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LOSSY COMMON INFORMATION IN A LEARNABLE GRAY-WYNER NETWORK

Anderson de Andrade, Alon Harell, Ivan V. Bajić

School of Engineering Science
Simon Fraser University
Burnaby, BC, Canada

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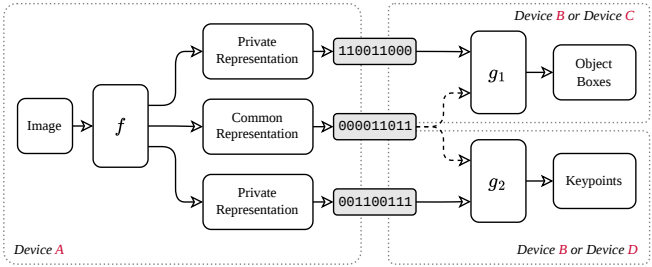
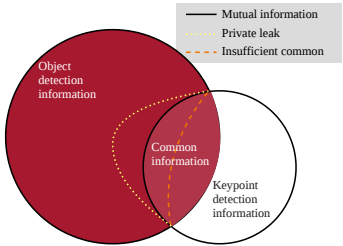
PROBLEM FORMULATION

- Isolate common information necessary for two tasks
- Applications:
  - Distributed inference
  - Information storage and retrieval
  - Resource optimization

DISTRIBUTED INFERENCE



(a) System architecture



(b) Information landscape

Figure 1: Motivating example: object and keypoint detection

THE GRAY-WYNER NETWORK (GWN)

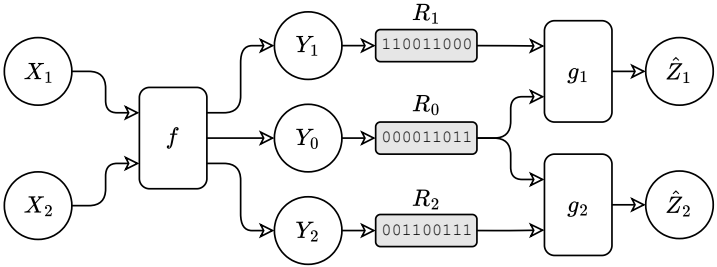


Figure 2: Adaptation of the Gray-Wyner Network[1]

[1] Robert M. Gray and Aaron D. Wyner. "Source coding for a simple network". In: *IEEE BSTJ* (1974).

CONTRIBUTIONS

1. Bounds between lossy common information types[2]
   - Conditions when all bounds are met
2. Unconstrained optimization objective derived from original
   - Targets either common information type and tradeoff
3. Propose and evaluate 3 neural-network-centric architectures for GWN
   - Best choice theoretically and empirically justified
4. Isolate common information in computer vision tasks
   - Better than baseline and close to empirical upper bound

[2] Kumar Viswanatha, Emrah Akyol, and Kenneth Rose. "The Lossy Common Information of Correlated Sources". In: *IEEE TIT* (2014).

EDGE-CASE EXPLORATION WITH IMAGE CLASSIFICATION

(a) Fully-dependent color-digit targets

(b) Independent color-digit targets

Figure 3: Colored MNIST image reconstructions from channels $Y_{\{0,1,2\}}$