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Lineárna a polynomiálna regresia

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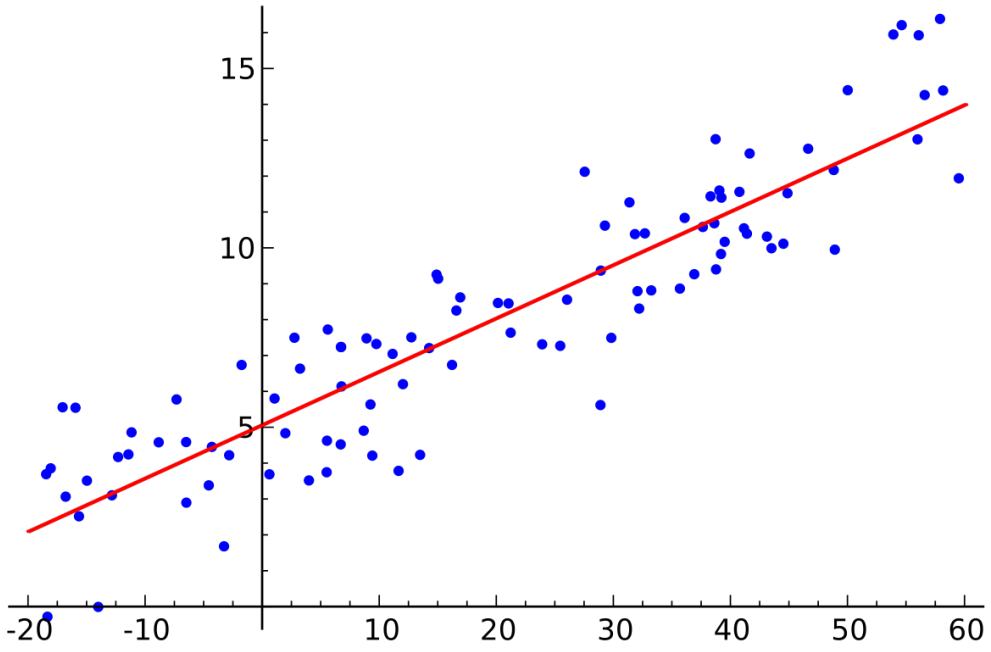
Regresná analýza

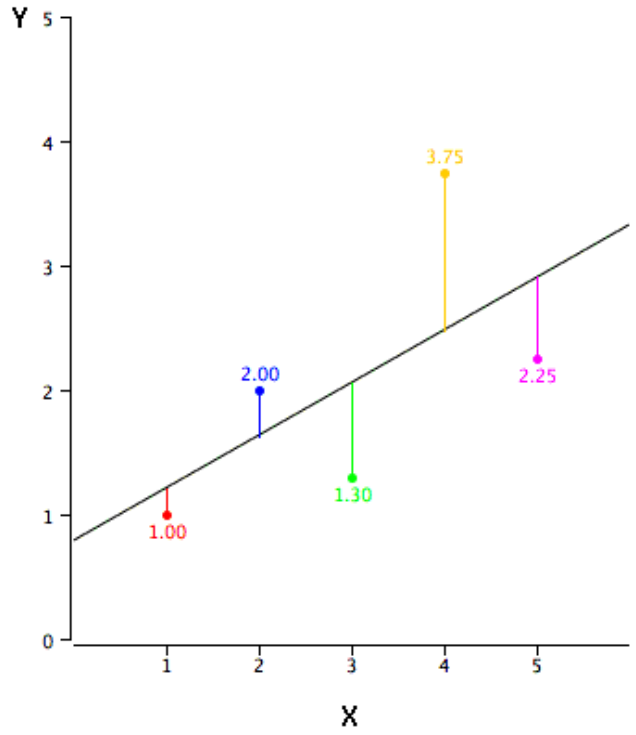
- Opis vzťahu medzi premennými
- Supervised learning

