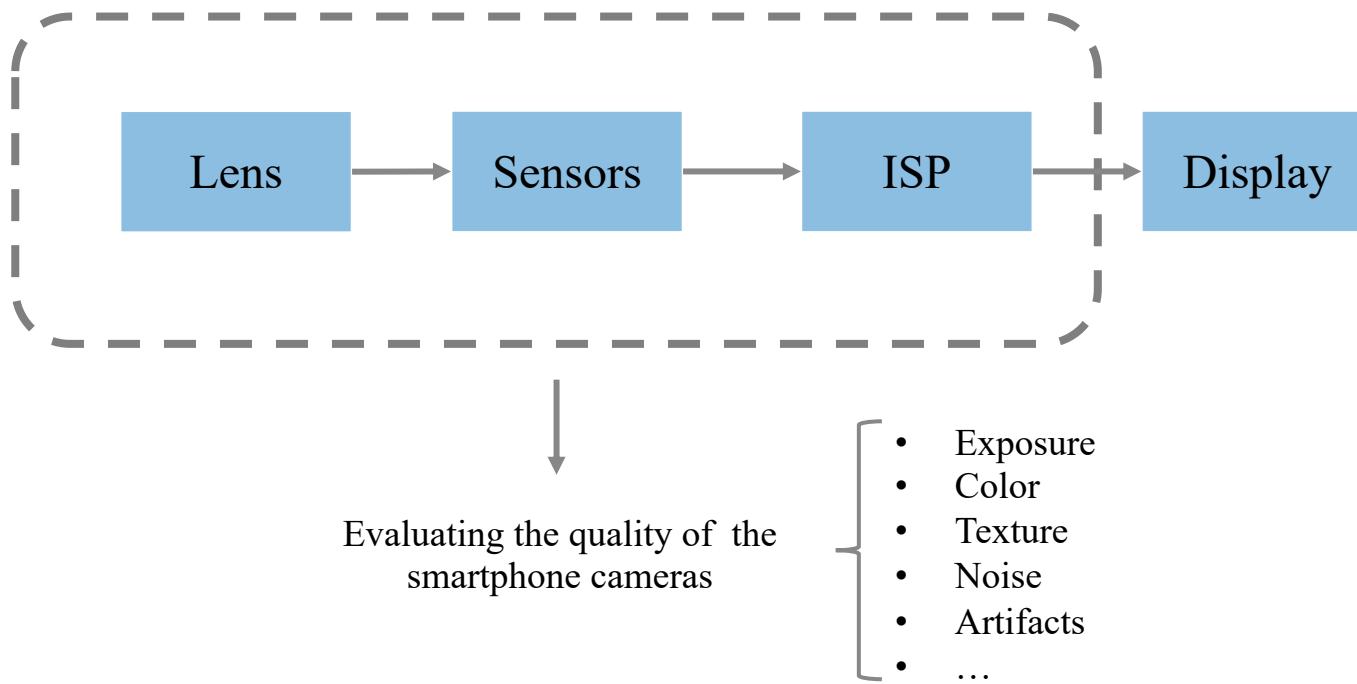


Background: Traditional IQA





Background: QA for Smartphone Cameras





Background: QA for Smartphone Cameras



MOBILE	CAMERA	SELFIE	AUDIO
	121	93	
Xiaomi Mi CC9 Pro Premium	121		
Apple iPhone 11 Pro Max	117		71
Samsung Galaxy Note 10+...	117	99	66
Samsung Galaxy Note 10+	117		66
Huawei P30 Pro	116	89	
Oppo Reno 10x Zoom	116		
Samsung Galaxy S10 5G	116	97	
OnePlus 7 Pro	114	86	65
Honor 20 Pro	113	85	53

Can we evaluate it
automatically ?

