RankIQA Implementation

...

Ayush Sharma
Research Intern

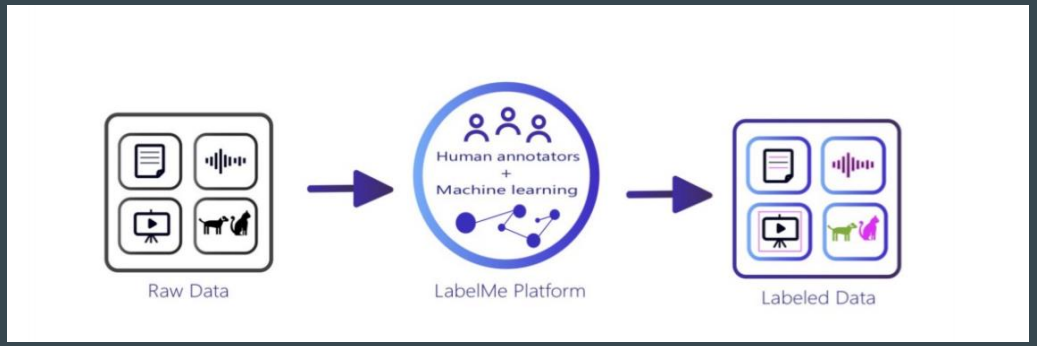
Mentor : Nitesh Kaushal

Image Quality Assessment(IQA)

IQA is used for Optimizing, Testing, Benchmarking and monitoring Applications

Can you tell the Quality of the image?

Data Annotators: The Unsung Heroes Of Artificial Intelligence



Advantages of Annotator

- Quality
- Flexibility and customization
- Cost

Disadvantages of Annotator

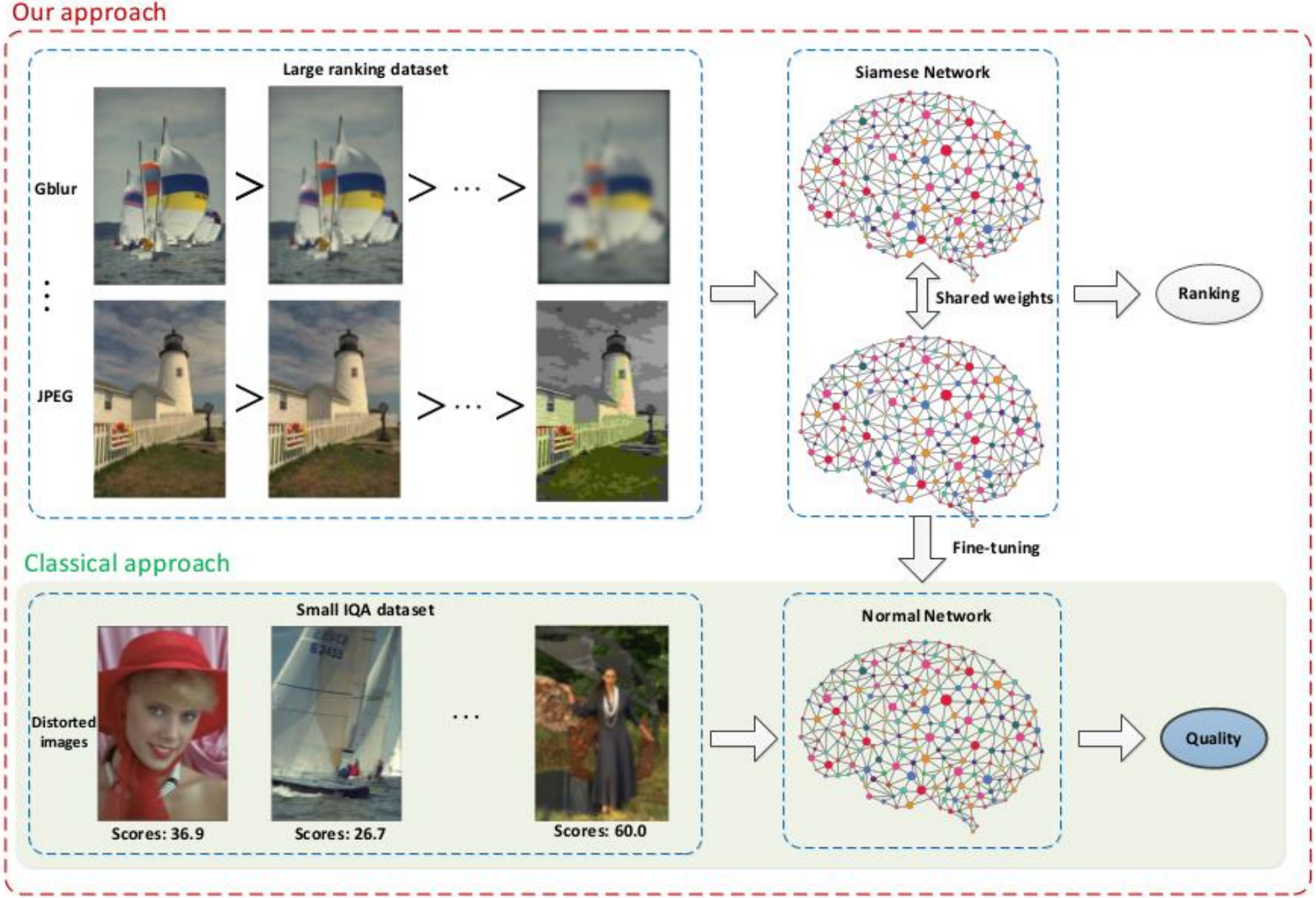
- Risk of mistakes
- Limited volume
- Time-consuming and labor-intensive

