Deň otvorených dverí

Matematika mnohorozmerných dát

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14. Február, 2023

Tri príklady viacrozmerných dát

- Tváre
- Jedlo
- Sedemboj

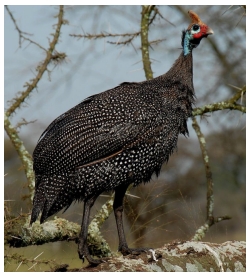
Redukcia dimenzie je užitočná.

Rôznym spôsobom.

Tváre

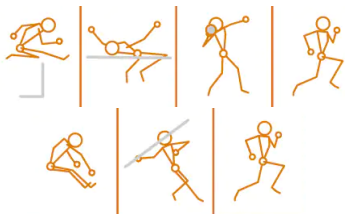
- 12000 pixelov

Jedlo



- 4 druhov živín

Sedemboj



- 7 športov

Príklad 1: tváre

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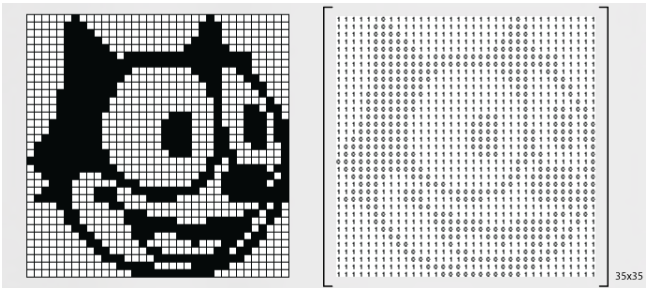
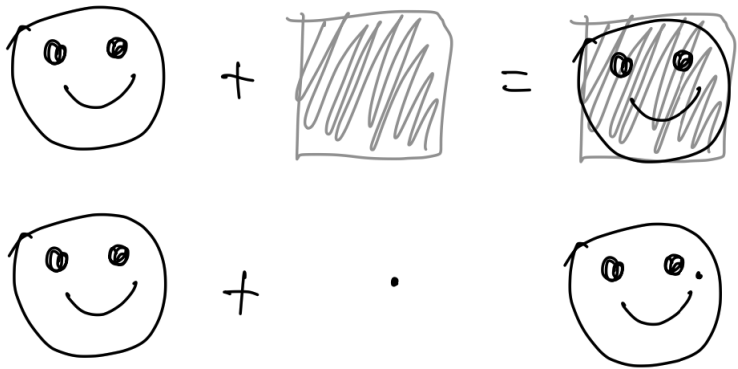
Matica = tabuľka čísel

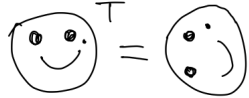


Operácie s maticami

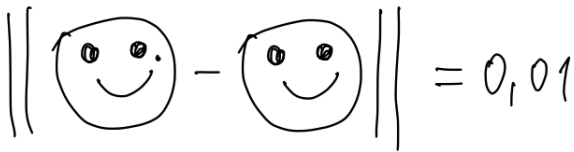
Matice môžu byť: veľké, malé, úzke, široké

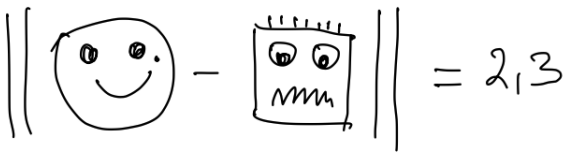
Rovnako veľké matice môžeme napr. sčítať alebo odčítať.

