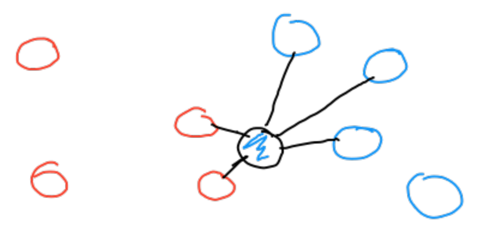


k

$X=(x_i,y_i)_{i=1}^{\ell}$

$x_i\in\mathbb{R}^d \quad y_i\in Y=\{1,\dots,k\}$

$\rho:\mathbb{R}^d\times\mathbb{R}^d\to[0,+\infty)$

$x': \rho(x',x_{(1)})\le\rho(x',x_{(2)})\le\dots\le\rho(x',x_{(\ell)})$

$a(x')=\arg\max\limits_{y\in Y}\sum\limits_{i=1}^{k}\mathbb{1}(y_{(i)}=y)$

$\rho(x',x)=\sum\limits_{i=1}^{d}(x'_{(i)}-x_{(i)})^2$

$\rho(x',x)=1-\cos(x,x')$

$\hat a(x')=\arg\max\limits_{y\in Y}\sum\frac{1}{\rho(x',x)+\varepsilon}\mathbb{1}(y_{(i)}=y)$

$X\in\mathbb{R}^{\ell_1\times d} \quad Z\in\mathbb{R}^{\ell_2\times d} \quad x_i\in X \quad z_j\in Z$

$\rho(x_i,z_j)=\sum\limits_{s=1}^{d}(x_i^s-z_j^s)^2$ $\left\{\begin{array}{l}1)\ d\text{ – вычитаний}\\ 2)\ d\text{ – возвед. в } 2\\ 3)\ d\text{ – сумм}\end{array}\right.$

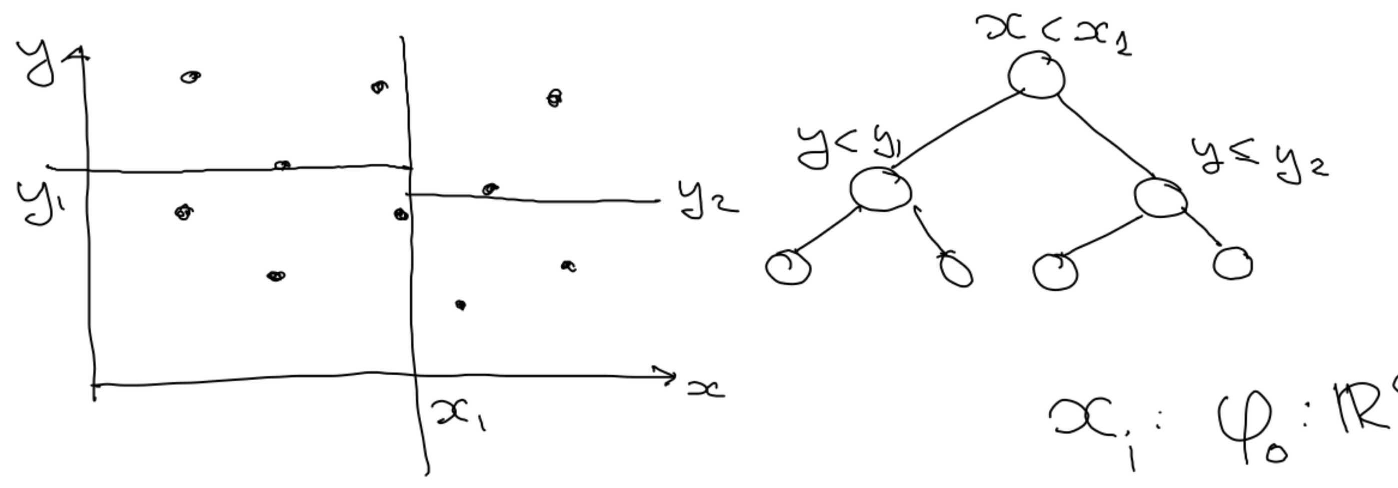
$3d$ операций

$3d\ell_1\ell_2$

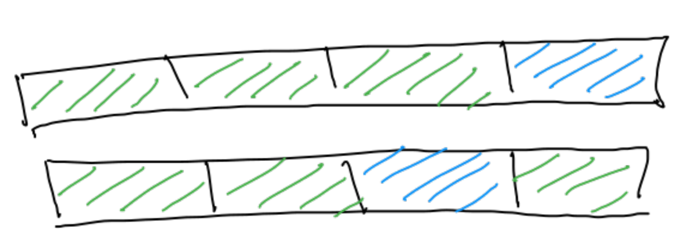
$\rho(x_i,z_j)=\underbrace{\sum\limits_{s=1}^{d}(x_i^s)^2}_{X}+\underbrace{\sum\limits_{s=1}^{d}(z_j^s)^2}_{Z}-\underbrace{2\sum\limits_{s=1}^{d}x_i^s z_j^s}_{-2\cdot XZ^T}$

$2d\ell_1+2d\ell_2+2d\ell_1\ell_2=2d(\ell_1+\ell_2+\ell_1\ell_2)$

kd-tree



k-fold



$k_1,k_2,\dots,k_T$

1) $k_{(1)}\le\dots\le k_{(T)}$

$x_i: \ \varphi_0:\mathbb{R}^d\to\mathbb{R}^d \quad \{\varphi_0\dots\varphi_n\}$

$\vdots$

$\varphi_m:\mathbb{R}^d\to\mathbb{R}^d$

$x'_i=\varphi_j(x_i) \quad (x'_i,y_i)$

$\underbrace{\begin{array}{cccc} z' ; & \varphi_0(z') ; & \varphi_1(z')\dots & \varphi_n(z')\\ \downarrow & \downarrow & \downarrow & \downarrow\\ \hat x & \hat x_0 & \hat x_1 & \hat x_n\end{array}}$

$n+1\to$ $\underbrace{k\text{ ближ. для } z'}_{\text{голосование}}$

$\Phi(x)=\{\varphi_j(x);\ j=\overline{1,n}\}$

$(x_i,y_i)\to(\varphi(x_i);y_i)$

$x_i: \{x_i,\varphi_1(x_i)\dots\varphi_n(x_i)\}$

$\begin{array}{cccc}\downarrow & \downarrow & & \downarrow\\ z_i^0 & z_i^1 & \dots & z_i^n\end{array}$

$\rho(x_i,z_i^{(0)})\le\rho(x_i,z_i^{(1)})\le\dots\le\rho(x_i,z_i^{(k)})$

x – тестов

z – трен.

$\begin{array}{lcccc} & x_i & \varphi_1(x_i) & \dots & \varphi_m(x_i)\\ \to z_1 & \alpha_{11} & \alpha_{12} & \dots & \alpha_{mi}\\ \to z_{j-1} & & & & \\ \to z_{ij} & & & & \\ z_n & \alpha_{n1} & \alpha_{n2} & \dots & \alpha_{nm}\end{array}$