1

Background

2

ICME2020 Grand Challenge

3

Solutions and Results

4

Assignment Requirements





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Challenge Description

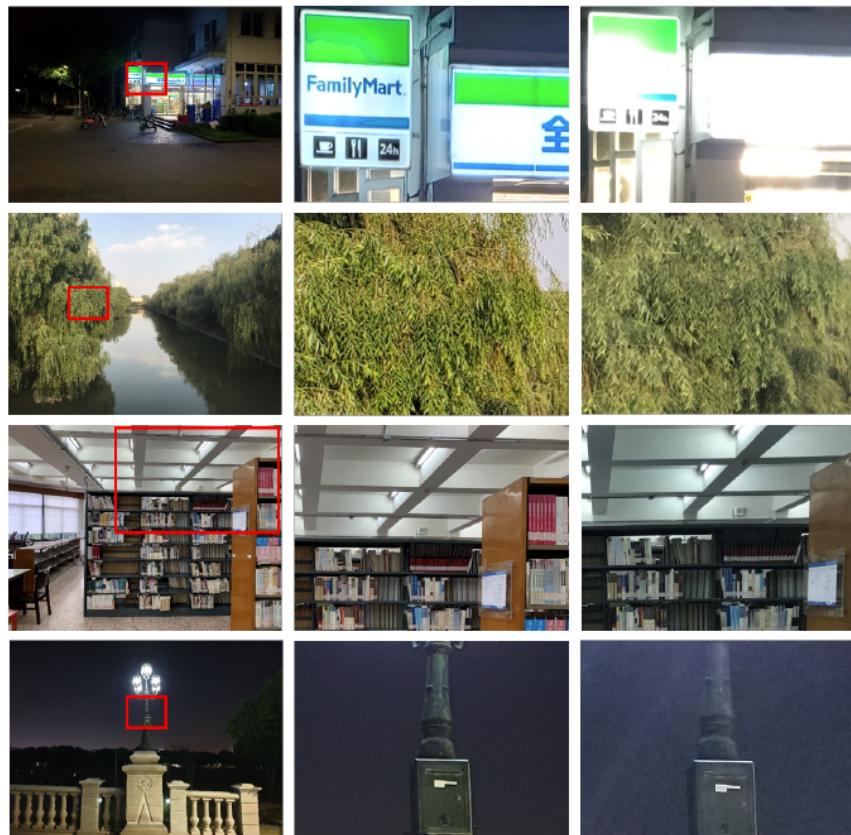
Smartphone has been one of the most popular digital devices in the past decades, with more than 300 million smartphones sold every quarter in the world wide. Most of the smartphone vendors, such as Apple, Huawei, Samsung, launch their new flagship smartphones every year. People use smartphone cameras to shoot selfie photos, film scenery or events, and record videos of family and friends. The specifications of smartphone camera and the quality of taken pictures are major criteria for consumer to select and buy smartphones. Many smartphone manufacturers also introduce and advertise their smartphones by introducing the strengths and advantages of their smartphone cameras. However, how to evaluate the quality of smartphone cameras and the taken pictures remains a problem for both smartphone manufacturers and consumers. Currently in the market, there are several teams and companies who evaluate the quality of smartphone cameras and announce the ranking and scores of the quality of smartphone cameras, and the scores of smartphone cameras are subjectively graded by several photographers and experts from different aspects, such as exposure, color, noise and texture. However, subjective assessment is not easy to reproduce, and it is not easy to deploy in practical image processing systems.

<https://qa4camera.github.io/>

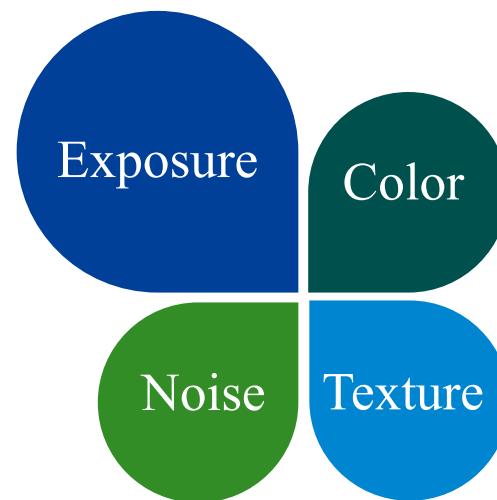
In association with:
ICME
2020
IEEE International Conference
of Multimedia and Expo 2020
July 6-10 2020
London, UK || Virtual



