Stories: data mining v businessové praxi

Aneb výzvy při automatizaci datové dělničiny

Viktor Brada & Hynek Walner

MFF UK, 28.2.2018

Avast, Lagardere, Kiwi.com, Alza, Ahold, ČSAS, Sporty.cz, Snowboards.cz, Vivantis, Rockaway, Leo Express, Koloniál, Prodeti.cz, BigBrands, Bibloo, Rozbaleno.cz, Le Premier, Liftago, Lidská Síla, Adastra, Bonavita, COOP, Nielsen, Agrozet, Seznam, Škoda Auto, Vodafone UK, Sklizeno, Volkswagen, Daher, Freshlabels, Heureka, MF ČR, ...

viktor@stories.bi, hynek@stories.bi

GoodData SELdep

logio

YOTTLY

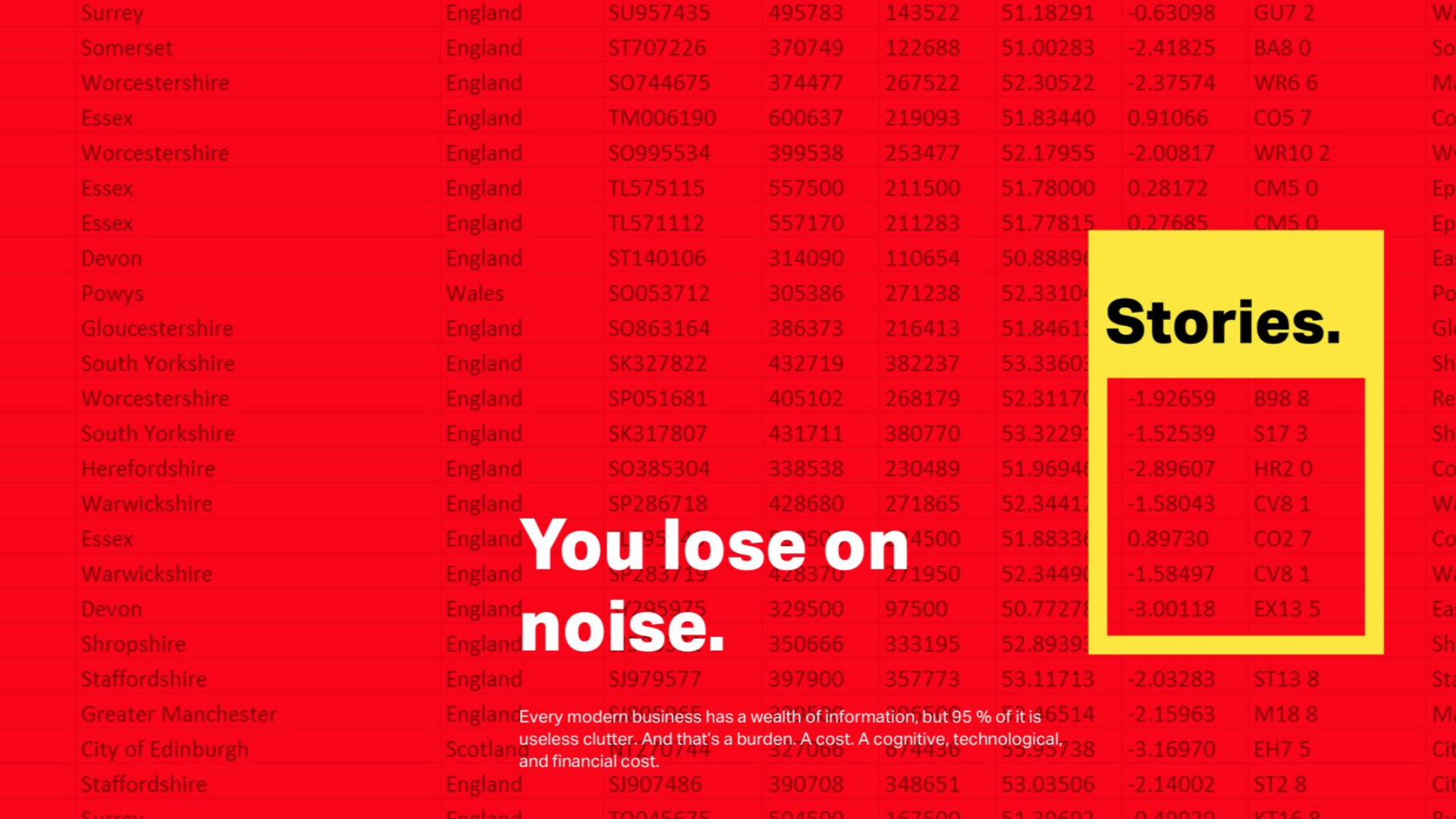
CLEVER° MAPS'

Keboola

PostgreSQL

amazon REDSHIFT

...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Devon England ST140106 314090 110654
Powys Wales SO053712 305386 271238
Gloucestershire England SO863164 386373 216413
South Yorkshire England SK327822 432719 382237
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South Yorkshire England SK317807 431711 380770 -1.52539 S17 3
Herefordshire England SO385304 338538 230489 -2.89607 HR2 0
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Shropshire England 350666 333195
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Greater Manchester England -2.15963 M18 8
City of Edinburgh Scotland -3.16970 EH7 5
Staffordshire England SJ907486 390708 348651 53.03506 -2.14002 ST2 8
Stories.
You lose on noise.
Every modern business has a wealth of information, but 95 % of it is useless clutter. And that's a burden. A cost. A cognitive, technological, and financial cost.

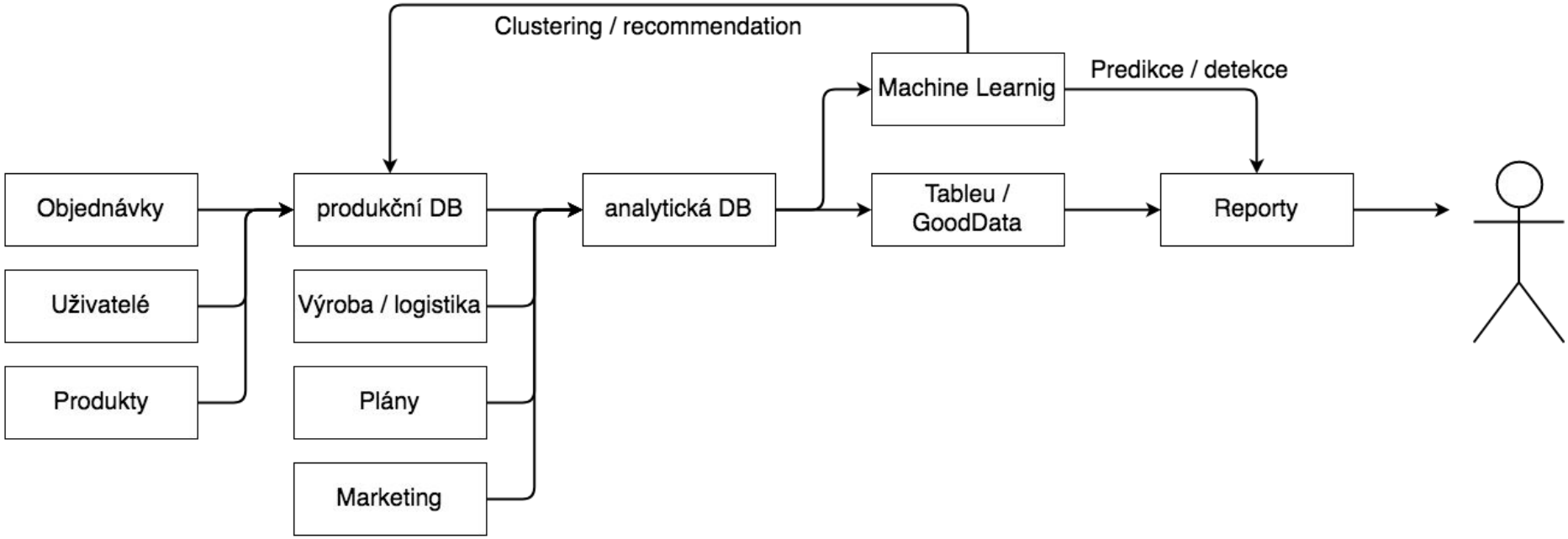
Co je Business Intelligence?

