Missing Modality Handling

Applying alternative strategies (zero-padding, imputation, robust fusion) when some modalities are absent

Zero-padding / Masking

Simple baseline strategy

- Missing modality: Fill with zeros
- Use mask tokens
- Easy implementation, fast inference
- Possible performance degradation

Imputation

Predict and fill missing data

- Mean/median imputation
- K-NN based imputation
- Generative models (VAE, GAN)
- Cross-modal prediction

Robust Fusion

Design fusion robust to missing data

- Dropout-based training
- Leverage late fusion
- Ensemble approach
- Gating mechanism

Knowledge Distillation

Transfer knowledge from complete model

- Teacher: Uses all modalities
- Student: Handles partial modalities
- Soft label learning
- Prepare for missing scenarios

| Random dropout | Modality-specific | Dynamic |

| during training | confidence weighting | architecture adjustment |