Lineárna regresia

$$Y = a + bX + \varepsilon$$

$$MSE = \frac{1}{n}\sum_{i=1}^{n}(Y_i - Y'_i)^2$$





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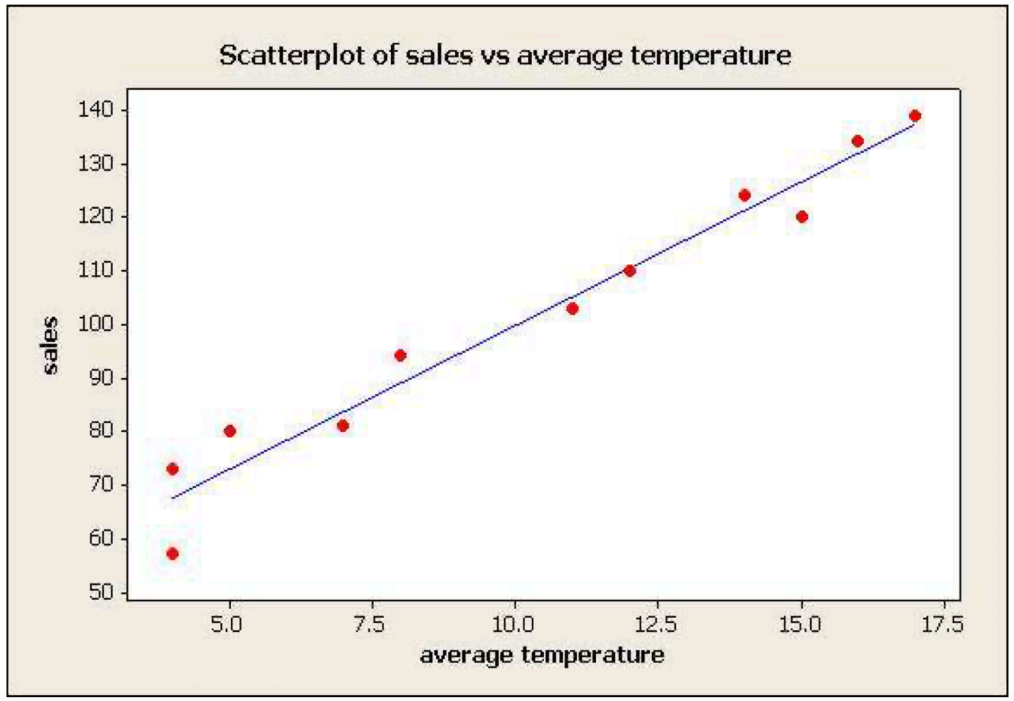
Lineárna regresia

- Predikcia spotreby pre výpočet HDP
- Export a import komodít
- Ponuka a dopyt na pracovnom trhu

Lineárna regresia

– Počet predaných zmrzlín vzhľadom na teplotu $y = 45.52 + 5.448x$

Month	Average Temp (°C)	Sales (£ 000's)
January	4	73
February	4	57
March	7	81
April	8	94
May	12	110
June	15	124
July	16	134
August	17	139
September	14	124
October	11	103
November	7	81
December	5	80



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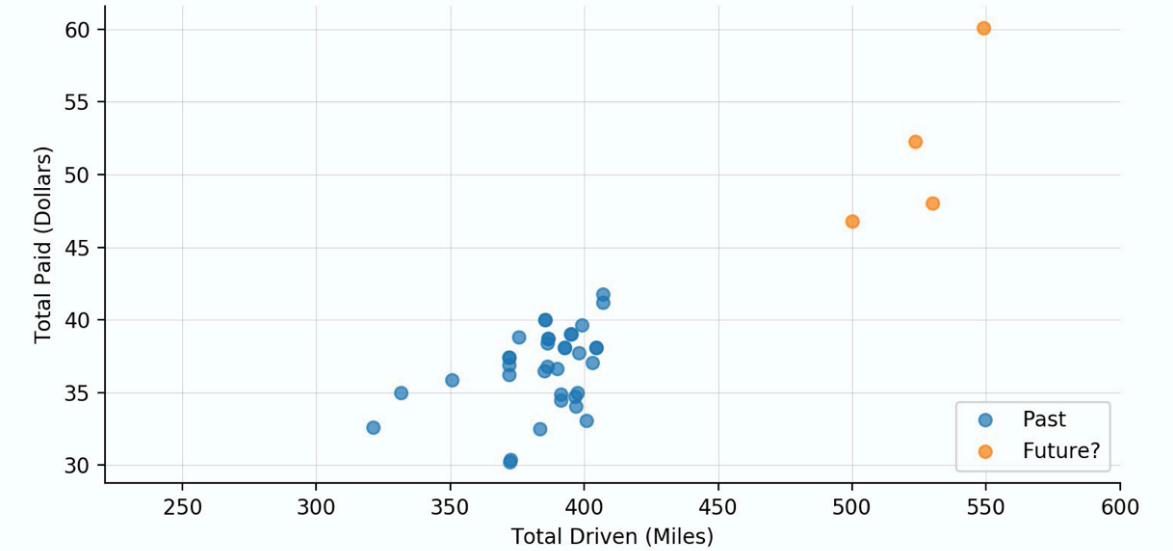
Lineárna regresia