Co je Business Intelligence?

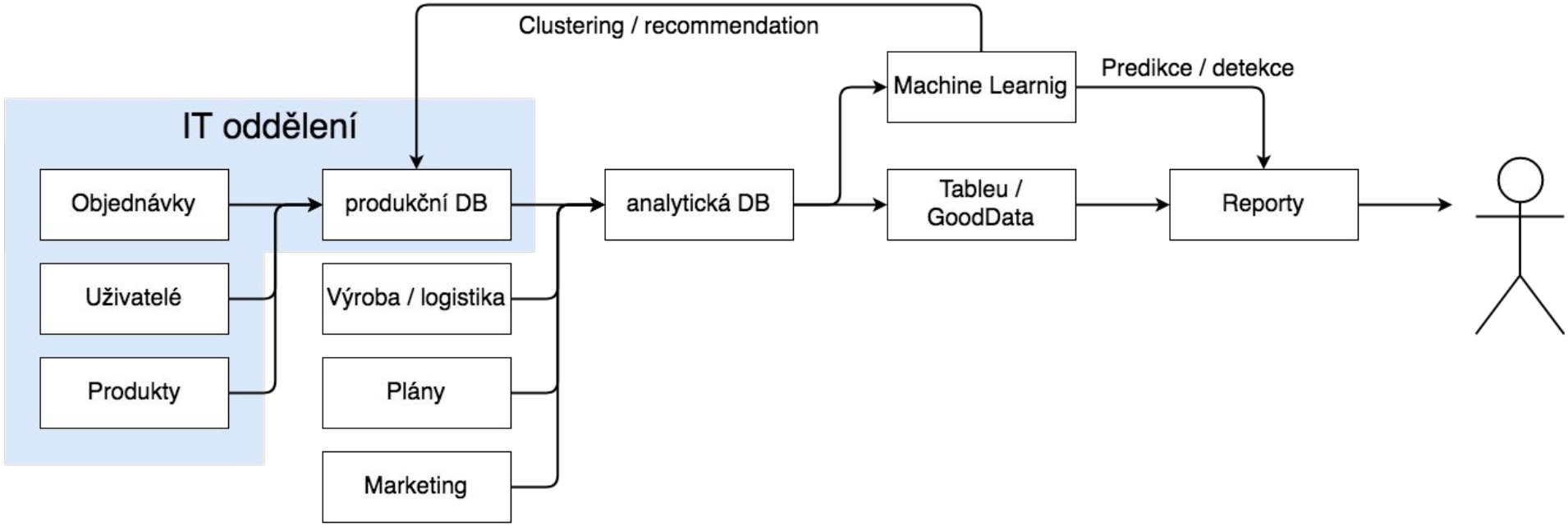
[...] applications, infrastructure and tools [...] that enable access to and analysis of information to improve [...] decisions and performance.

https://www.gartner.com/it-glossary/business-intelligence-bi/

Co je BI?


Clustering / recommendation
Machine Learnig
Predikce / detekce
Objednávky
Uživatelé
Produkty
produkční DB
Výroba / logistika
Plány
Marketing
analytická DB
Tableu / GoodData
Reporty