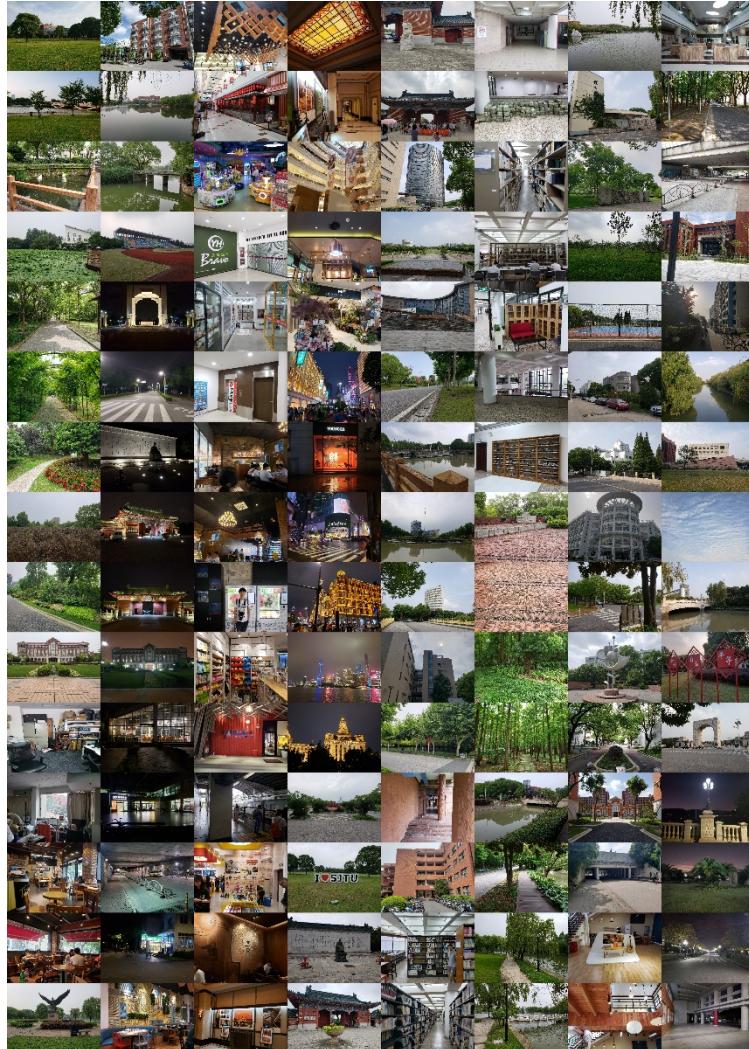
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Different from traditional quality evaluation, we hope to evaluate the image quality of mobile phones from four aspects, including exposure, color, noise and texture.



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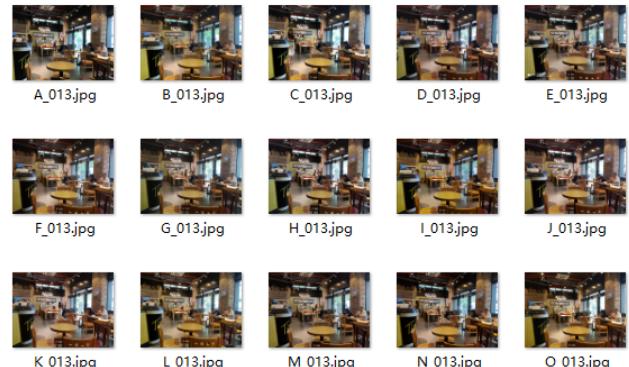
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Description of the dataset:

- Training dataset
 - 100 scenes
 - 15 images in each scene
 - 4 scores (exposure, color, noise, and texture) are provided for each image
- Test dataset
 - 20 scenes
 - 15 images in each scene

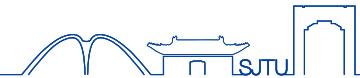


Require the participants to provide quality rankings or scores of images in the test dataset in terms of four different aspects



