3. Data Compression, AEP and Lossless Source Coding

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Contents

Source coding

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Definition 1 (Discrete Memoryless Source: DMS)

Fixed-length source coding

Definition 2 (fixed-length code)

Variable-length source coding

Definition 3 (variable-length code)

Decodability and optimality

Uniquely decodable code

Definition 4 (unique decodability)

Definition 5 (prefix-free code)

Condition of optimal code

Lemma 6

Lemma 7

Lemma 8

∗ <u>Proof</u>:

Huffman Code

Huffman Code Algorithm

1.

Lemma 9

* <u>Proof</u>:

Asmptotic Equipartition Property (AEP)

Theorem 10 (Weak Law of Large Numbers (WLLN))

For proof of WLLN, we using markov inequality.

Theorem 11 (Markov inequality)

∗ <u>Proof</u>:

Asymptotic Equipartition Property (AEP)

Theorem 12 (Asymptotic Equipartition Property (AEP))

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Definition 13 (weak typical set)

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Corollary 14

Corollary 15

Loseless source coding

Fixed-length block coding

References

- T. M. Cover and J. A. Thomas. Elements of Information Theory, Wiley, 2nd ed., 2006.
- Gallager (2008), Principles of Digital Communication, Cambridge University Press.
- Lecture notes for EE623: Information Theory (Fall 2024)