Co je BI?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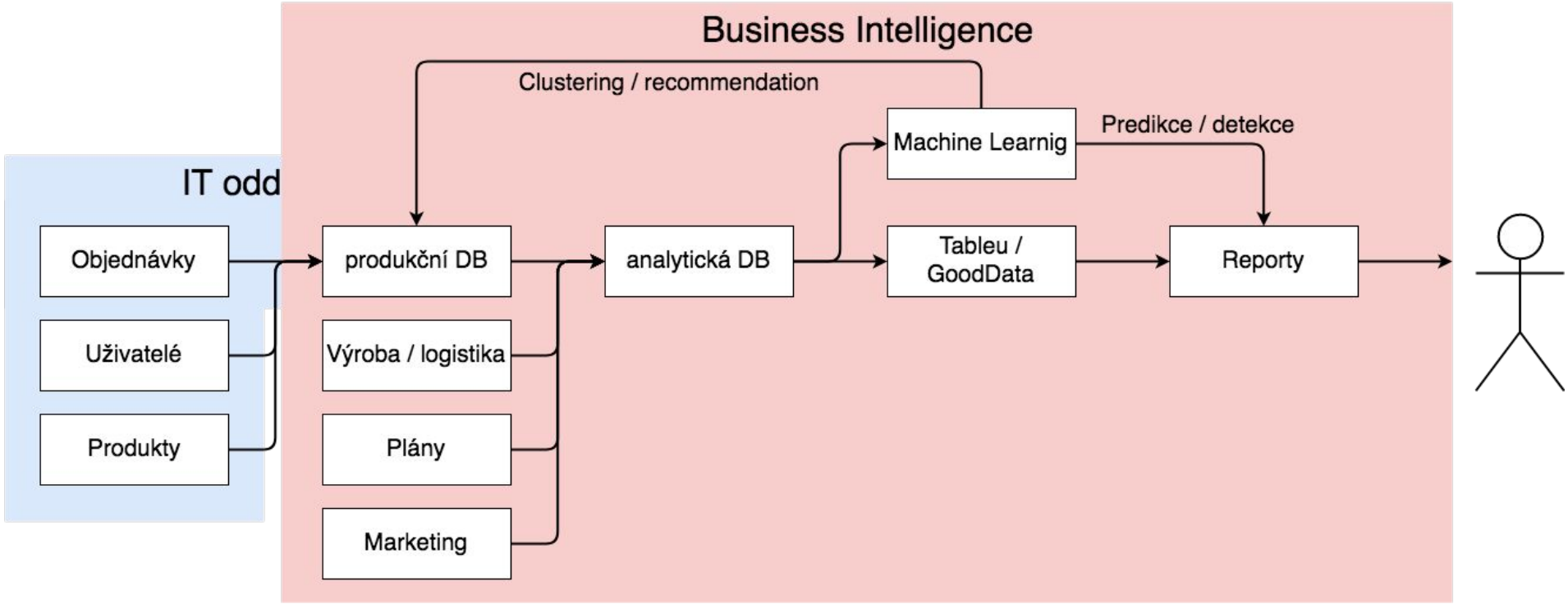
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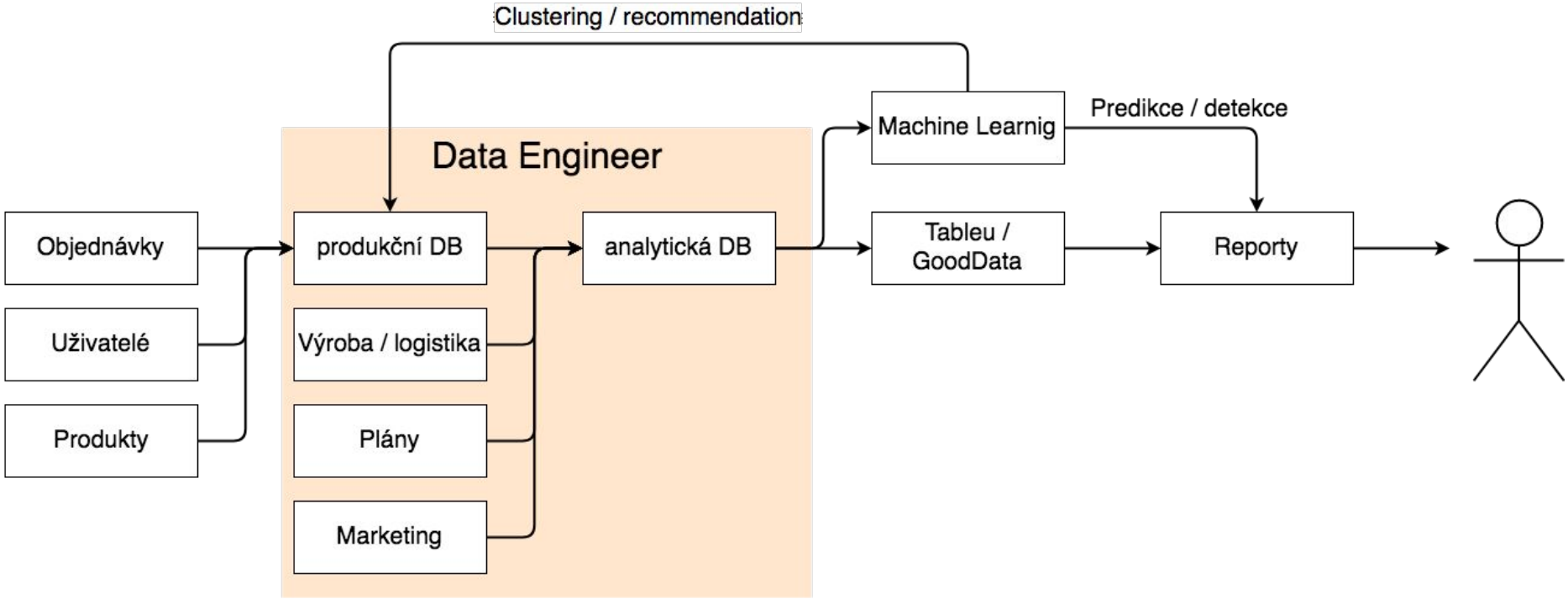
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Výroba / logistika
Plány
Marketing
analytická DB
Tableu / GoodData
Reporty

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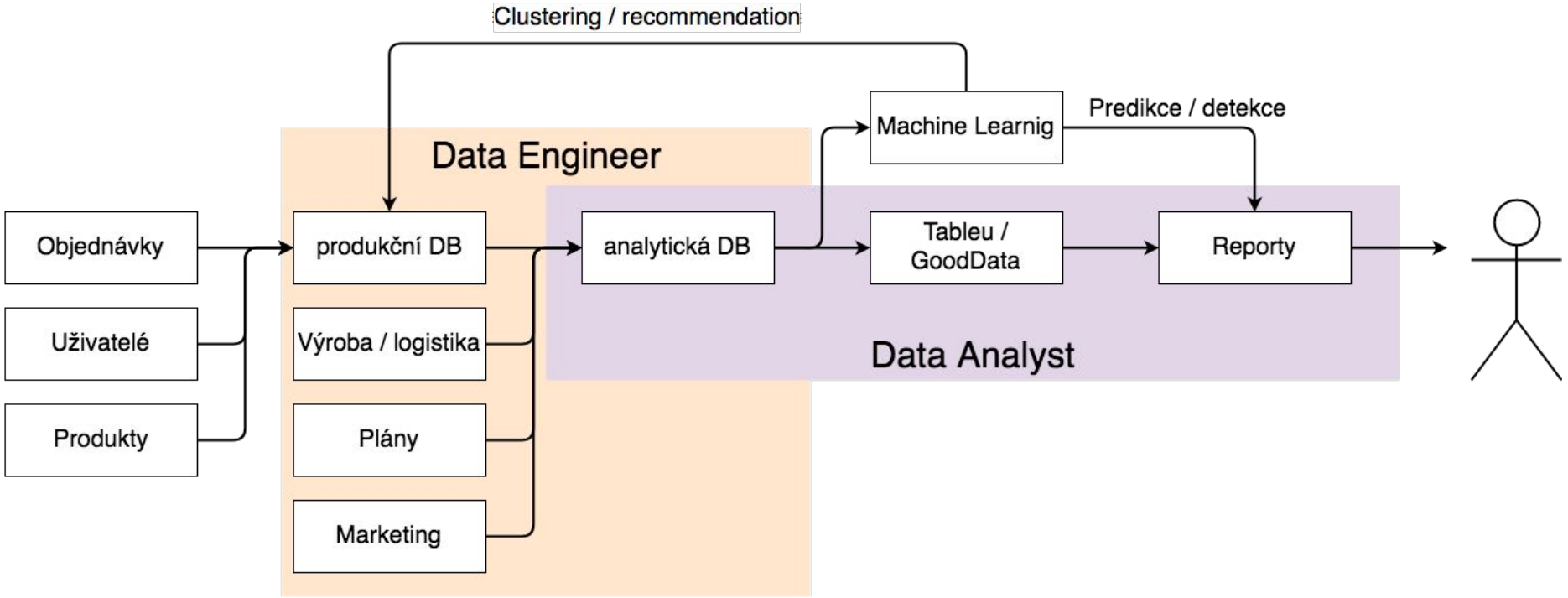
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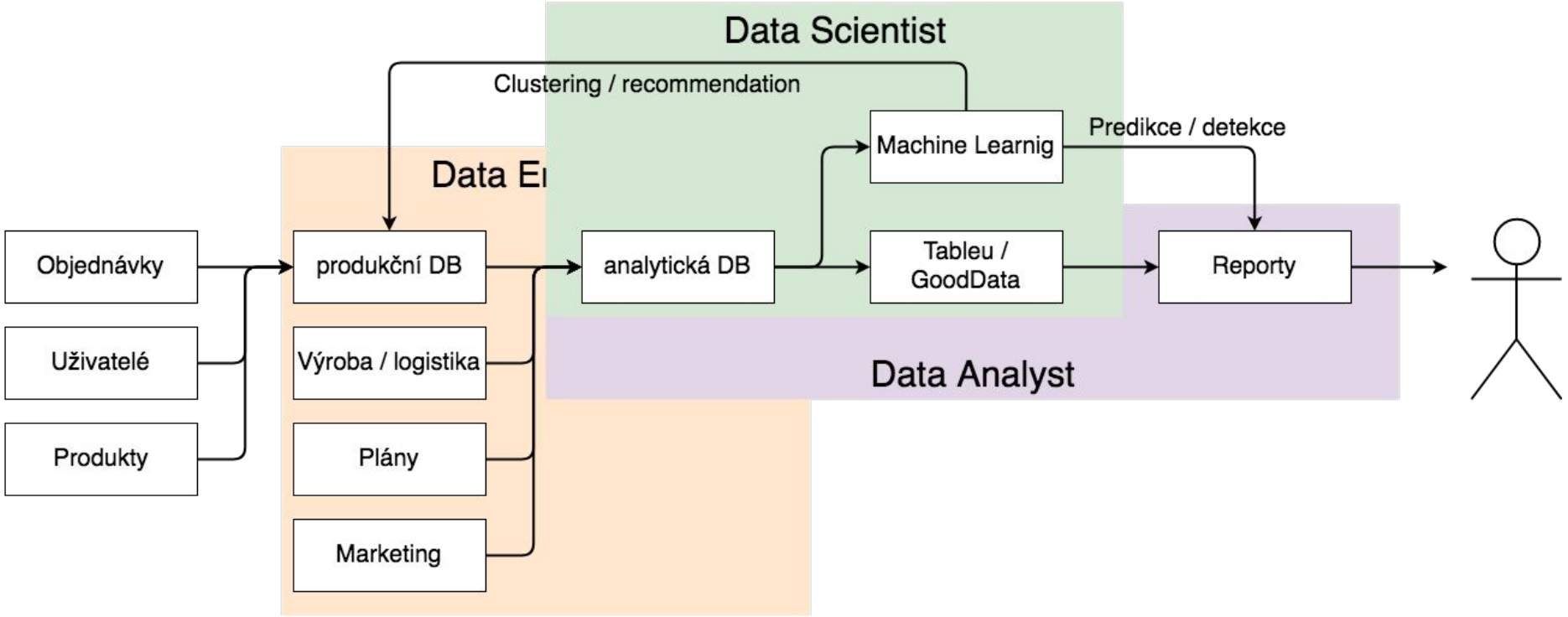
Výroba / logistika
Plány
Marketing
analytická DB
Tableu / GoodData
Reporty
Data Analyst

