CV

- pixel operation
  - negate
  - contrast scaling
  - histogram
    - compute
      - mean
      - variance
      - entropy
    - comparison
      - L2 distance
      - χ^2 distance
      - intersections
- thresholding
  - Input
  - thresholding based on a histogram
  - OTSUs method.
  - videos
    - Frame differencing
    - moving average
- color
  - what is color?
  - color space
    - RGB
    - HSV
    - ⟷ color histogram
- Fourier histogram (☆).
  - Real / Imagine part
    - magnitude
    - phase
  - Intuition about
    - low Frequency
    - high Frequency
      - spatial part
      - edges
  - lowpass filter
  - highpass filter
- filter
  - local operations : convolution → linear operations
  - salt and pepper noise, Gaussian noise
    - ↳ median filtering ← relation → ↳ Gaussian filtering
  - relation.
  - mean filter
- scale-space smooth, then subsampling.
- edge:
  - origin of edge : noise affect detection of edge
    - prewitte
    - sobel
  - canny detector
    - NMS
    - double threshold
      - low
      - high
- optical flow (☆)
  - motion field.
  - optical flow
    - 2 Images
    - Bright consistency
    - moving is not fast.
    - spatial coherence ⟷ Aperture
  - camera motions zoom in/out. pan, left to right
    - rotation
- object detection
  - V·J
    - Integral Image
    - Feature selection by boosting
    - cascade detection
      - Fast rejection, negatives.
      - number of stages
      - Flow final. detection Rate / FPR.
    - walking person
      - relates to the dection rate per stages.
  - HOG | working principle.
    - histogram of visual words / code dictionary book
- Bag of words
- Tracking meanshift ⟷ working principle of meanshift

ML

- KNN (☆)
  - k=1, NN.
- NN - linear classifer
  - NLP
    - hinge loss (max)
    - MSE → regression
  - activation function
    - ReLU
    - Sigmoid
    - Tanh
- SVM
  - margin based $\frac{2}{\|w\|}$ + hinge loss
    - hard margin
    - soft margin. (slack variable)
  - Linear svm
  - kernel svm
    - Linear
    - polynomial
    - RBF ☆ 6.
  - mutiple class.
- clustering
  - non-parameteric clustering
    - hierachical
      - Agle
        - max
        - min
        - average
      - Divisive.
    - K-means
      - manually clustering
  - GMM → EM relationship between EM / kmeans.
- Feature Dimensionality reduction (☆)
  - unsupervised → PCA | working principle / meaning of
    - Eigen values
    - Eigen vectors
  - How to determine the number of pcs projection
  - supervised → LDA → number of directions. (n-1)
    - → 2-class → $S_W^{-1}(C_1-C_2)$.
- 2 class → 2+ class (☆)
  - (hold-out).
  - one against rest
    - hard decision values
    - soft decision values ⟷ max-min
  - One against one → majority voting.
    - $C_n^2 \leq \frac{n(n-1)}{2}$
- over-fitting → correct.
- performance Evaluation (☆)
  - confusion matrix.
    - multi-class confusion
    - 2-class confusion matrix

TP	FN
FP	TN

- [TPR, FPR]
- sensitivity Spec
- detection rate.
- precision
- recall
- ROC AUC (area under curve) EER : equal error rate