Deep learning for NR-IQA

Deep networks is the need for large labeled datasets, which are currently not available for NR IQA research

A large number of automatically generated rankings of image quality to train a deep network.

This allows us to train much deeper and wider networks than other methods in NR-IQA which train directly on absolute IQA data.


Our approach
Large ranking dataset
Gblur
JPEG
Siamese Network
Shared weights
Ranking
Fine-tuning
Classical approach
Small IQA dataset
Distorted images
Scores: 36.9
Scores: 26.7
Scores: 60.0
Normal Network
Quality

Dataset

For this project, we had to prepare two datasets:

Ranked dataset : Waterloo dataset

~ 99k images (Originally 4.5k images)

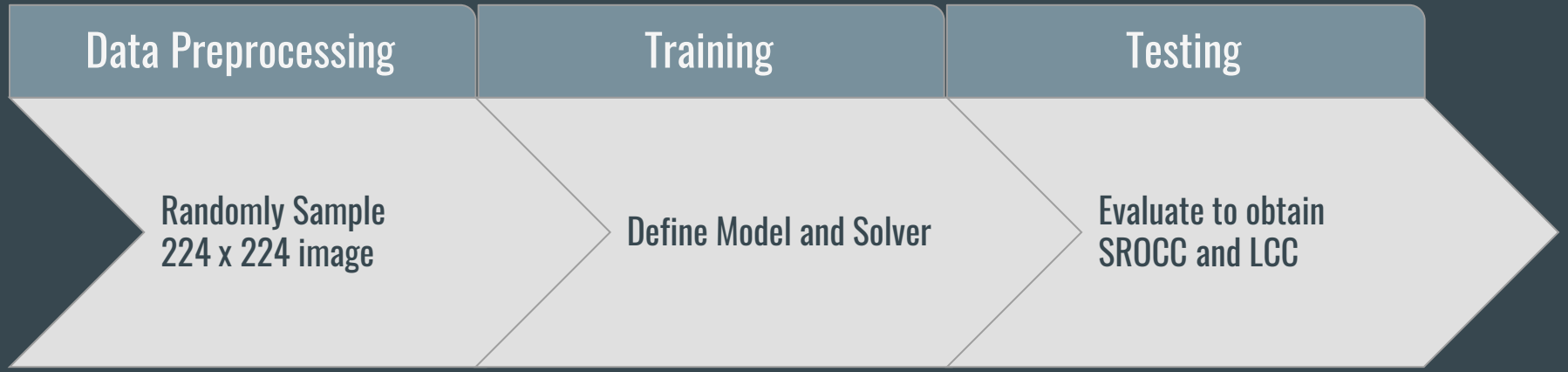
IQA dataset : LIVE Dataset

~ 1000 images (Originally 30 images)

Dataset Details

- LIVE dataset generated four types of distortion at five levels
  - Gaussian Blur
  - White Noise
  - JPEG Compression
  - JPEG2000 Compression
  - Fastfading
- Ranking dataset had these distortions over a range of intensities.
  - Gaussian Blur
  - Gaussian Noise
  - JPEG Compression
  - JPEG2000 Compression