Co je BI?


Data Scientist
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Machine Learnig
Predikce / detekce
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Objednávky
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Plány
Marketing
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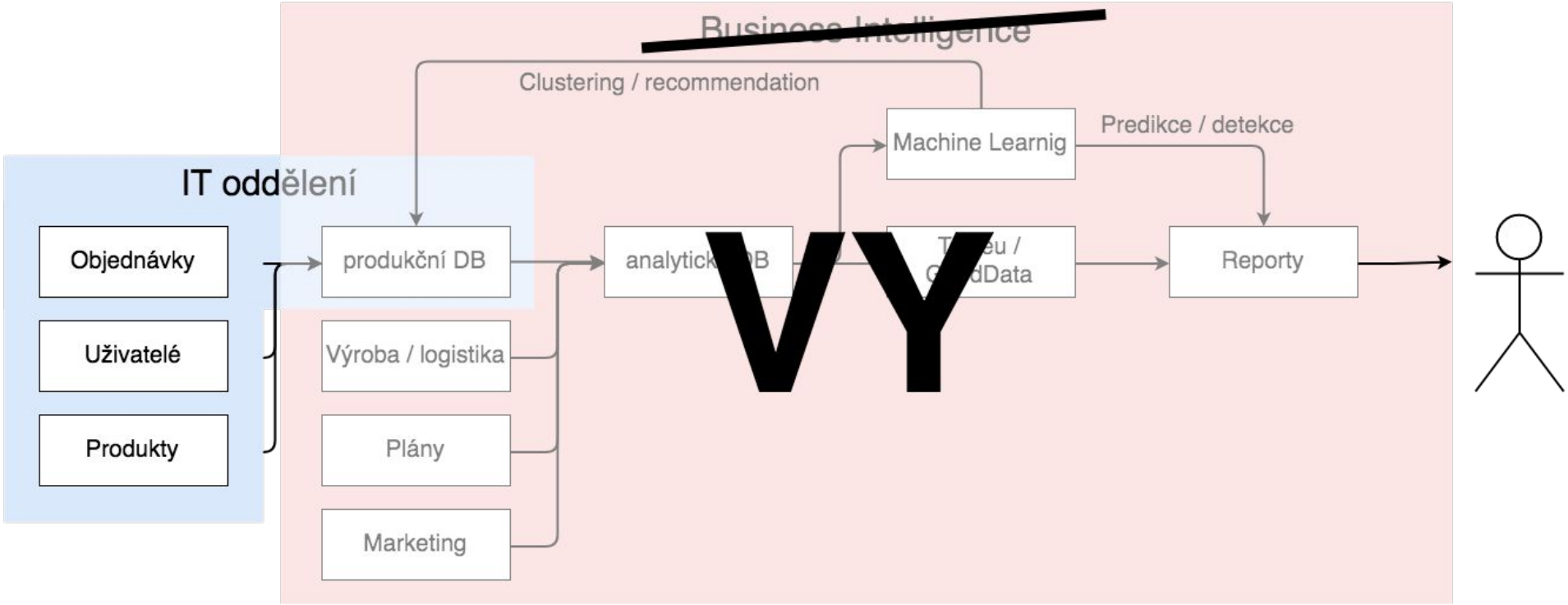
Tableu / GoodData
Reporty
Data Analyst

Co je BI?