Name	Color	Exposure	Noise	Texture
A_013.jpg	3.2	3.5	3.2	3.7
B_013.jpg	3.8	3.9	3	3.2
C_013.jpg	3.3	3.3	3.6	4.1
D_013.jpg	4	4	4	4.3
E_013.jpg	3.7	4	3.7	3.8
F_013.jpg	4.1	4.4	3.9	4.6
G_013.jpg	3.5	4.1	3.5	4.3
H_013.jpg	3.8	3.8	4.1	4.2
I_013.jpg	3.5	4.5	3.5	3.9
J_013.jpg	3.9	3.8	3.4	4
K_013.jpg	3.8	4.1	3.7	4.2
L_013.jpg	4.2	3.8	4.3	4.4
M_013.jpg	3.6	3.8	3.6	4.2
N_013.jpg	3.9	4.1	3.7	4.2
O_013.jpg	4.2	3.4	4.1	3.9

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Evaluation criterion:

The prediction rankings generated by the candidate algorithm will be compared with the ground truth subjective rankings using the Spearman Rank order Correlation Coefficient (SRCC).

$$\text{SRCC} = 1 - \frac{6 \sum_{i=1}^N d_i^2}{N(N^2 - 1)}$$

where d_i denotes the difference between the ranks of i -th images in subjective and objective assessments, and N represents the number of testing images.

$$SRCC = AVERAGE(SRCC_1, SRCC_2, \dots, SRCC_{20})$$

1

Background

2

ICME2020 Grand Challenge

3

Solutions and Results

4

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Solutions and Results



Institution
Shanghai University
East China Normal University
University of Macau
Southeast University
University of Science and Technology of China
Communications University China
INSA Rennes
National Institute of Telecommunications and ICT
National Taiwan University

Ten teams took part in the challenge,
and six submitted their results.



