Video Quality Assessment

Learning Progress Report

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Learning Goals and Topics

- Compare BRISQUE and GAMIVAL through experimentation
- Dataset: Cinnamoroll (Sanrio cartoon character)
- Source: Images collected from Pinterest and Twitter
- MOS Criteria: Higher scores assigned if Cinnamoroll resembles the original Sanrio design
- Training Set: 590 images
- Test Set: 148 images

What is BRISQUE?

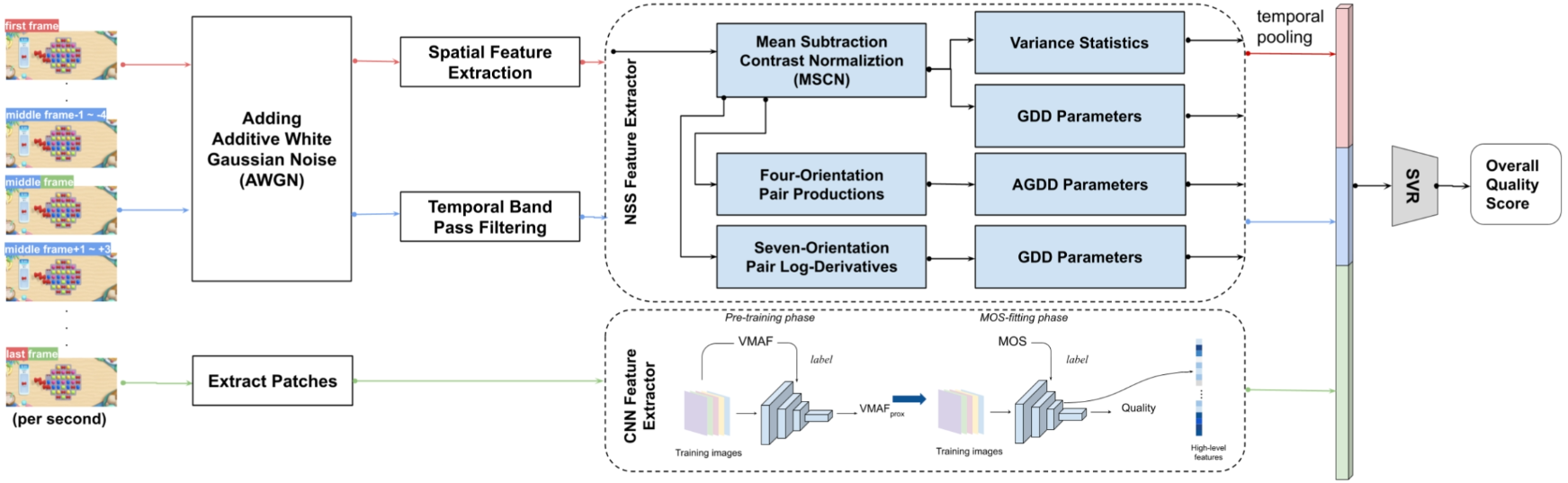
- Full name: Blind/Referenceless Image Spatial Quality Evaluator
- Type: No-Reference Image Quality Assessment (NR-IQA)
- Goal: Evaluate image distortion (e.g., blur, noise, compression) without the original image
- Application: Image processing, visual quality analysis, UGC quality rating

BRISQUE Overall Pipeline

1. Convert the input image to grayscale
2. Compute MSCN (Mean Subtracted Contrast Normalized) coefficients
3. Fit Generalized Gaussian Distribution (GGD) and Asymmetric Generalized Gaussian Distribution (AGGD)
4. Extract 28-dimensional feature vector
5. Use a pre-trained SVR model to predict the quality score

What is GAMIVAL

- Full name: Gaming Video Quality Evaluator
- Type: No-Reference Video Quality Assessment (NR-VQA)
- Goal: Evaluate frame image quality of video game



GAMIVAL Overall Pipeline

1. Preprocess Video Frames
   - Add Additive White Gaussian Noise (AWGN) to input frames
   - Apply temporal band-pass filtering for motion information
2. Extract Features
   - NSS Feature Extractor:
     - Compute MSCN (Mean Subtracted Contrast Normalization)
     - Generate four-orientation pair products
     - Generate seven-orientation pair log-derivatives
     - Fit statistical models: Variance, GGD, AGGD
   - CNN Feature Extractor:
     - Pre-train using VMAF labels
     - Fine-tune with MOS labels
     - Extract high-level quality-aware features

GAMIVAL Overall Pipeline

3. Patch-Based Sampling
   - Uniformly extract spatial patches from video (per second)
4. Temporal Pooling
   - Aggregate features across frames for consistent temporal representation
5. Quality Prediction
   - Use SVR (Support Vector Regression) to predict the overall video quality score

Experiment Result

Method	SRCC	PLCC	KRCC	RMSE
BRISQUE	0.429	0.435	0.328	1.385
GAMIVAL (SVR)	0.903	0.930	0.781	0.551
GAMIVAL (LinearSVR)	0.501	0.523	0.389	1.274

Summary & Insights

- **GAMIVAL (SVR)** significantly outperforms **BRISQUE** in all evaluation metrics
  → Especially strong in SRCC (0.903) and PLCC (0.930)
- **CNN-based features** in GAMIVAL provide richer representations than hand-crafted BRISQUE features
- GAMIVAL is more suitable for video content and visually complex styles like **Cinnamoroll cartoons**
- BRISQUE still useful for lightweight image-level assessment, but limited in modeling semantic quality
- Future Work:
  - Fine-tune CNN features using cartoon-specific datasets
  - Explore deep NR-IQA/VQA models (e.g., BIQI, DIIVINE, FSIM, VIF, FID, V-BLIINDS, MOVIE, ST-RRED, VMAF, VIDEVAL, LPIPS)
  - Incorporate temporal consistency more robustly

Thank You