VO2 - OSNOVNI KONCEPTI

ANA GEO
0036510069

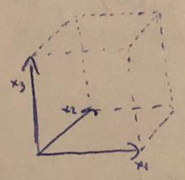
2.2

$\mathcal{X} = \{0,1\}^3$ $\quad h(x;\theta) = 1\{\theta_{1,1} \le x_1 \le \theta_{1,2}) \wedge (\theta_{2,1} \le x_2 \le \theta_{2,2}) \wedge (\theta_{3,1} \le x_3 \le \theta_{3,2})\}$

$\theta \in \mathbb{R}^6$

$|\mathcal{H}| = ?$

$$\theta = \begin{bmatrix} \theta_{11} & \theta_{12} \\ \theta_{21} & \theta_{22} \\ \theta_{31} & \theta_{32} \end{bmatrix}$$



ekstenzionalna jednakost : $h_1 = h_2 \leftrightarrow \forall x\,(h_1(x) = h_2(x)),\ x \in X$

Ako točka unutar kvadra $\rightarrow y = 1$

1) 1 točka : 8
2) 1 brid : 12
3) 1 ploha : 6
4) sve točke : 1
5) niti 1 točka

$\Big\} \; |\mathcal{H}| = 28$

2.8. VJ2

ANA GETO
0036510069

$N = 6$ skup označenih primjera iz $\mathbb{R}^3$

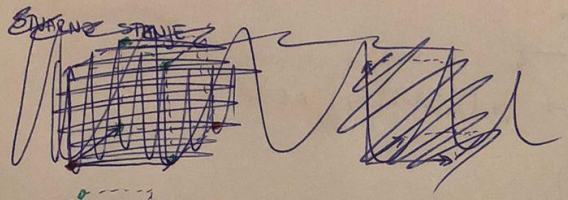
$D = \{(x^{(i)}, y^{(i)})\} = \{((0,0,0),0), ((1,1,0),0), ((1,0,0),1), ((1,0,1),1), ((0,1,0),1), ((0,1,1),1)\}$

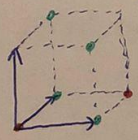
$E(h|D) = ?$

očekivanje asimetričnog gubitka

$L(FN) = 1$, $L(FP) = 0.5$ → FN: $L(1,0)$, FP: $L(0,1)$

$$E(h|D) = \frac{1}{N} \sum |(h(x) - y)|$$

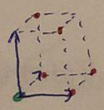




1. SLUČAJ: MIN

→ FP → $\frac{1}{6} \cdot L(FP) = \frac{1}{6} \cdot 0{,}5 = \frac{1}{12} = E(h|D)_{MIN}$

2. SLUČAJ: MAX



→ OVAKVA SITUACIJA: 4FN, 1 FP

$\frac{1}{6}(4 \cdot 1 + 1 \cdot 0{,}5) = \frac{3}{4} = E(h|D)_{MAX}$

RJEŠENJE: $\frac{1}{12} \leq E(h|D) \leq \frac{3}{4}$

VO4 - LIN. REG II

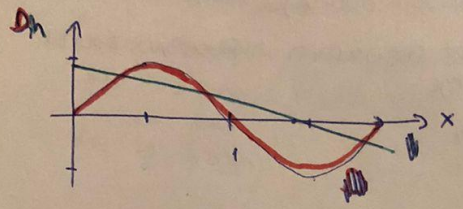
ANA GETO
0036510063

1.3 $f = \sin(\pi x)$, $D = \{(0{,}25, 0{,}707), (0{,}5, 1), (1, 0), (1{,}5, -1), (2, 0)\}$

a) $\phi(x) = (1, x)$

$$\Phi = \begin{bmatrix} 1 & 0.25 \\ 1 & 0.5 \\ 1 & 1 \\ 1 & 1.5 \\ 1 & 2 \end{bmatrix} \quad y = \begin{bmatrix} 0.707 \\ 1 \\ 0 \\ -1 \\ 0 \end{bmatrix} \quad \vec{w} = (\Phi^T\Phi)^{-1}\Phi^T y = \begin{bmatrix} 0.9433 \\ -0.7637 \end{bmatrix}$$

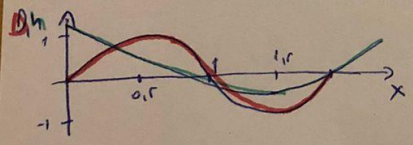
$h(x) = w_0 + w_1 x = 0.9433 - 0.7637\,x$



b) $\phi(x) = (1, x, x^2)$

$$\Phi = \begin{bmatrix} 1 & 0.25 & 0.0625 \\ 1 & 0.5 & 0.25 \\ 1 & 1 & 1 \\ 1 & 1.5 & 2.25 \\ 1 & 2 & 4 \end{bmatrix} \quad y = \begin{bmatrix} 0.707 \\ 1 \\ 0 \\ -1 \\ 0 \end{bmatrix} \quad \vec{w} = \begin{bmatrix} 1.7538 \\ -2.9408 \\ 0.9755 \end{bmatrix}$$