Solutions and Results



Team: CUC-IMC

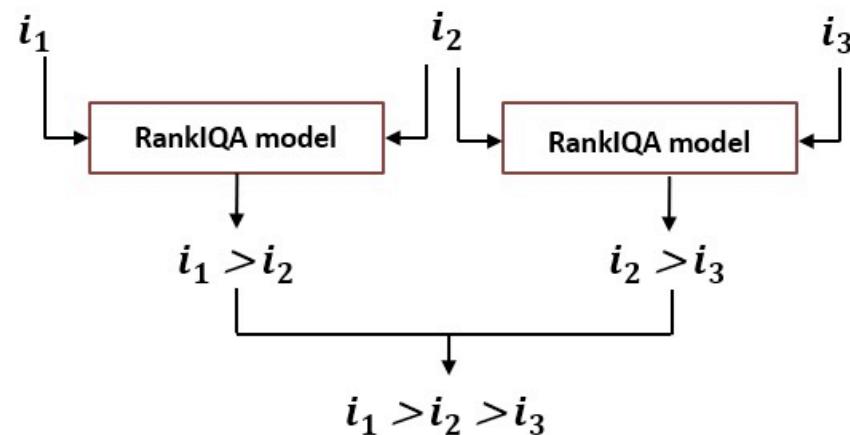
Make pairs



Compare the quality of
each pair



Sort all the images

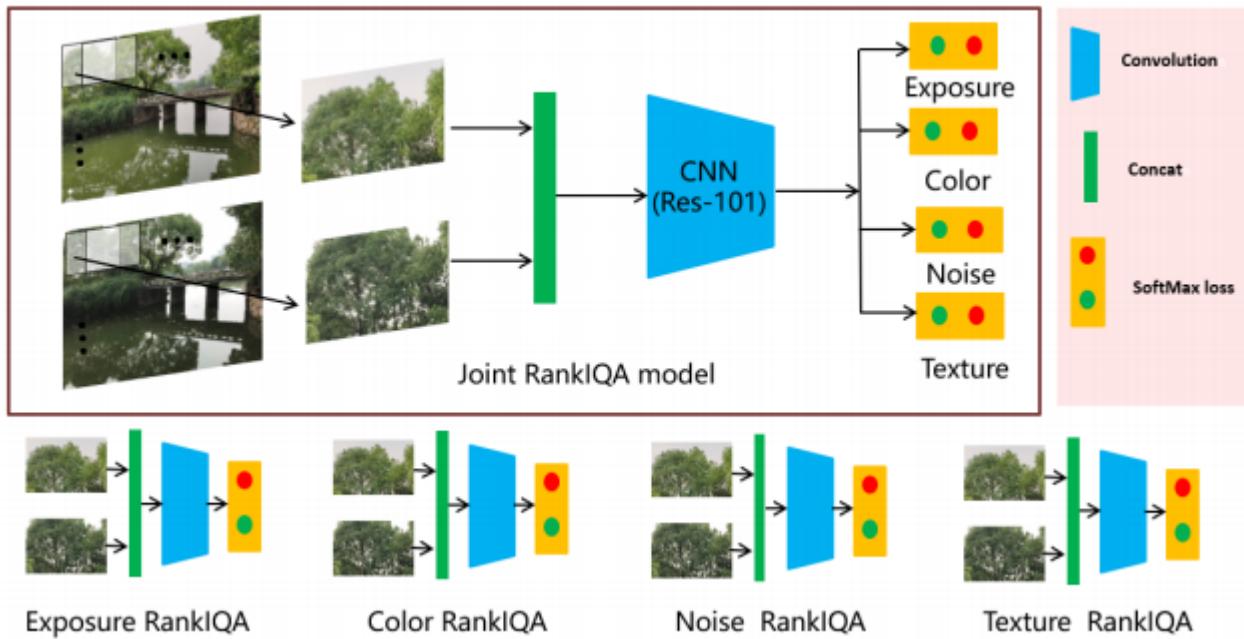


Ying Z, Pan D, Shi P. Quality Difference Ranking Model For Smartphone Camera Photo Quality Assessment[C]//2020 IEEE International Conference on Multimedia & Expo Workshops (ICMEW). IEEE, 2020: 1-6.



Solutions and Results

Team: CUC-IMC

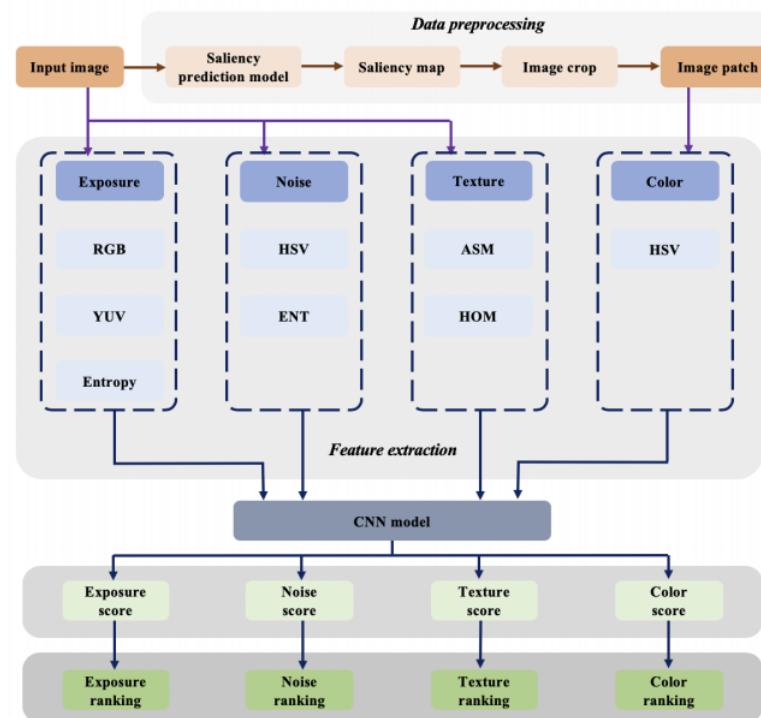


Ying Z, Pan D, Shi P. Quality Difference Ranking Model For Smartphone Camera Photo Quality Assessment[C]//2020 IEEE International Conference on Multimedia & Expo Workshops (ICMEW). IEEE, 2020: 1-6.



