Theme 1: INFORMATION COMPLEXITY

Information complexity

Barak et al:
http://people.seas.harvard.edu/~madhusudan/courses/Spring2016/papers/BBCR.pdf
Compressing interactive communication

Braverman and Rao: https://arxiv.org/abs/1106.3595
Information Complexity = Amortized communication complexity

[Braverman] Interactive information complexity

Separating Information Complexity from Amortized Communication Complexity

Ganor, Kol, Raz: https://eccc.weizmann.ac.il/report/2014/113/

Rao, Sinha: https://homes.cs.washington.edu/~anuprao/pubs/simpleseparation.pdf

Braverman et al: http://drops.dagstuhl.de/opus/volltexte/2018/8332/

Distributed Source Coding

Ma and Ishwar: https://ieeexplore.ieee.org/abstract/document/6006615
A paper in the IT literature that may contain exactly same results as those we (will cover?) covered in class in Lectures 15-16. Project should contrast the results and papers.

Information Complexity is computable

Braverman: https://arxiv.org/abs/1502.02971
First upper bound on computing info complexity

Zero error shannon capacity

Lovasz: https://ieeexplore.ieee.org/document/1055985
Classical paper! Simple (in retrospect) with striking results.

Common Randomness Generation

Ahlswede and Csiszar: https://ieeexplore.ieee.org/document/243431 &
https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=651026

Witsenhausen: https://epubs.siam.org/doi/pdf/10.1137/0128010

Guruswami & Radhakrishnan: https://eccc.weizmann.ac.il/report/2016/033/

Ghazi & Jayram: http://people.csail.mit.edu/badih/papers/crg_main.pdf

Randomness manipulation

Ghazi, Kamath, Sudan: http://eccc.hpi-web.de/report/2016/104/download/
(see also De-Mossel-Neeman, Ghazi-Kamath-Raghavendra for more recent work)

Theme 2: BIG TOPICS

Differential Privacy

Dwork and Roth: https://www.cis.upenn.edu/~aaroth/Papers/privacybook.pdf
Book - starts from basic foundations. Projects can focus on a chapter (for instance)

Bun and Steinke: https://arxiv.org/pdf/1605.02065.pdf
Example of advanced paper in field. Bridges between KL-divergence and max-divergence (latter is standard in Privacy)

Streaming

Lower bounds for Johnson-Lindenstrauss
JayramWoodruff: http://www.cs.cmu.edu/afs/cs/user/dwoodruf/www/jw11.pdf
Application to streaming and JL transforms

Property testing

Blais, Brody and Matulef: https://eccc.weizmann.ac.il/report/2011/045/
Connects CC lower bounds to Prop. testing

Rounds in Communication Complexity

Nisan and Wigderson:
http://www.math.ias.edu/~avi/PUBLICATIONS/MYPAPERS/NOAM/ROUNDS/SICOMP/FINAL/final.pdf
Analyzes influence of #rounds on communication complexity

Amir Yehudayoff: https://eccc.weizmann.ac.il/report/2016/151/
Does same with more sophisticated tools

Rounds in CRG
Bafna et al.: https://arxiv.org/abs/1808.08907
Considers round effects in CRG

Data structure/Cell probe lower bounds

For Approx nearest neighbor - https://www.cs.dartmouth.edu/~ac/Pubs/sicomp-randann.pdf,
Application to DS for approx nearest neighbor search

Unifying Landscape of DS LB
Patrascu: https://arxiv.org/pdf/1010.3783.pdf
Many reductions for data structures lower bounds

Bro Milterson et al.:
http://www.math.ias.edu/%7Eavi/PUBLICATIONS/MYPAPERS/MILTERSEN/JOURNAL/final.pdf
Round elimination techniques and Data structures

Lower bounds From Online CC - https://arxiv.org/abs/1704.06185
Cell probe lower bounds from communication complexity

Computational notions of entropy:

Comparing entropies with computational complexity consequences
Goldreich and Vadhan: https://eccc.weizmann.ac.il//eccc-reports/1998/TR98-063/index.html
Considers the problem of comparing entropies of two different sources

Statistical Difference and SZK
https://eccc.weizmann.ac.il//eccc-reports/2000/TR00-084/index.html
https://eccc.weizmann.ac.il/report/2019/038/

Inaccessible Entropy
Haitner et al: https://eccc.weizmann.ac.il/report/2009/045/
Computational notions of entropy with applications in crypto

Computational Entropy
Agarwal et al: https://arxiv.org/pdf/1902.11202.pdf
New notion of KL-hardness and appln in crypto

Entropy waves, ZigZag Product
Reingold, Vadhan, Wigderson: https://arxiv.org/abs/math/0406038

Uses entropy to construct expanding graphs.