$h(x) = 1.7538 - 2.9408x + 0.9755x^2$



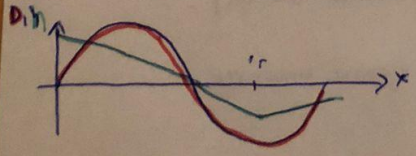
c) $\phi(x) = (1, x, x^2, x^3, x^4)$, uz L-2 reg $(\lambda = 1)$

$$\Phi = \begin{bmatrix} 1 & 0.25 & 0.0625 & 0.0156 & 3.906 \cdot 10^{-3} \\ 1 & 0.5 & 0.25 & 0.125 & 0.0625 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1.5 & 2.25 & 3.37 & 5.0625 \\ 1 & 2 & 4 & 8 & 16 \end{bmatrix} \quad y = \begin{bmatrix} 0.707 \\ 1 \\ 0 \\ -1 \\ 0 \end{bmatrix}$$

$$\lambda \cdot \begin{bmatrix} 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

$\vec{w} = [0.8330 \quad -0.2818 \quad -0.4156 \quad -0.3461 \quad 0.2475]^T$

$h(x) = 0.8330 - 0.2818x - 0.4155x^2 - 0.3461x^3 + 0.2475x^4$



d) ~~Najbolji~~ NAJPRIKLADNIJI JE MODEL POD c) JER IMA NAJMANJU KVADRATNU POGREŠKU I NAJBOLJE PRATI FUNKCIJU.

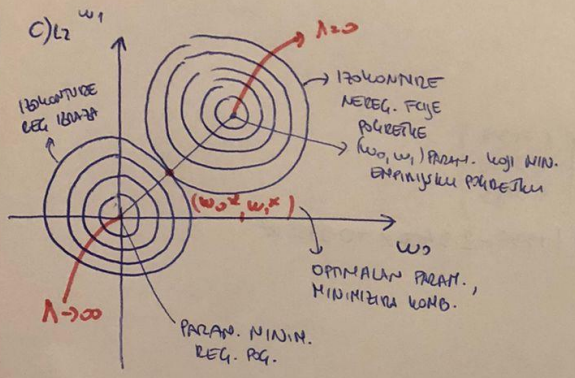
15. UG

ANA GETO
0036510069

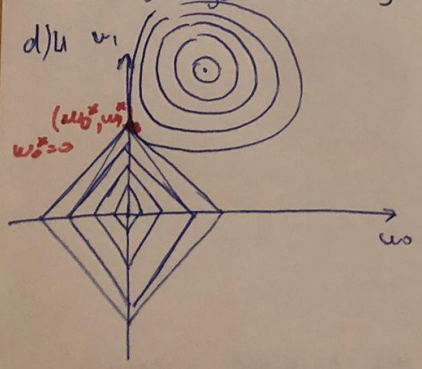
a) SURHA REGULARIZACIJE – SPRJEČAVANJE PRENAUČENOSTI MODELA TAKO DA OGRANIČIMO RAST VRIJEDNOSTI PARAM.

TEMELJI SE NA PRETPOSTAVCI: ŠTO JE LIN. MODEL SLOŽENIJI IMA VEĆE VRIJEDNOSTI PARAM. ZATO KAŽNJAVAMO HIPOTEZE S VELIKIM PARAM. (U FUNKC. POGREŠKE UGRAĐUJEMO MJERU SLOŽENOSTI MODELA).

b) PREDNOST REG. MODELA JE DA GA JE TEŽE PRENAUČITI. POSEBNO DOLAZI DO IZRAŽAJA KADA IMAMO MALO PRIMJERA ZA UČENJE.
TAKOĐER, POBOLJŠAVA NUMERIČKU STABILNOST.



⇒ OPTIMALAN PARAM. NUJNO NA SREDIŠTU IZOKONTURA. MANJI OD PARAM KOJI MIN FCIJU POG. (NEREG. REG.)
⇒ L2-REG. NE MOŽE REZULTIRATI RIJETKIM MODELIMA, ZATO BI SE OPTIM. PARAM. MORAO NALAZITI NA w_1 OSI. L2 KAŽNJAVA TEŽINE PROPORCIONALNO NJIHOVOM IZNOSU.
⇒ L2 DAJE RJEŠENJE U ZATVORENOJ FORMI.



⇒ IZOKONTURE L1 IMAJU KVADRATNI OBLIK. VJEROJATNOST DA SE SJEČE NA (ILI BLIZU) OSI KVADRATNO SUSTAVA (w_0, w_1).
⇒ ~~RIJEDAK~~
⇒ ZATO REZULTIRAJU RIJEDIM MODELIMA.

2.3. VOL

ANA GETO
0036510069

rang $(X) = m+1$

G: $(x+1) \times (m+1)$

x_5 - lin. kombinacija $(x_1 - x_4)$ => izbacujemo x_5

=> 6 (linearno) + 6 (kvadratno) + $\binom{6}{2}$ + $\binom{6}{3}$ = 48

→ parovi → trojke

=> ZA PRESLIKAVANJE KORISTIMO PRESLIKAVANJE S KVADRATNIM, INTERAKCIJSKIM I LINEARNIM ZNAČAJKAMA

interakcija parova i trojki

$x_1 - x_4$ → prosjeci svakog razreda

x_5 → Prosjeci razreda (ukr.) → lin. komb $(x_1 - x_4)$

x_6 → mat

x_7 → fizika