Solutions and Results

Team: UMXu

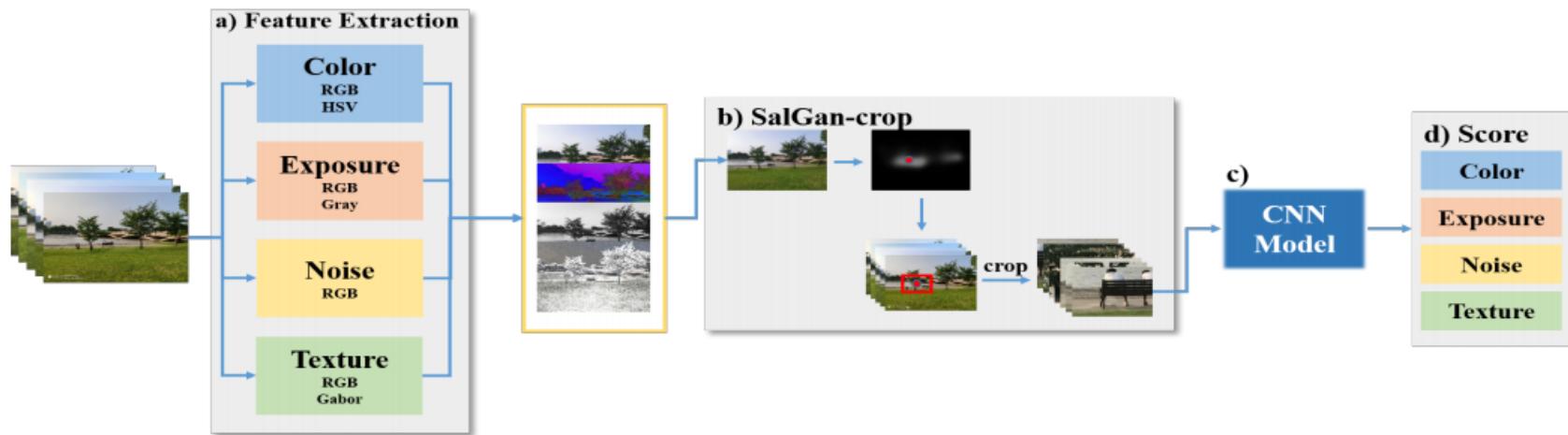


Xu S, Yan J, Hu M, et al. Quality assessment model for smartphone camera photo based on inception network with residual module and batch normalization[C]//2020 IEEE International Conference on Multimedia & Expo Workshops (ICMEW). IEEE, 2020: 1-6.



