The Frequentist Approach

- Step 1) collect data

  Data : $X = \{x_1, x_2 \cdots, x_n\}$

- Step 2) write down likelihood

  Likelihood : $L \overset{\sim}{\prod_{i=1}} f(x; \mu, \sigma^2)$

- Step 3) μ, σ^2 $\underset{\mu, \sigma^2}{\operatorname{argmax}} L$

The Bayesian Approach

- 모수 = Random Variable
- We don't solve for μ, σ^2
- Instead, we find $p(\mu, \sigma^2 | X)$
- We don't find "number", will find "distribution"

Sampling

- 모수 추정 ↔ DL은 예측

Machine Learning Models

- E.g.) Linear Regression

  $y = w^T x$ (w 를 학습하고자 함)

Machine Learning Models (Bayesian)

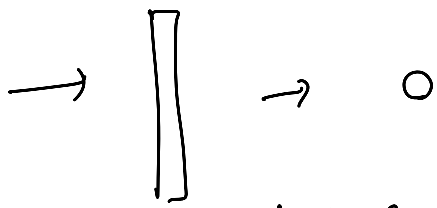
- 全てが Random Variable
- w を a 点ではなく, p(w | X, Y) が知りたい
  (X, Y = 学習データ)

Bayesian Networks

- 依存関係を自在に設計できる
- E.g.) #1 hours of studying
  #2 hours of video games
  #3 hours of sleeping

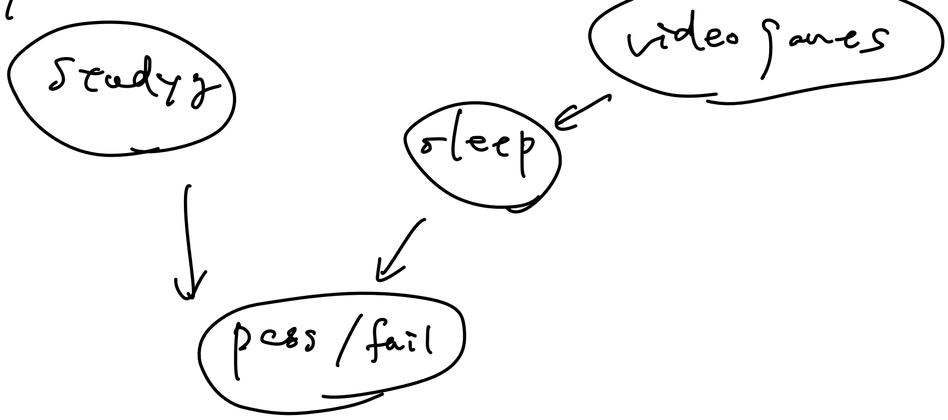
Deep learning

#1 hours of studying
#2 hours of video games
#3 hours of sleeping



全ての要素が依存する

Bayesian Networks



・i.e. explicitly, 明示的に