Exam topics in Statistics and Information Theory

1. Kullbach-Leibler divergence, entropy, mutual information, entropy rate of a stationary process
2. Noiseless source coding theorem, Shannon-code, arithmetic codes
3. Method of types, Stein lemma
4. Basics of information geomety: I-projection, linear and exponential distribution families, Pythagorean identity, maximum likelihood estimation when the set of feasible distribution is an exponential family
5. Log-linear models, hypothesis testing for exponential families and in particular for log-linear models
6. Regression problem, universal consistency of the partitioning regression function estimates, kernel estimates, nearest neighbour estimates
7. Pattern recognition
8. Glivenko-Cantelli theorem, Vapnik–Chervonenkis dimension
9. Universal density estimation

Literature

Handwritten lecture notes and a few videos:

https://www.dropbox.com/scl/fo/u6yskz4kj6t27qql521kl/AOJASzOAveg-SBu32e7wZm4?rlkey=y1tvxagq3frsl7gyobdges18g&st=0utco3yv&dl=0

https://users.renyi.hu/~csiszar/Publications/Information_Theory_and_Statistics:_A_Tutorial.pdf

Thomas M. Cover and Joy A. Thomas, Elements of Information Theory, Wiley Interscience, New York, NY, 1991., pages 12-31. and 63-65.

Györfi, L., Kohler, M., Krzyżak, A., & Walk, H. (2002). A Distribution-Free Theory of Nonparametric Regression. Springer Series in Statistics. – Györfi L., Nonparametric statistics