Politecnico di Torino
Dipartimento di Automatica e Informatica

PhD in Computer and Control Engineering
XXXIV cycle

PIC4SeR
Polito Interdepartmental Centre for Service Robotics

Supervisor
Prof. Enrico Masala

Optimizing Perceptual Quality Prediction Models For Multimedia Communication Systems

PhD Candidate: *Lohic Fotio Tiotsop (lohic.fotio@polito.it)*

1. Introduction & Research Question

- Multimedia Processing Systems (MPSs) aim at capturing, compressing/coding, enhancing, transmitting and decoding multimedia content;
- For each of these task, the MPS is expected to generate a content with the best perceptual quality as possible under bandwidth and storage capacity constraints.
- A research question of interest is how to design quality prediction algorithms (QPAs) that can predict the quality of a processed content as humans would perceive it?

2. Applications

- Monitoring the final users' quality of experience (QoE), e.g., Netflix uses a QPA called VMAF;
- Designing and comparing codecs, e.g., at the same compression level (bit rate), the best codec is the one that guarantees higher quality as measured by a QPA.

3. State-of-the-art limitations

- Existing QPAs typically aim at MOS prediction;
- The MOS of a content is the Mean of the Opinion Scores of a group of human viewers on the quality of that content;
- Existing QPAs are not able to accurate in all situations;
- QPAs as MOS estimators, do not fully account for the individual expectations of final users;

4. PhD Contribution

- I proposed for the first time to train a Deep Neural Network (DNNs) that can mimic an individual human viewer in terms of quality perception;
- I called such a DNN an Artificial Intelligence-based Observer (AIO);
- Many AIOs can be trained to mimic viewers with different characteristics, yielding a more complete quality estimation process.

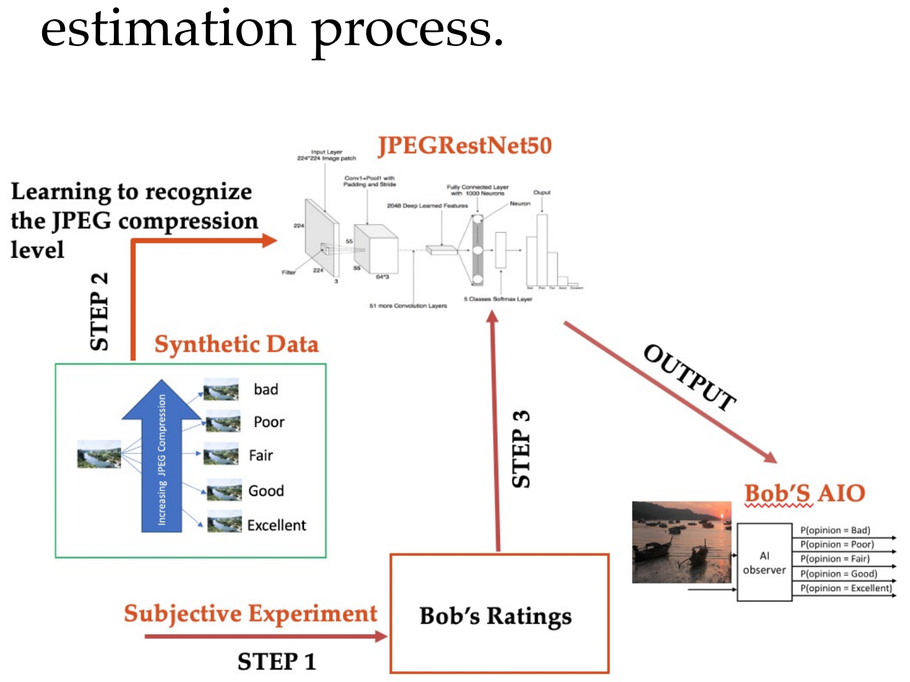

Fig: The Bob's AIO training process

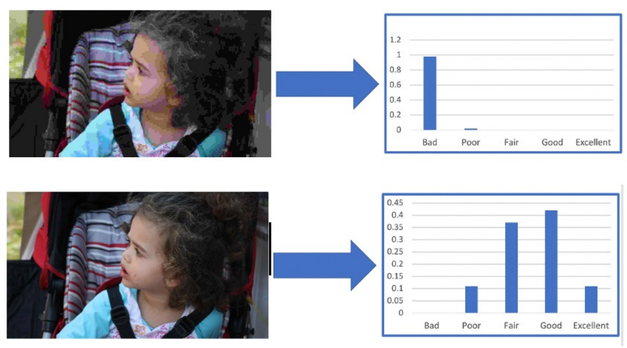

Fig: AIOs performance showcase on two images

5. References

1. L. Fotio Tiotsop et al "Mimicking Individual Media Quality Perception with Neural Networks based Artificial Observers". In: ACM Transactions on Multimedia Computing, Communications and Applications (2021).
2. L. Fotio Tiotsop et al "Deep Convolutional Neural Networks based Artificial Observers for No Reference Image Quality Assessment". Submitted to: Signal Processing: Image Communication (2021).