– Peniaze na benzín



$$Total_{Paid} = 0.0954 * 1200 + 0.001 \equiv 114.5$$

	A	B
1	Total Payed	Total Miles
2	36.66	390
3	37.05	403
4	34.71	396.5
5	32.5	383.5
6	32.63	321.1
7	34.45	391.3
8	36.79	386.1
9	37.44	371.8
10	38.09	404.3
11	38.09	392.6
12	38.74	386.49
13	39	395.2
14	40	385.50
15	36.21	372
16	34.05	397
17	41.79	407
18	30.25	372.33
19	38.83	375.6
20	39.66	399

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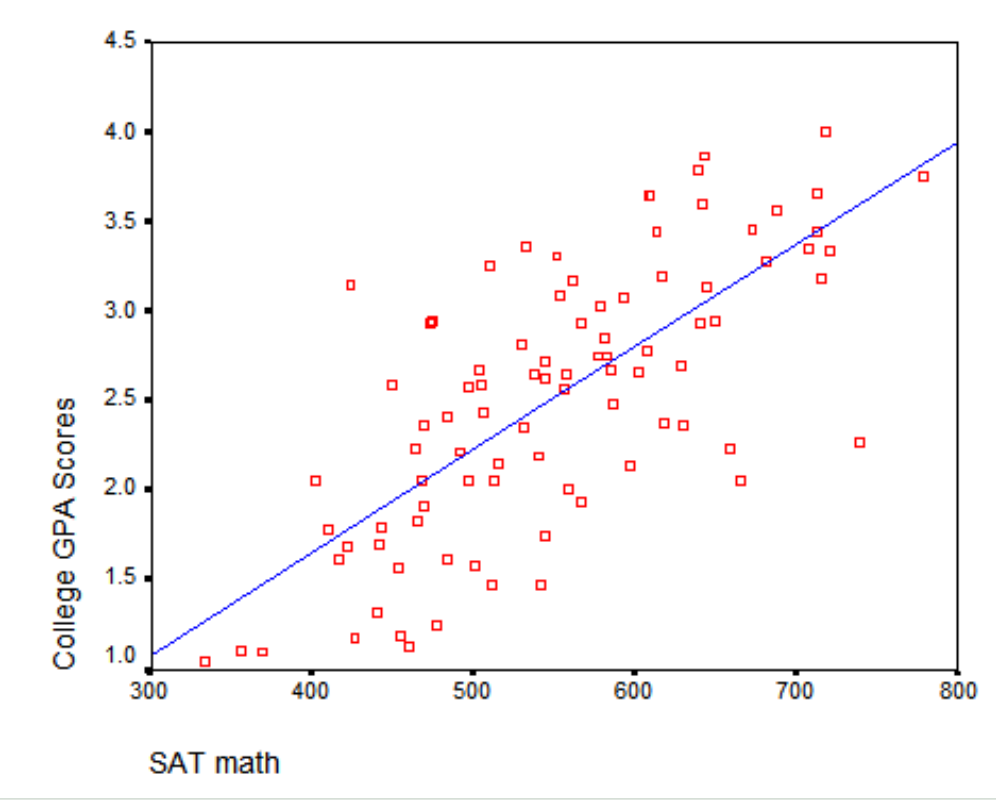
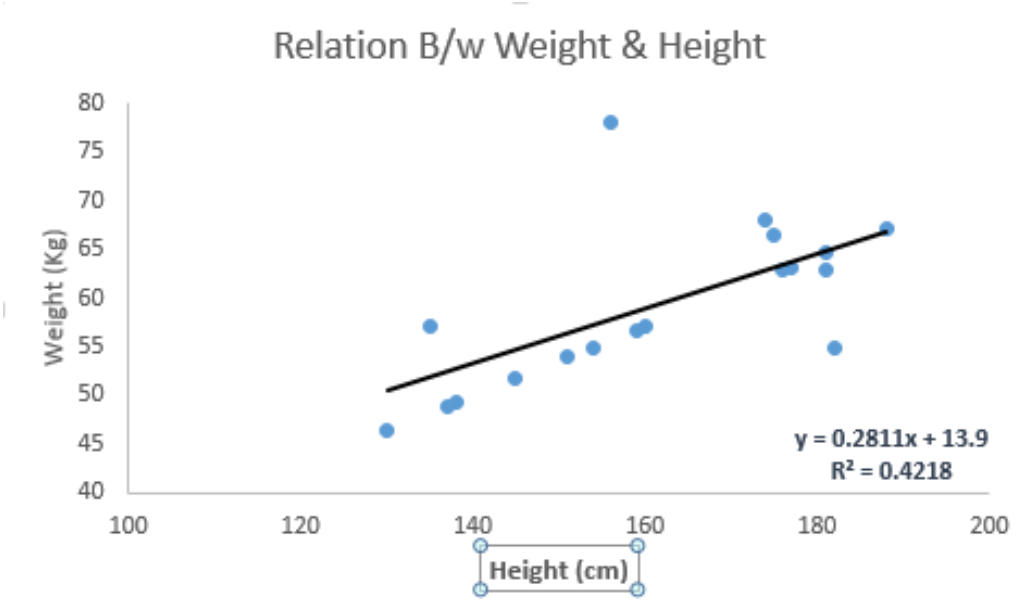
Lineárna regresia