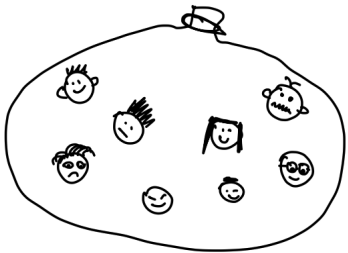


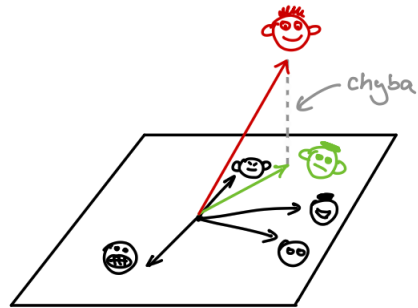


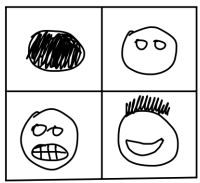
Medzi maticami vieme merať vzdialenosti



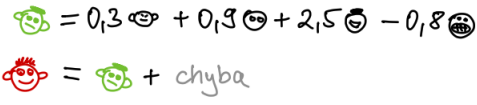


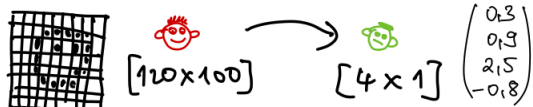






bázické tváre



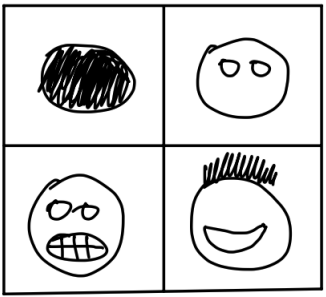


Rekonštrukcia pomocou 36 hlavných komponentov

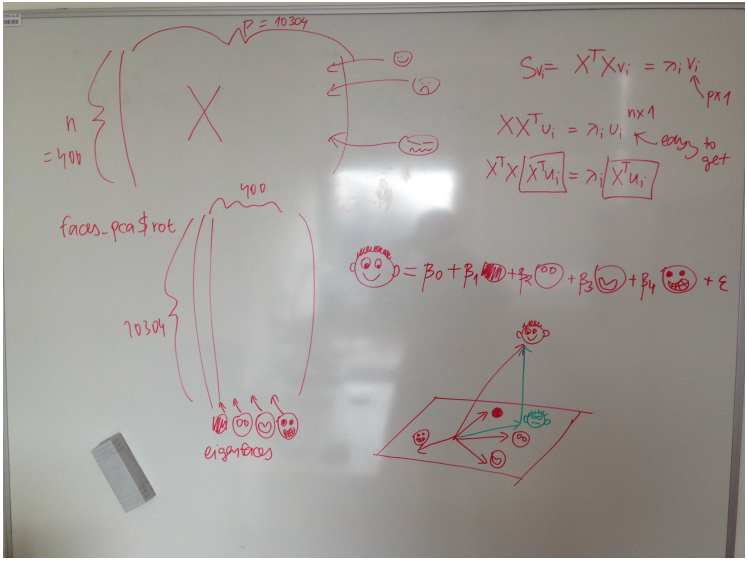
Sample of original faces before running PCA:

Zdroj: `https://github.com/gbuesing/pca/tree/master/examples`

’Bázické tváre’



...matematika


P = 10304
X
n
= 400
400
faces_pca$rot
10304
eigenfaces
$S_{vi} = X^T X v_i = \lambda_i v_i$
px1
$XX^T u_i = \lambda_i u_i$
nx1
easy to get
$X^T X \boxed{X^T u_i} = \lambda_i \boxed{X^T u_i}$
$= \beta_0 + \beta_1 + \beta_2 + \beta_3 + \beta_4 + \varepsilon$

Príklad 2: jedlo

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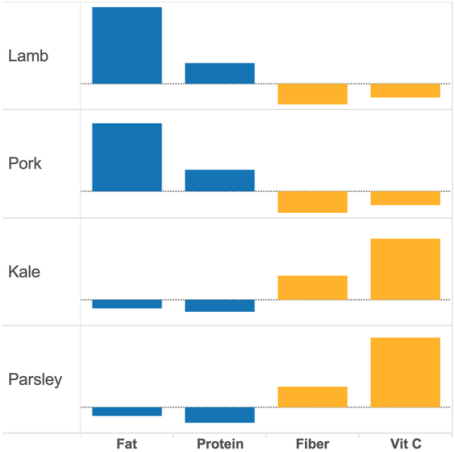

Obr.: Zdroj: `https://www.quora.com/What-is-an-intuitive-explanation-for-PCA`

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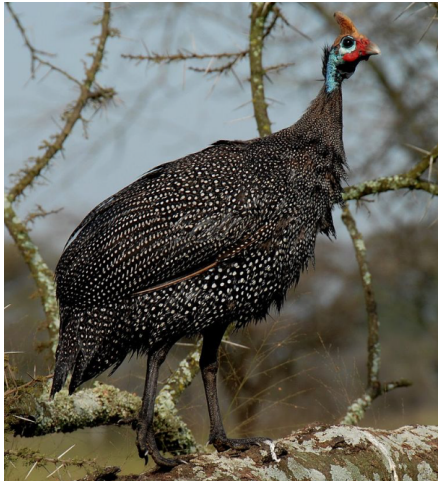
Guinea Hen