Solutions and Results

Team: ECNUfirst



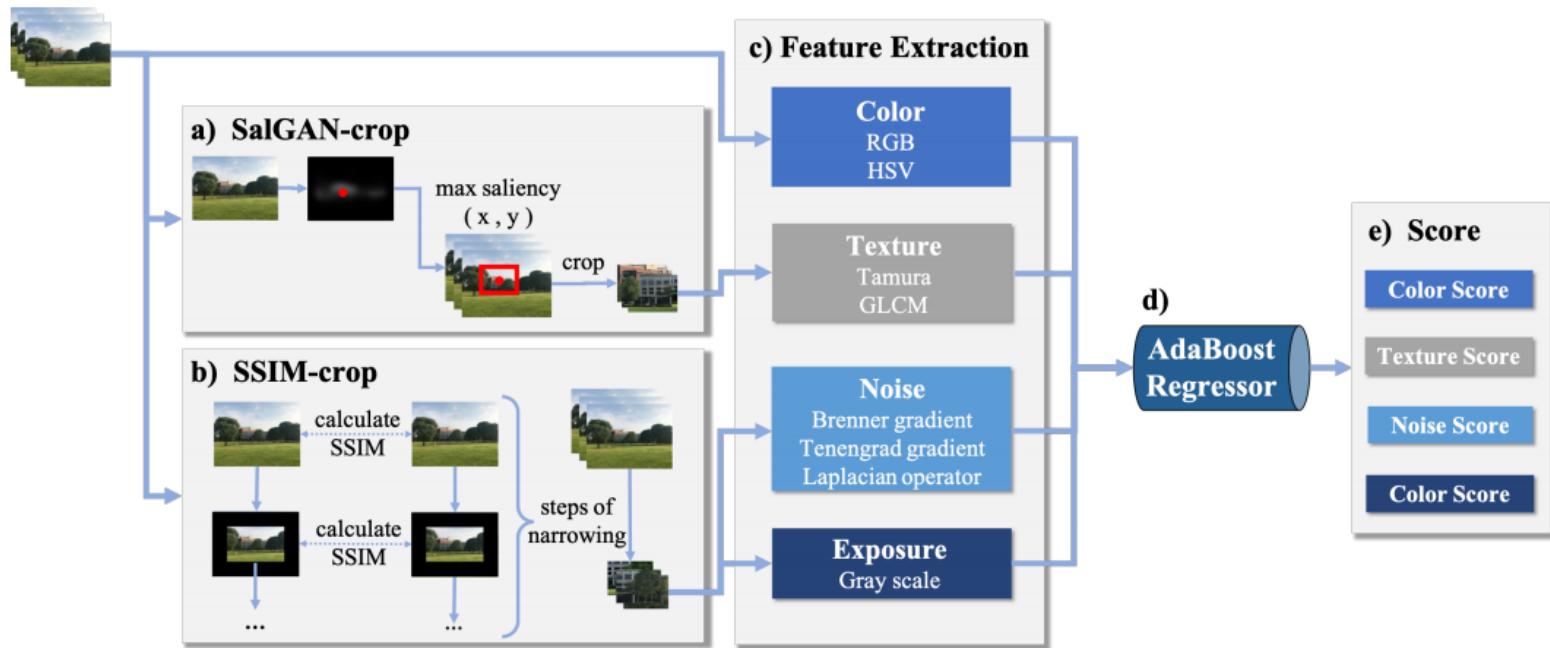
Yao C, Lu Y, Liu H, et al. Convolutional Neural Networks Based on Residual Block for No-Reference Image Quality Assessment of Smartphone Camera Images[C]//2020 IEEE International Conference on Multimedia & Expo Workshops (ICMEW). IEEE, 2020: 1-6.



Solutions and Results



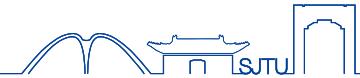
Team: SEU-Zhou



Zhou Y, Wang Y, Kong Y, et al. Multi-Indicator Image Quality Assessment of Smartphone Camera Based on Human Subjective Behavior And Perception[C]//2020 IEEE International Conference on Multimedia & Expo Workshops (ICMEW). IEEE, 2020: 1-6.



Solutions and Results



Grand Challenge Results:

Team Name	[Color , Exposure , Noise , Texture]	overall	Order
CUC-IMC	[0.341 , 0.478 , 0.657 , 0.588]	0.516	1
3721	[0.381 , 0.442 , 0.569 , 0.427]	0.455	2
ECNUfirst	[0.273 , 0.428 , 0.443 , 0.335]	0.370	3
SEUZhou	[0.162 , 0.051 , 0.128 , 0.422]	0.191	4
PhysicalYuan	[0.378 , 0.025 , 0.188 , 0.158]	0.187	5
UMXu	[0.124 , 0.038 , 0.010 , 0.187]	0.090	6