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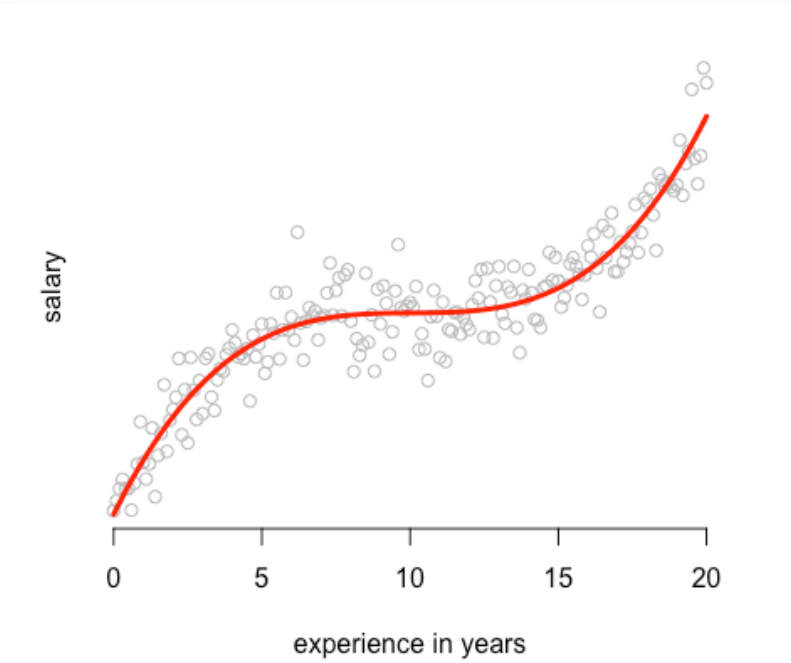
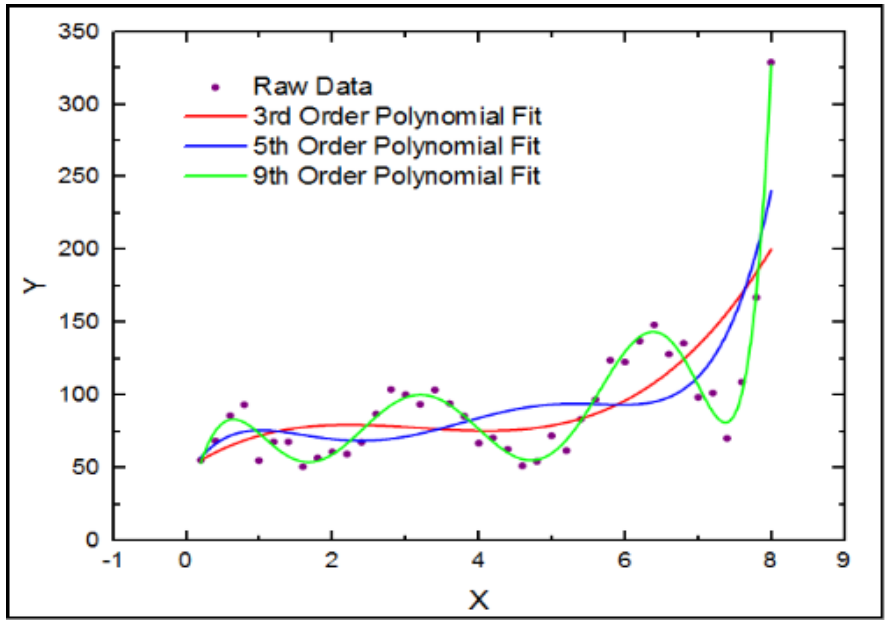
Polynomiálna regresia

