

## C&O 739 Information Theory and Applications

University of Waterloo, Winter 2024

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### References

This is a list of references to complement the other resources listed on the course website. The references only cover lecture material that is not included in those resources. It will be updated as the course progresses.

The lower bound for the Union-Closed Sets Conjecture is due to Gilmer [3], and the improvement presented in the course was based on follow-up work by Sawin [6] and an entropy inequality implicit in earlier work by Boppana [1].

The protocol based on rejection sampling, and the resulting interpretations for relative entropy and mutual information are due to Harsha, Jain, McAllester, and Radhakrishnan [4].

The treatment of the self-testing and self-correction properties of the Hadamard code, and the exponential-size, constant-query PCP for 3Sat follows the text by Motwani and Raghavan [5].

The treatment of  $k$ -wise independent and almost  $k$ -wise independent random variables is based on Lecture 4 of the Spring 1999 course on Fourier Transforms & Theoretical Computer Science by Vazirani [7].

The method for bounding the non-negative rank of a matrix from below is due to Braverman and Moitra [2].

### References

- [1] Ravi B. Boppana. A useful inequality for the binary entropy function. Technical Report arXiv:2301.09664 [math.CO], arXiv, <http://www.arxiv.org/>, 2023.
- [2] Mark Braverman and Ankur Moitra. An information complexity approach to extended formulations. In *Proceedings of the Forty-fifth Annual ACM Symposium on Theory of Computing*, STOC '13, pages 161–170, New York, NY, USA, 2013. ACM.
- [3] Justin Gilmer. A constant lower bound for the union-closed sets conjecture. Technical Report arXiv:2211.09055v2 [math.CO], arXiv, <http://www.arxiv.org/>, 2022.
- [4] Prahladh Harsha, Rahul Jain, David McAllester, and Jaikumar Radhakrishnan. The communication complexity of correlation. *IEEE Transactions on Information Theory*, 56(1):438–449, January 2010.
- [5] Rajeev Motwani and Prabhakar Raghavan. *Randomized Algorithms*. Cambridge University Press, 1995.
- [6] Will Sawin. An improved lower bound for the union-closed set conjecture. Technical Report arXiv:2211.11504 [math.CO], arXiv, <http://www.arxiv.org/>, 2022.
- [7] Umesh V. Vazirani.  $k$ -wise independence and  $\epsilon$ -biased  $k$ -wise independence, 1999. Lecture 4, Course on Fourier Transforms & Theoretical Computer Science, Notes available at <https://www.cs.berkeley.edu/~vazirani/s99cs294/index.html>.