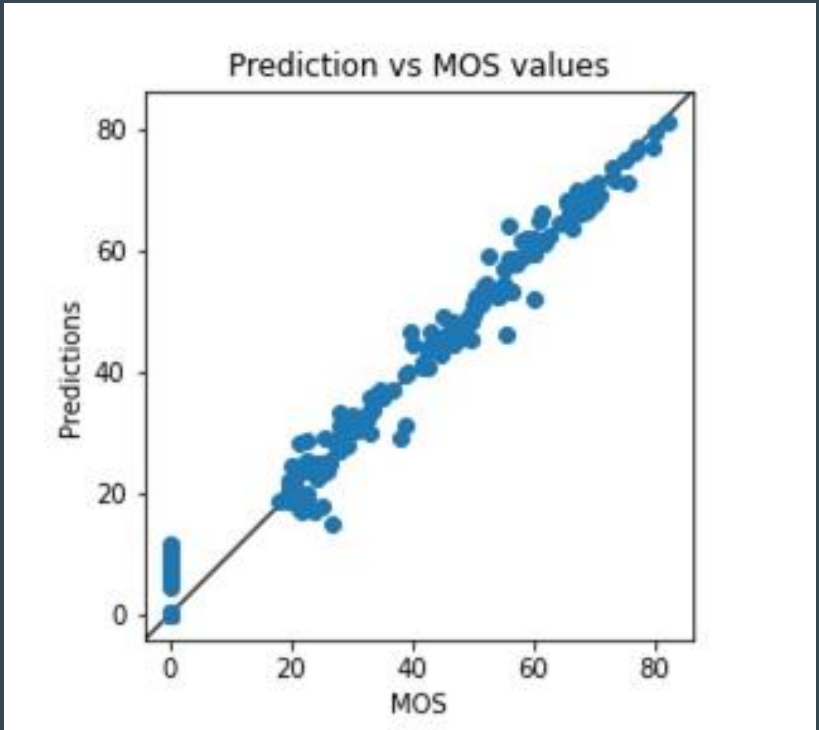
Pipeline


Data Preprocessing
Training
Testing
Randomly Sample
224 x 224 image
Define Model and Solver
Evaluate to obtain
SROCC and LCC

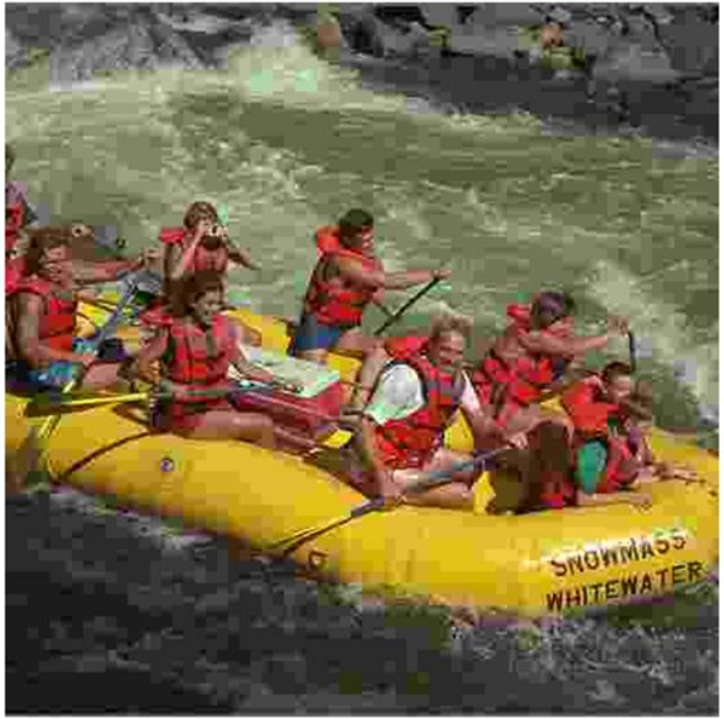
Testing results

SROCC = 0.9871

LCC = 0.9902



Distorted Image



MOS = 70.96

Pred = 69.15

Reference Image

Testing on KonIQ Dataset (model trained on LIVE)

KonIQ-10k is the largest IQA dataset to date consisting of 10,073 quality scored images.

We used 263 images in the test set.

SROCC : 0.55245

LCC : 0.55823

With fine tuning, these values can be improved to a great extent.

RankIQA Applications

- Ultrasound volume projection image quality selection by ranking from convolutional RankNet.
  - Computerized Medical Imaging and Graphics (2021)
- Quality Difference Ranking Model for Smartphone camera photo quality assessment.
  - IEEE International Conference on Multimedia and Expo Workshops (2020)
- Residual Networks based distortion classification and ranking for Laparoscopic image quality assessment.
  - IEEE International Conference on Image Processing (2020)

Thank You