Classification lung disease with CNN

Use ELBO as loss function

Estimate the distribution of weights with Monte Carlo

Approximate distribution as p(|x)

**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