Obr.: Zdroj: `wiki`

Príklad 3: sedemboj

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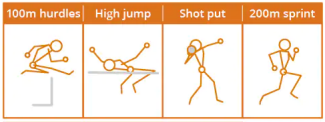
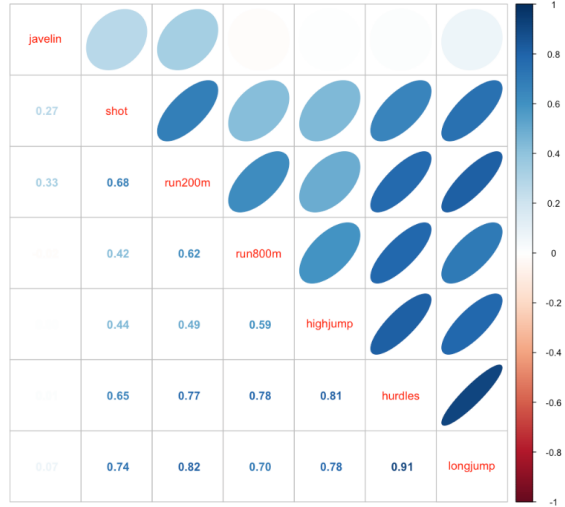


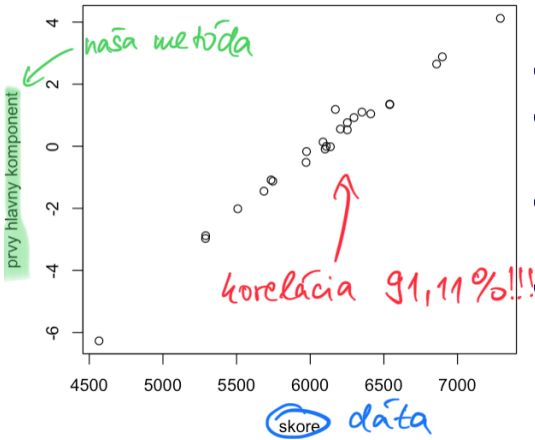

```
> heptathlon
```

	hurdles	highjump	shot	run200m	longjump	javelin	run800m
Joyner-Kersee (USA)	3.73	1.86	15.80	4.05	7.27	45.66	34.92
John (GDR)	3.57	1.80	16.23	2.96	6.71	42.56	37.31
Behmer (GDR)	3.22	1.83	14.20	3.51	6.68	44.54	39.23
Sablovskaite (URS)	2.81	1.80	15.23	2.69	6.25	42.78	31.19
Choubenkova (URS)	2.91	1.74	14.76	2.68	6.32	47.46	35.53
Schulz (GDR)	2.67	1.83	13.50	1.96	6.33	42.82	37.64
Fleming (AUS)	3.04	1.80	12.88	3.02	6.37	40.28	30.89
Greiner (USA)	2.87	1.80	14.13	2.13	6.47	38.00	29.78
Lajbnerova (CZE)	2.79	1.83	14.28	1.75	6.11	42.20	27.38
Bouraga (URS)	3.17	1.77	12.62	3.02	6.28	39.06	28.69
Wijnsma (HOL)	2.67	1.86	13.01	1.58	6.34	37.86	31.94
Dimitrova (BUL)	3.18	1.80	12.88	3.02	6.37	40.28	30.89
Scheider (SWI)	2.57	1.86	11.58	1.74	6.05	47.50	28.50
Braun (FRG)	2.71	1.83	13.16	1.83	6.12	44.58	20.61
Ruotsalainen (FIN)	2.63	1.80	12.32	2.00	6.08	45.44	26.37
Yuping (CHN)	2.49	1.86	14.21	1.61	6.40	38.60	16.76
Hagger (GB)	2.95	1.80	12.75	1.14	6.34	35.76	24.95
Brown (USA)	2.35	1.83	12.69	1.78	6.13	44.34	17.00



Chceli by sme tento 7 rozmerný priestor zredukovať do 1 rozmerného.

Ako veľmi bude toto číslo podobné skutočnému skóre?



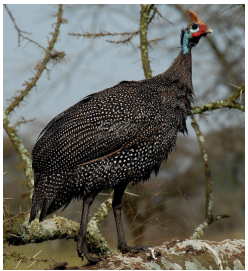
- Naša metóda zredukovala 7D do 1D
- Nikdy nevidela dáta o nameranom skóre (!!!)
- Napriek tomu sme dostali **skoro totožné výsledky**
- Interpretácia?

Zhrnutie

Tváre

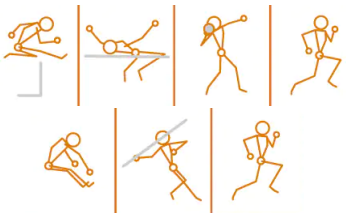
- 12000D $\rightarrow$ 36D
- úspora pamäte

Jedlo



- 4D $\rightarrow$ 2D
- vizualizácia

Sedemboj



- 7D $\rightarrow$ 1D
- porozumenie


Ďakujem za pozornosť!
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