Business Intelligence
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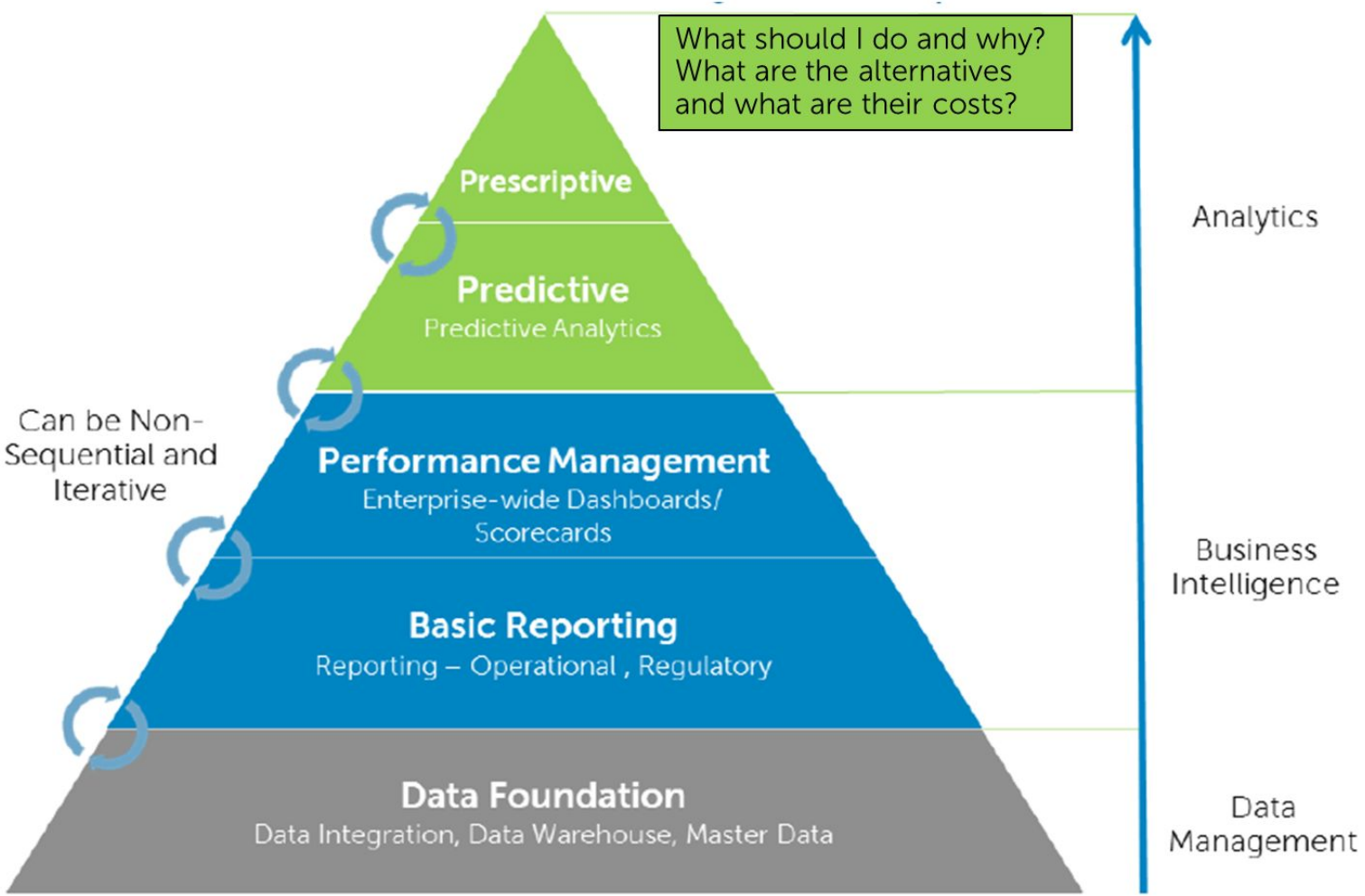
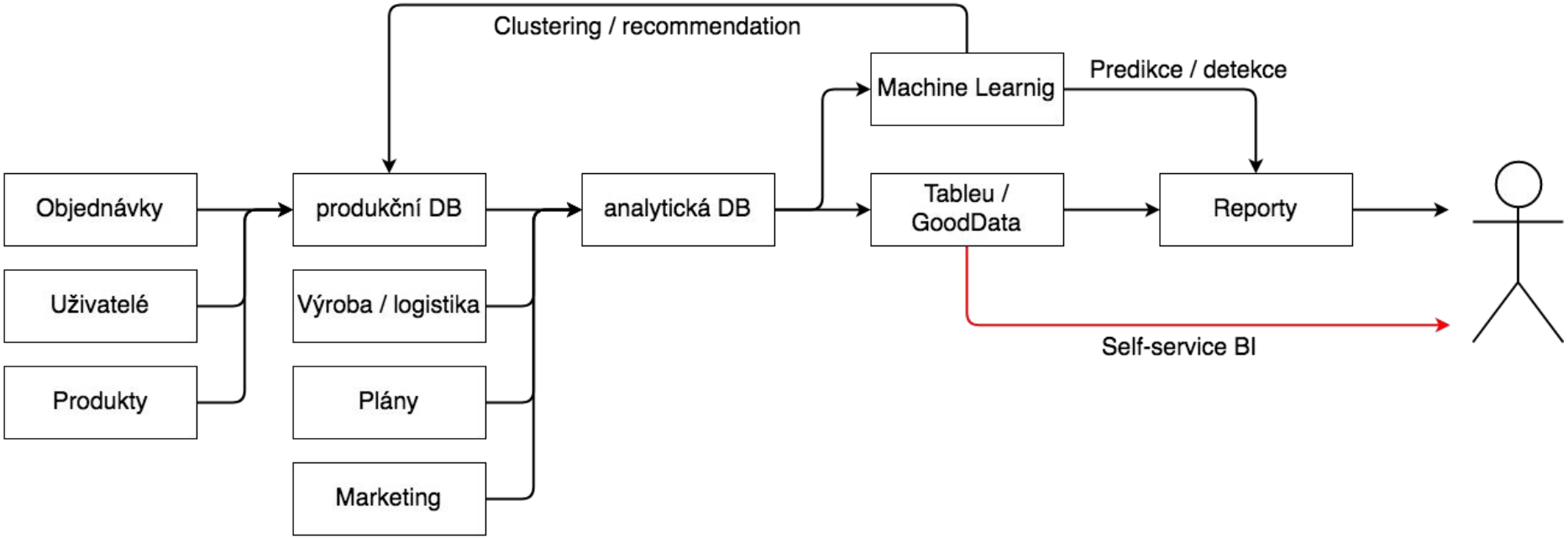

What should I do and why?
What are the alternatives
and what are their costs?
Prescriptive
Predictive
Predictive Analytics
Performance Management
Enterprise-wide Dashboards/
Scorecards
Basic Reporting
Reporting – Operational , Regulatory
Data Foundation
Data Integration, Data Warehouse, Master Data
Can be Non-
Sequential and
Iterative
Analytics
Business
Intelligence
Data
Management

Co je Self-service BI?