$$Y = a + bX + cX^2 + \varepsilon$$

$$Y = a + bX + cX^2 + dX^3 + \cdots X^n + \varepsilon$$





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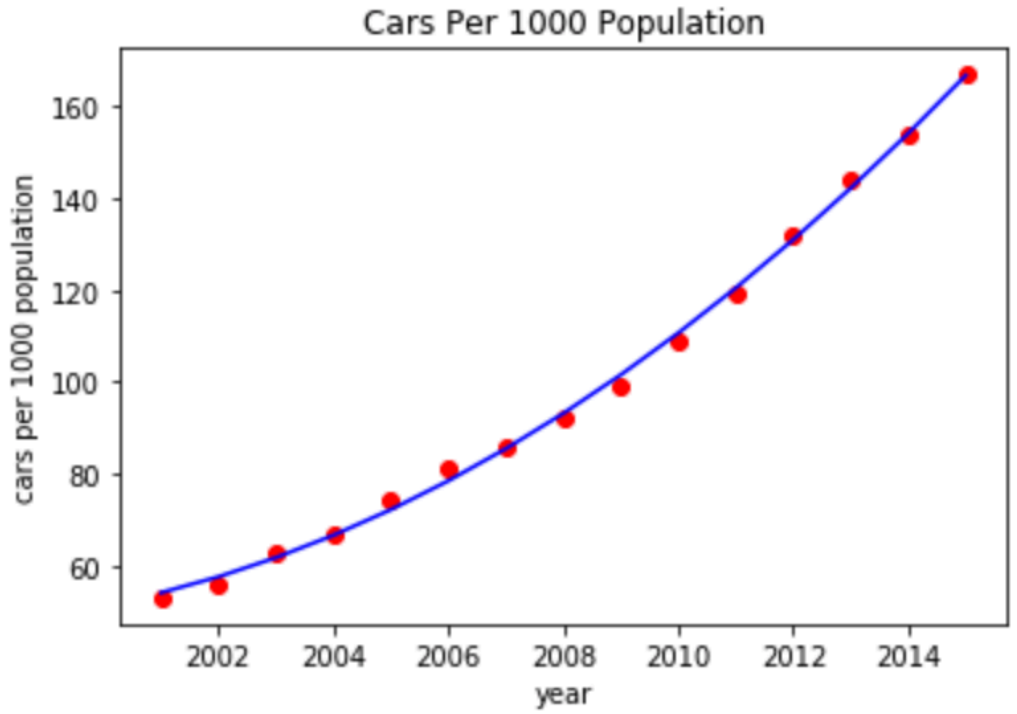
Polynomiálna regresia

- Meranie progresu epidémie
- Tempo rastu a obnovy tkaniva
- Distribúcia izotopov uhlíka v sedimentoch jazier.

