

5	6	7	1	2	3	4
12	13	14	8	9	10	11
19	20	21	15	16	17	18
26	27	28	22	23	24	25
M	T	W	T	F	S	S

3.8.2020

1 APRIL

Wednesday

WK 18 • 120-245

30

## ENTROPY AND INFORMATION

9 TAUGHT BY

10 • prof. indranil chakrabarthy

### 11 COURSE TOPICS

12 1. entropy concept in probability theory

1 • entropy of finite schemes

2 • joint entropy & conditional entropy

3 • relative entropy & mutual information

4 • chain rules

5 • the uniqueness theorem

6 • jensen's inequality and its consequences

• long sum inequality and its applications

• data processing inequalities

• sufficient statistics

• fano's inequality

absent

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2 JUNE

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16

7	1	2	3	4	5	6
14	8	9	10	11	12	13
21	15	16	17	18	19	20
28	22	23	24	25	26	27
M	T	W	T	F	S	S

## 2. probability measure and asymptotic equipartition property

- probability as a measure
- law of large number
- asymptotic equipartition theorem (AEP)
- data compression
- typical sets
- gambling & data compression

## 3. entropy rates of a stochastic process

- entropy of markov chains
- entropy rate
- entropy rate of a random walk on a weighted graph
- hidden markov models
- fundamental theorems

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17

Tuesday

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3.8.2020

3

4	5	6	7	1	2	3
11	12	13	14	8	9	10
18	19	20	21	15	16	17
25	26	27	28	22	23	24
5	M	T	W	29	30	31
				T	F	S

## 4. data compression

- Kraft inequality

- optimal codes

- bound on the optimal code length

- Kraft inequality for uniquely decodable codes

- Huffman codes

- optimality of Huffman code

## 4.5. channel capacity

- examples of channel capacity

- symmetric channels

- properties of channel capacity

- joint typical sequence

- channel coding theorem

- zero error codes

- Fano's inequality and converse of channel coding theorem.

	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			
M	T	W	T	F	S	S

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18

• feedback capacity

• differential entropy, maximum entropy, & spectral estimation

• definition

• AEP for continuous random variable

• Relation of differential entropy to discrete entropy

• joint & conditional entropy

• relative entropy & mutual information

• maximum entropy distributions

• anomalous maximum entropy problem

• spectrum estimation

## TEXTBOOKS

1. elements of information theory ; Cover, thomas.