Junior Data Scientist - media & advertising task

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Data preparation and behavioral findings

- After receiving data, we read them and provide initial checks
- We joined weekly data to monthly data and prepared two datasets to analyse
- Firstly, we apply behavioral finding into marking channels:
  - Diminishing returns (Hill function):

$$f(x) = \frac{x^{\gamma}}{x^{\gamma} + k^{\gamma}}$$

  - Ads memory ("decay law"):

$$x(t) = \text{Investments}(t) + \lambda \cdot x(t-1), \text{where } 0 \leq \lambda \leq 1$$

- Model was fitted using variables:
  - marketing channels with applied behavioral findings (investments in TV, radio, press, online and banners)
  - competitors variables (investments, recognitions)
  - other variables as public holidays, stores opened, economy index, brand knowledge, weather index and precipitation index
  - in monthly dataset we have additional variables: unemployment, tourists, gdp and confidence

Weekly model results - statistical interpretation

- The model is able to explain 74% of dataset.
- According statistics, the model is significant and relevant.
- By checking residuals, there is not significant biases
- The model warn about strong multicollinearity or numerical instability, what would need by studied and eliminated by sophisticated techniques

	coef	std err	t	P>|t|
investment_tv_adsMemory_diminishingReturns	1.805e+06	3.81e+05	4.740	0.000
investment_radio_adsMemory_diminishingReturns	8.201e+05	1.13e+06	0.725	0.470
investment_press_adsMemory_diminishingReturns	1.513e+06	4.99e+05	3.029	0.003
investment_banners_adsMemory_diminishingReturns	-6.393e+04	3.97e+05	-0.161	0.872
investment_online_adsMemory_diminishingReturns	1.854e+06	4.36e+05	4.250	0.000
investment_competition	-0.0273	0.023	-1.180	0.241
investment_competition_1	-0.0279	0.023	-1.192	0.236
investment_competition_2	0.0067	0.021	0.317	0.752
competitor_recognition_1	-1.74e+06	3.46e+06	-0.503	0.616
competitor_recognition_2	-3.146e+06	3.44e+06	-0.916	0.362
public_holidays	-1.275e+06	2.23e+05	-5.732	0.000
stores_opened	5.478e+04	1.6e+04	3.430	0.001
economy_index	-344.8687	170.024	-2.028	0.045
brand_knowledge	8.377e+06	3.8e+06	2.206	0.030
weather_index	-9.084e+06	1.43e+06	-6.363	0.000
precipitation_index	-5268.3927	3705.978	-1.422	0.158

- The most significant marketing channels: TV, press and online
- The most significant other variables: public holidays, stores opened, branch knowledge, economy and weather index

Weekly model results - marketing

- The model is answering marketing interesting questions.
- Contribution of investment in marketing channels to sales can be found in the top figure
- Efficiency of marketing channels is shown in bottom figure.
- Investments to banners look as useless.
- The highest contribution to sales is investments to online, but its efficiency is the smallest
- The investments to radio is contributing to sales very low, but its efficiency is the highest.
- It looks the channels have opposite order in contribution on sales and efficiency.