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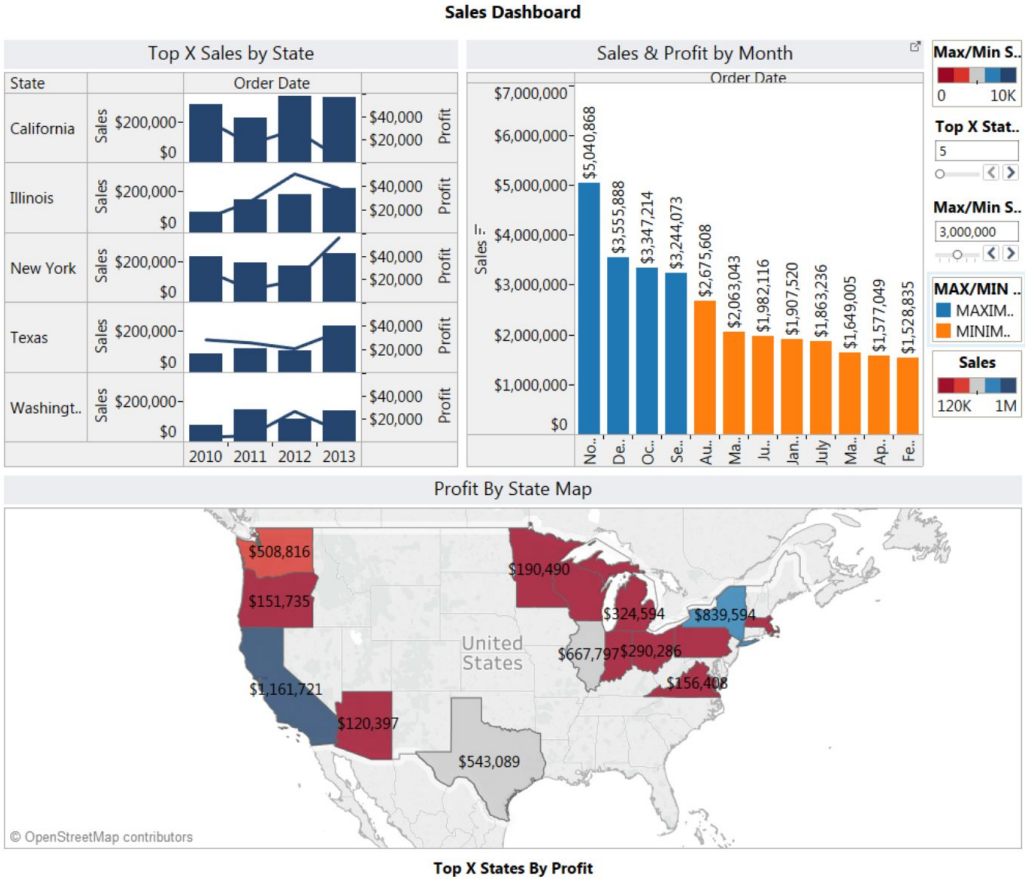


Source: Tableau

Gartner

Too many places to look in the data

If there are just 10 Variables:
Graphs with
1 Variable at a Time

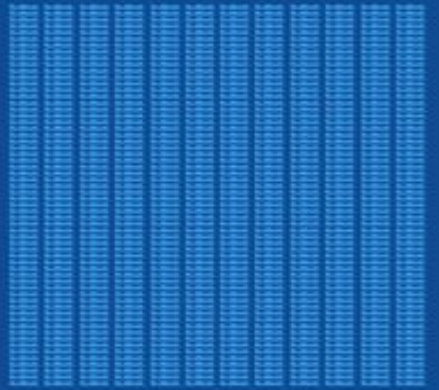
10

If there are just 10 Variables:
Graphs with
2 Variables at a Time

90

If there are just 10 Variables:
Graphs with
3 Variables at a Time

720

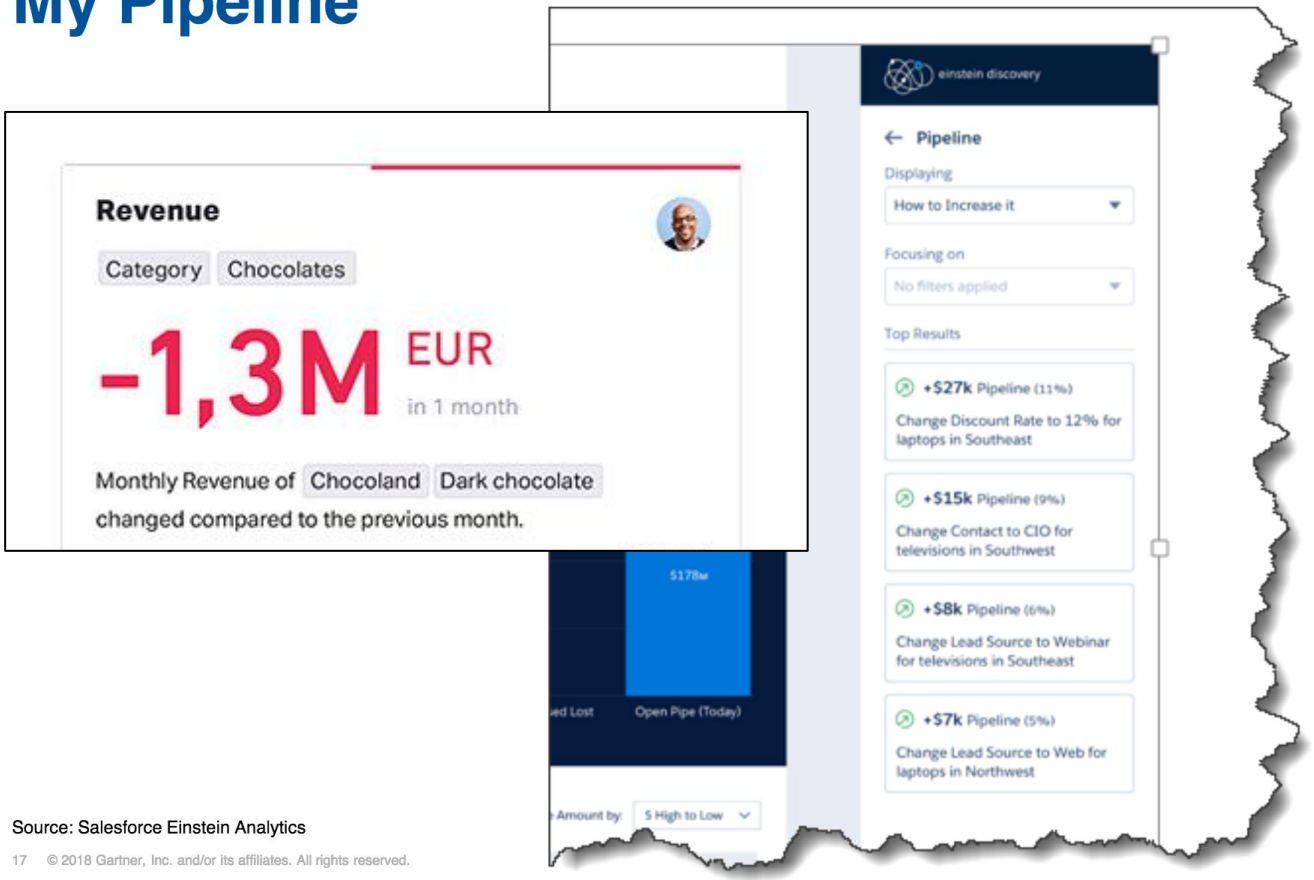


Who wants to review

820

Graphs?

To: Here Are the Top Four Things I Can Do to Increase My Pipeline



Source: Salesforce Einstein Analytics

Gartner

SPAs: What Will the ABI Market Impact Be?

By 2020, 50% of the analytic queries will be generated using search, NLP, voice or autogenerated.

By 2020, 30% of today's data scientist tasks can be automated.

