Classification lung disease with CNN

Use ELBO as loss function

Estimate the distribution of weights with Monte Carlo

Approximate distribution as p(|x)

**Bayesian books**

* <https://www.amazon.com/Markov-Chain-Monte-Carlo-Statistical/dp/1584885874/ref=sr_1_5?dchild=1&keywords=MCMC&qid=1631907266&sr=8-5> (MCMC specific *Markov Chain Monte Carlo: Stochastic Simulation for Bayesian Inference, Second Edition*) 实体
* <https://www.amazon.com/Bayesian-Analysis-Chapman-Statistical-Science/dp/1439840954/ref=sr_1_6?dchild=1&keywords=MCMC&qid=1631907266&sr=8-6> (Standard graduate level book *Bayesian Data Analysis* ) E
* <https://www.amazon.com/dp/036713991X/?_encoding=UTF8&pd_rd_w=Mg5r4&pf_rd_p=f0565570-f67b-4783-ab26-5a1f2c0bb3fd&pf_rd_r=WQN4WS1YTWX7H5S5E4G3&pd_rd_r=d5092730-8645-45a2-b58e-f1a2ae831df7&pd_rd_wg=RvKds&ref_=bd_tags_dp_rec> (new popular book) X
* <https://www.amazon.com/Bayesian-Statistical-Methods-Springer-Statistics/dp/1441928286/ref=sr_1_1?dchild=1&keywords=a+first+course+in+Bayesian&qid=1631907441&sr=8-1> (short and concise book) E
* <https://www.amazon.com/Students-Guide-Bayesian-Statistics/dp/1473916364/ref=sr_1_3?dchild=1&keywords=a+student+guide+in+Bayesian+statistics&qid=1631907503&s=books&sr=1-3> (good introductory undergraduate level book *A Student’s Guide to Bayesian Statistics* ) 实体

**MCMC**

Introduction:

Metropolis et al.(1953)

Betancourt (2018) *A Conceptual Introduction to Hamiltonian Monte Carlo ch.2*

Metropolis-Hastings algorithm: Hastings (1970) *Monte Carlo sampling methods using Markov chains and their applications*

Gibbs sampling: Stuart Geman and Donald Geman (1984) *Stochastic Relaxation, Gibbs Distributions, and the Bayesian Restoration of Images*

Monte Carlo: random drop/accept-rejection

MCMC: sampling from Markov chain

Generate next sample only from the last sample and stochastic matrix

**1 week on math interpretation**

**1 week on 1d sample eg.Population mean**

(or 2d sample since Gibbs sampling can not be using in 1d)

**HMC**

Neal (2010) *MCMC using Hamiltonian dynamics*

Betancourt (2018) *A Conceptual Introduction to Hamiltonian Monte Carlo ch.3-6*

Hamiltonian dynamics

Sample from Hamiltonian dynamics

1-2 week on Hamiltonian dynamics + math interpretation

1-2 week on sample from Neal and Betancourt

Compare HMC and MCMC in the same setting of some problems

**Import HMC to CNN**

Charles Blundell (2015) *Weight Uncertainty in Neural Networks*

Biraja Ghoshal1 and Allan Tucker1 (2020) *Estimating Uncertainty and Interpretability in Deep Learning for Coronavirus (COVID-19) Detection*

Data

Data1: Cohen (2020)

Data2: kaggle Chest X-Ray Images (Pneumonia)

Data3: kaggle Covid:

Maria de la Iglesia Vayá et al (2020) *BIMCV COVID-19+: a large annotated dataset of RX and CT images from COVID-19 patients*

MNIST