Polynomiálna regresia

– Predaj áut



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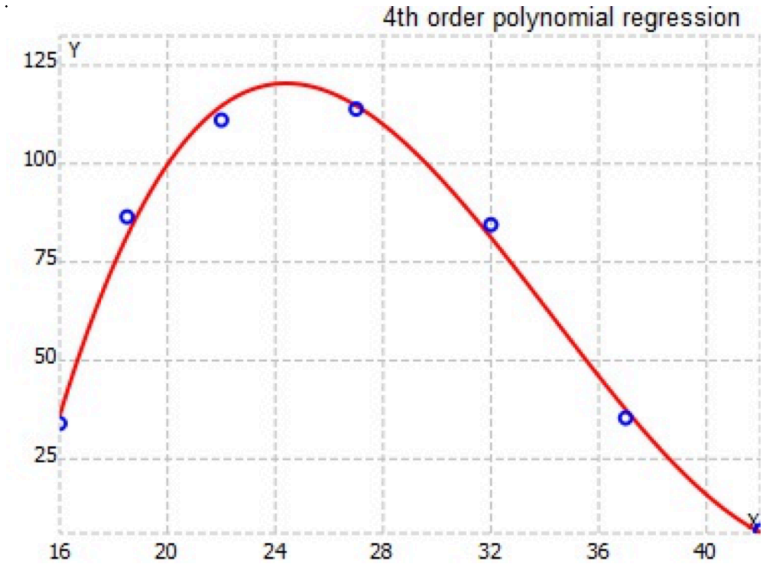
Polynomiálna regresia

– Priemerný počet narodení detí u žien rôzneho veku

Age	Births/1000 women
16	34
18,5	86,5
22	111,1
27	113,9
32	84,5
37	35.4
42	6,8
45	We will calculate this value



$\text{polyfit}(xz, 4) = -5.368\text{e-}5\, x^4 + 0.038\, x^3 - 3.479\, x^2 + 105.811\, x - 916.689$ $\text{replace symbols}(\text{polyfit}(xz, 4), x, 45) = 2.601$

The average number of births per 1000 women of age 45 is 2.6.

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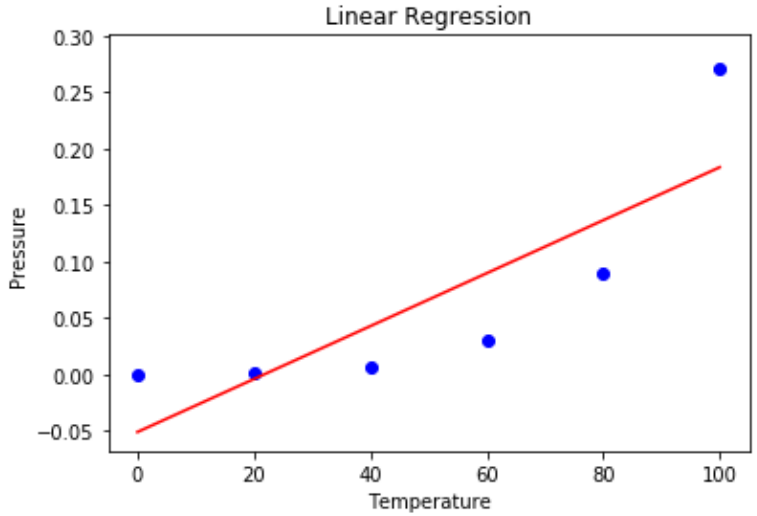
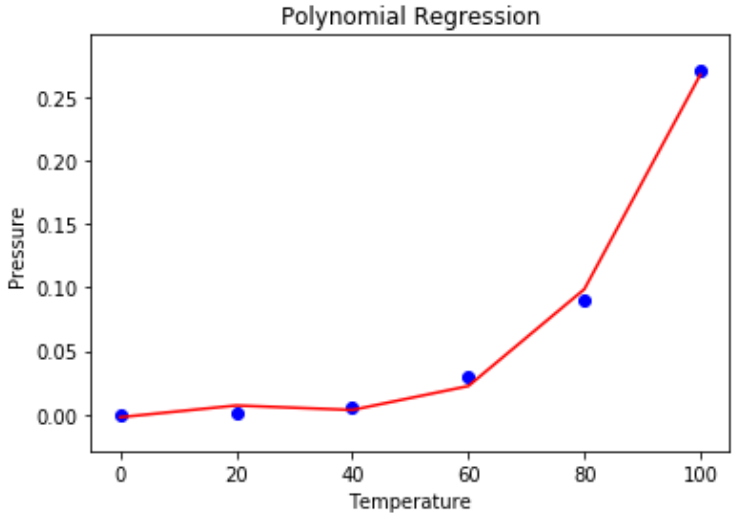
Polynomiálna regresia