1

Background

2

ICME2020 Grand Challenge

3

Solutions and Results

4

Assignment Requirements

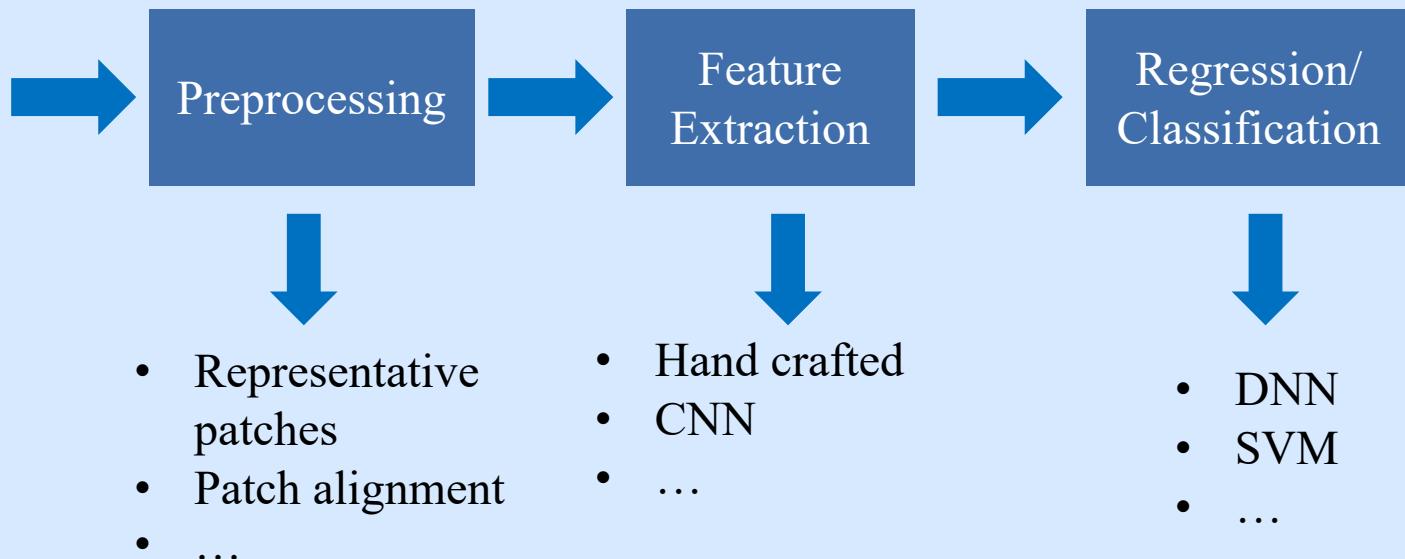


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Assignment Requirements

1. Design **an objective IQA model** to provide quality rankings or scores in terms of four different aspects, including exposure, color, noise and texture.

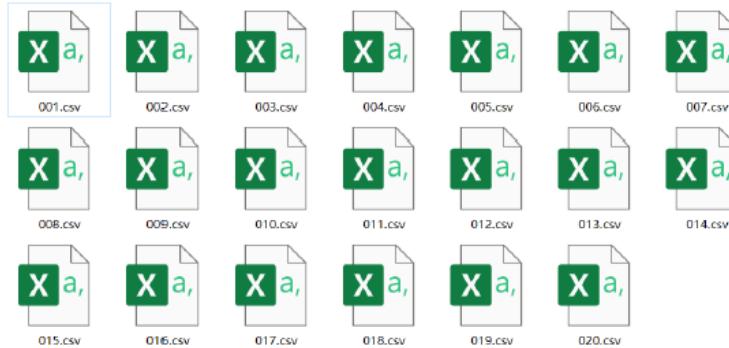




Assignment Requirements



1. Design **an objective IQA model** to provide quality rankings or scores in terms of four different aspects, including exposure, color, noise and texture.
2. Write **a report** in IEEE Journal format. The report should include title, abstract, the implementation details of your models, the experimental setup and the experimental results, and some analyses, etc.
3. Validate the proposed model on the test dataset.



	A	B	C	D	E
1	Color	Exposure	Noise	Texture	
2	A_001.jpg	9	13	13	15
3	B_001.jpg	12	9	6	5
4	C_001.jpg	13	11	15	9
5	D_001.jpg	3	1	4	11
6	E_001.jpg	15	7	14	13
7	F_001.jpg	7	15	2	10
8	G_001.jpg	5	14	5	12
9	H_001.jpg	1	4	1	14
10	I_001.jpg	8	6	11	2
11	J_001.jpg	2	10	3	7
12	K_001.jpg	4	2	8	3
13	L_001.jpg	14	3	12	8
14	M_001.jpg	6	8	7	1
15	N_001.jpg	11	12	10	4
16	O_001.jpg	10	5	9	6

Send **the report, the model (including the readme file), and the results on the test dataset** to sunguwei@sjtu.edu.cn . The email title should be written as:
Assignment1 + Name1 + StudentNumber1 + Name2 + StudentNumber2

Thank you!