Connections to Learning/Statistics

Information-Theoretic Analysis of Stability and Bias of Learning Algorithms
http://maxim.ece.illinois.edu/pubs/raginsky_etal_ITW16.pdf
Analyzing generalization of learning algorithms

Information bottleneck for ML
https://arxiv.org/pdf/physics/0004057.pdf
Generalization bounds for ML/deep networks

See also https://arxiv.org/pdf/1503.02406.pdf

Information Theory and Statistics
Csiszar and Shields:
https://users.renyi.hu/~csiszar/Publications/Information_Theory_and_Statistics:_A_Tutorial.pdf
Broad survey

Optimization: Extension complexity

Yannakakis: https://www.sciencedirect.com/science/article/pii/002200009190024Y?via%3Dihub
Sets up framework of extension complexity

Fiorini et al.: https://arxiv.org/abs/1111.0837
Derives a strong lower bound in this framework (using disjointness)

Braverman and Moitra: https://eccc.weizmann.ac.il/report/2012/131/
Extensions, tightening

Theme 3: MORE OF WHAT WE'VE SEEN

Brascamp Lieb inequalities (??), Isoperimetric inequalites and Shearer's lemma

Carlen and Cordero-Erausquin: https://arxiv.org/pdf/0710.0870.pdf
Entropy applied in Functional Analysis (similar in spirit to Shearer)

https://arxiv.org/pdf/1703.10122.pdf
Edge isoperimetric for cube - this paper or something in the references

Ellis et al.: https://arxiv.org/pdf/1510.00258.pdf
Edge isoperimetric for integer lattice - stable version of Shearer's lemma!

CC - Hardness of Gap Hamming

Chakrabarti and Regev : https://arxiv.org/abs/1009.3460
Application to streaming + lower bound

Blais, Brody and Ghazi: http://people.csail.mit.edu/badih/papers/inf_comp_hd.pdf
Application to property testing + lower bound in one range + open question?

Grammar compression

Charikar et al.: https://ieeexplore.ieee.org/document/1459058
Worst-case compression

Uncertain compression

Juba et al.: http://madhu.seas.harvard.edu/papers/2011/ambiguity-conf.pdf
Compression for communication with different priors

Haramaty and Sudan: http://madhu.seas.harvard.edu/papers/2012/elad-color.pdf
Deterministic compression with uncertain priors

Ghazi et al.: http://madhu.seas.harvard.edu/papers/2017/dist-comp-conf.pdf
Compression in a distributed setting

Polarization

Arikan: https://arxiv.org/abs/0807.3917
The original paper. Good for contrasting with what we learned

Sasoglu's survey
Great source.

Algorithmic polarization for Hidden Markov models
Guruswami, Nakkiran, Sudan: https://arxiv.org/abs/1810.01969
Applies Polarization to HMMs and channels with memory

PRGs from Polarizing random walks
Chattopadhyay et al: https://eccc.weizmann.ac.il/report/2018/015/
Completely different application of polarization.

More Channel Coding:

Interactive coding
Schulman: https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=556671
Kol and Raz: https://eccc.weizmann.ac.il/report/2013/001/
Channel coding applied to interactive communication!

Codes for insertions and deletions
https://arxiv.org/pdf/1704.00807.pdf
Builds codes for channels that have insertion/deletion errors
https://arxiv.org/pdf/1804.03604.pdf

More communication complexity

Communication is bounded by root of rank
Lovett: https://arxiv.org/abs/1306.1877
No comments necessary?

Multiparty communication, NOF model.

Parallel repetition theorem

Holenstein, other variants
http://theoryofcomputing.org/articles/v005a008/v005a008.pdf
For amplifying probability of failure of 2-player games

Theme 4: Random Other Stuff

Constructive proof of General Lovasz Local Lemma

Moser and Tardos: https://arxiv.org/pdf/0903.0544v3.pdf
Super elegant constructive proof of a previously non-constructive theorem in probability theory

Rounding SDP hierarchies via global correlation

https://arxiv.org/pdf/1104.4680.pdf
Defining entropy for pseudo-dist and rounding SDPs

Distribution testing

http://www.cs.columbia.edu/~ccanonne/files/misc/2015-survey-distributions.pdf
Survey

A Randomized Rounding Approach to the Traveling Salesman Problem

https://homes.cs.washington.edu/~shayan/tsp.pdf

Communication complexity of approximate Nash equilibria

http://arxiv.org/ftp/arxiv/papers/1608/1608.06580.pdf

Portfolio optimization

Chapter 16 of text by Cover and Thomas
Application of IT in finance.