Out[3]:

	sno	Temperature	Pressure
0	1	0	0.0002
1	2	20	0.0012
2	3	40	0.0060
3	4	60	0.0300
4	5	80	0.0900
5	6	100	0.2700





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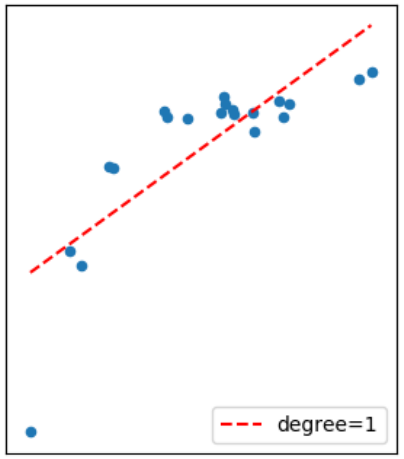
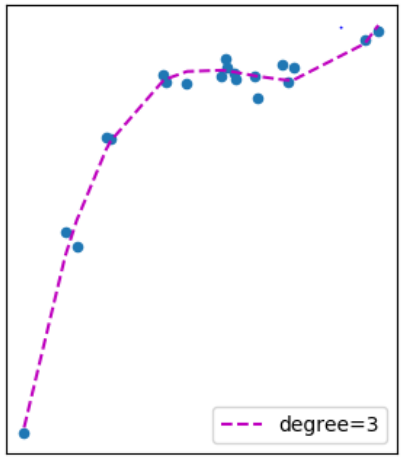
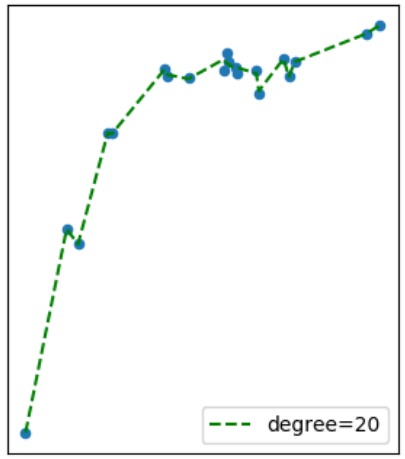
Polynomiálna regresia - overfitting



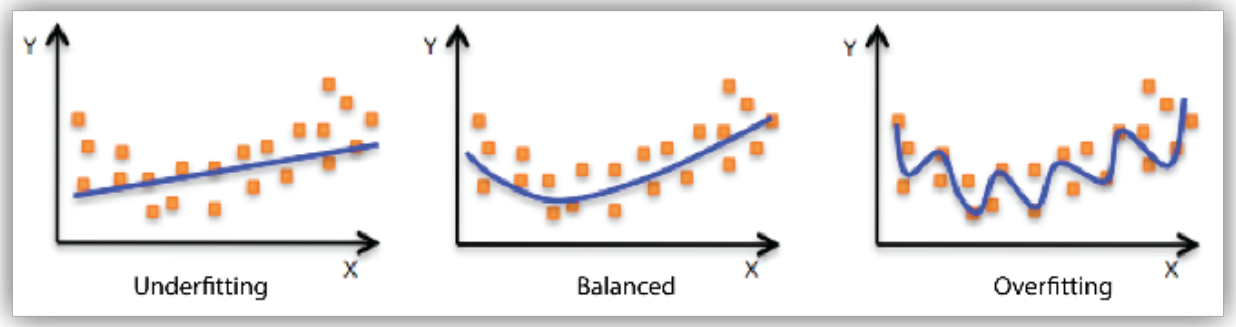
Underfit
High Bias
Low Variance



Correct Fit
Low Bias
Low Variance



Overfit
Low Bias
High Variance



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