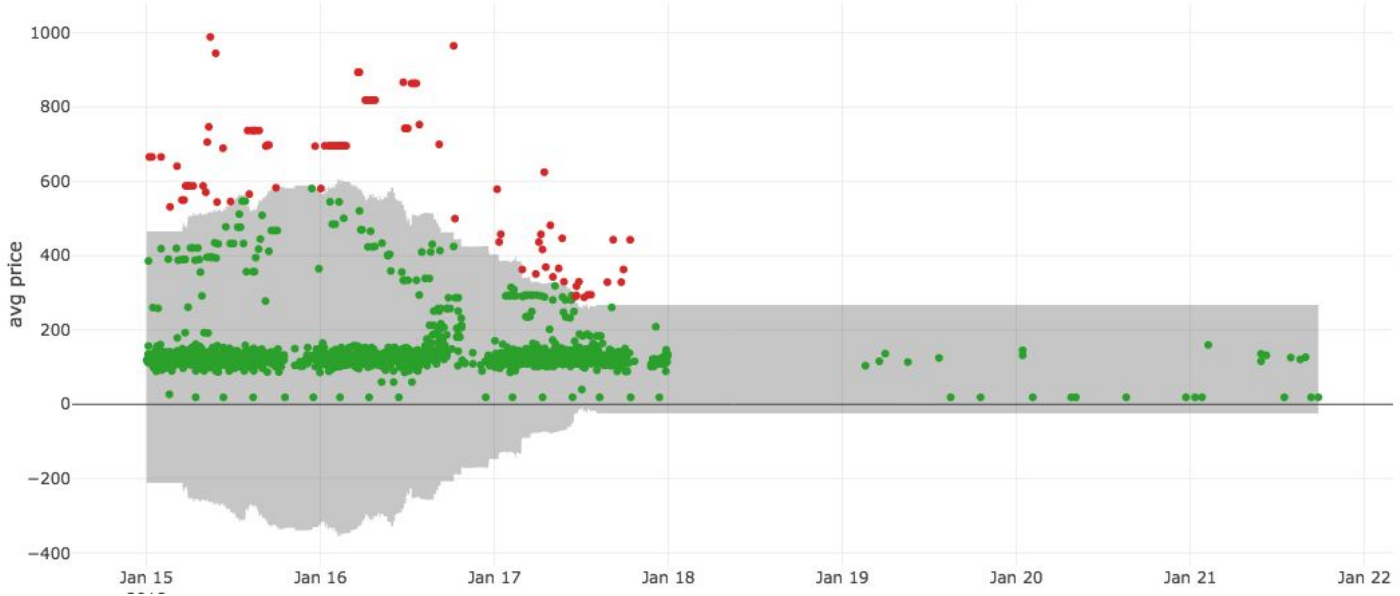
Gartner

Co děláme?

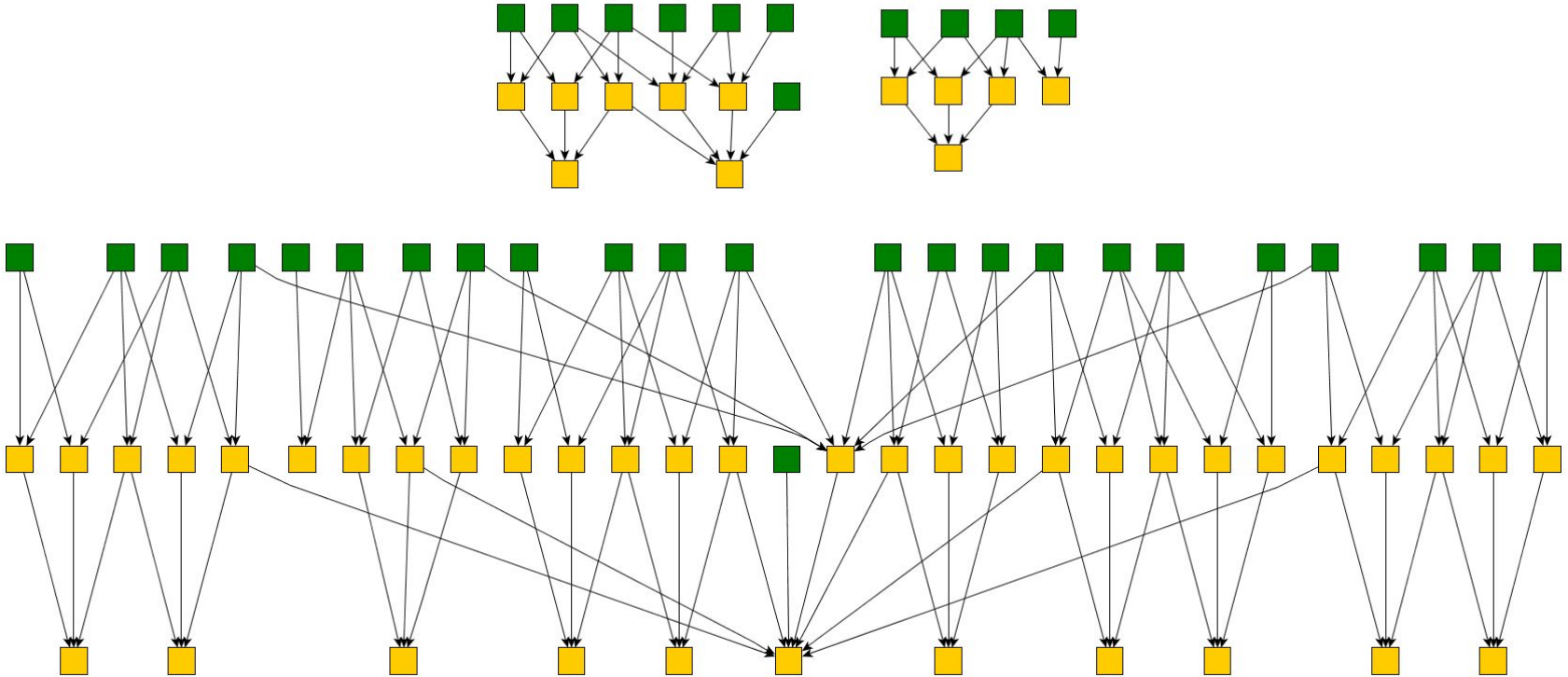
Vezmeme tohle:

Name	Link Source	Level	Tier	Expansion	Delay	Min	Max	DRatio	Rating	Avg	CritBonus100	CritBonus50	W/Crits	APM	DPM	T8 Ammo	Stats	Proc
Eagle's Talon (Mythical)	\aITE Epic Quest	80	Mythical	RoK	9	204	1156	5.67	151.11	680	1.77	1.39	942.30	6.67	6281.97	4893.65	64 STR, 38 STA, 42 INT, 275 Health, 275 Power, 8 Ranged, 8 Ranged DA, 8 Ranged Crit	
Rigid Scale Bow	\aITE Emerald Halls recipe	70	Fabled	EoF	9	208	831	4.00	115.44	519.5	1.67	1.34	694.43	6.67	4629.56	4393.46	40 STR, 30 AGI, 125 Health, 175 Power	1.7/min, 440 slashing
Star Darkened Longbow	\aITE Mayong Mistmore	70	Fabled	EoF	9	149	843	5.66	110.22	496	1.77	1.39	687.22	6.67	4581.49	4347.83	28 STR, 12 STA, 27 AGI, 14 INT, 125 Health, 145 Power	1.7/min, critical ranged AA
Tunare's Wrath	\aITE Mayong Mistmore	70	Fabled	EoF	9	261	784	3.00	116.11	522.5	1.58	1.29	673.59	6.67	4490.61	4261.58	35 STR, 35 AGI, 145 Health, 155 Power	1.9/min, 507 heat
Longbow of Corruption	\aITE Direvine Matron, Mystic Lake	70	Fabled	Mara	8.5	137	774	5.65	107.18	455.5	1.77	1.39	631.03	7.06	4454.31	4227.14	30 STR, 15 AGI, 75 Health, 140 Power	1.8/min, 172-287 slashing
Longbow of the Grove	\aITE Galiel Spirithoof, EH	68	Fabled	EoF	8.5	129	729	5.65	100.94	429	1.77	1.39	594.33	7.06	4195.27	4123.95	22 STA, 27 AGI, 122 Health, 112 Power	
Ancestral Sarnak War Bow	\aITE Venekor, HoS	68	Fabled	KoS	8	121	686	5.67	100.88	403.5	1.77	1.39	559.17	7.50	4193.74	4122.45	16 STR, 16 STA, 18 AGI, 68 Health, 82 Power, 3 Ranged	
Vol'drath	\aITE Selrach Di'Zok, Temple of Kor-Sha	80	Fabled	RoK	9	172	972	5.65	127.11	572	1.77	1.39	792.44	6.67	5282.93	4115.41	46 STR, 30 STA, 46 INT, 145 Health, 175 Power, 7 Ranged	
Resonating Wire	\aITE Shade of Khalan Dar, VP	80	Fabled	RoK	7	133	756	5.68	127.00	444.5	1.77	1.39	616.13	8.57	5281.10	4113.97	46 STR, 60 STA, 58 INT, 300 Health, 265 Power, 4 Ranged	1.7/min, 499-609 piercing, 354-433 heal
Silvertipped Recurve	\aITE Silverwing, VP	80	Fabled	RoK	7	178	712	4.00	127.14	445	1.67	1.34	594.93	8.57	5099.41	3972.44	36 STR, 52 STA, 28 AGI, 32 INT, 225 Health, 225 Power	1.7/min, 298-447 magic, 33 DPS
The Marksman (PVP)	\aITE PvP, 400 Tokens	80	Fabled	RoK	9	165	933	5.65	122.00	549	1.77	1.39	760.62	6.67	5070.78	3950.14	25 STR, 22 STA, 18 INT, 115 Health, 35 Power, 5 Ranged DA, 2 Ranged Crit	Stuff
Dragonhawk	\aITE Kluzen the Protector, VP	80	Fabled	RoK	9	227	907	4.00	126.00	567	1.67	1.34	757.94	6.67	5052.92	3936.23	34 STR, 46 STA, 52 INT, 200 Health, 200 Health, 225 Power, 7 Ranged, 7 DPS	1.7/min, 900 deaggro
Trueshot Recurve	\aITE Phara, VP	80	Fabled	RoK	7	176	705	4.01	125.86	440.5	1.67	1.34	589.01	8.57	5048.67	3932.91	40 STR, 42 STA, 32 AGI, 32 INT, 200 Health, 200 Power, 3 Haste	
Eagle's Talon (Group)	\aITE Epic Quest	80	Fabled	RoK	9	215	862	4.01	119.67	538.5	1.67	1.34	720.13	6.67	4800.85	3739.86	40 STR, 26 STA, 26 INT, 160 Health, 160 Power, 3 Ranged, 4 Ranged DA	1.7/min, 20% no ammo, +CA, 186-433 slash
Nature's Bow of the Stalker	\aITE Sarik the Fang, EH	70	Fabled	EoF	7	176	529	3.01	100.71	352.5	1.58	1.29	454.47	8.57	3895.46	3696.79	28 STR, 22 STA, 18 AGI, 145 Health, 145 Power, 2 Ranged Crit	
Slythe's Bow of Flimflam	\aITE Quest, Hold on to the Phylactery	75	Legendary	RoK	7	107	607	5.67	102.00	357	1.77	1.39	494.75	8.57	4240.75	3664.01	20 AGI, 5 INT, 50 Health, 60 Power, 25 Combat Art	1.7/min, 500 deaggro
Dragonhorn Recurve	\aITE Shade of Ghazi, Bonemire	68	Fabled	KoS	7	168	503	2.99	95.86	335.5	1.58	1.29	432.32	8.57	3705.61	3642.62	18 STR, 18 STA, 22 AGI, 18 WIS, 90 Health, 80 Power	
Snaggletoothed Bow	\aITE Snaggletooth, Sebilis	80	Legendary	RoK	8	133	756	5.68	111.13	444.5	1.77	1.39	616.13	7.50	4620.96	3599.73	36 AGI, 32 INT, 90 Health, 150 Power, 1 Haste, 2 Ranged Crit	
Wind-Shaped Bow	\aITE Sarik the Fang, EH	70	Fabled	EoF	7	168	504	3.00	96.00	336	1.58	1.29	433.08	8.57	3712.15	3522.83	34 STR, 30 STA, 24 INT, 5 Ranged	1.7/min, 420 piercing
Bazkul the Soulseeker	\aITE Tarinax, DT	69	Fabled	KoS	6.5	153	458	2.99	94.00	305.5	1.58	1.29	393.65	9.23	3633.72	3510.18	20 STR, 15 STA, 15 AGI, 5 WIS, 100 Health, 80 Power, 4 Piercing, 5 Ranged	1.8/min, 197-296 divine, 100 arrows
Wurm Destroyer Bow	\aITE Lord Vyemm, Labs	68	Fabled	KoS	4.5	104	311	2.99	92.22	207.5	1.58	1.29	267.34	13.33	3564.49	3503.90	20 STR, 18 STA, 24 AGI, 16 INT, 60 Health, 60 Power	28-34 divine on each attack
Recurved Heartsinger	\aITE Bearer of the Crux, Bonemire	67	Fabled	KoS	7	158	473	2.99	90.14	315.5	1.58	1.29	406.54	8.57	3484.65	3484.65	16 STR, 20 STA, 22 AGI, 18 INT, 75 Health, 75 Power, 6 Ranged	1.7/min, 270-450 piercing
Bow of Eternal Hunger	\aITE Bi'lithu, Maiden's	79	Legendary	RoK	8	174	696	4.00	108.75	435	1.67	1.34	581.56	7.50	4361.71	3471.92	10 STA, 42 AGI, 60 Health, 140 Power, 6 Ranged	
Calcified Timber Longbow	\aITE Faction Merchant - Teren's Grasp	68	Legendary	RoK	7	121	485	4.01	86.57	303	1.67	1.34	405.18	8.57	3473.01	3413.97	36 AGI, 16 INT, 65 Health, 70 Power, 3 Ranged	
Sinew Wrapped Lonbow	\aITE Gnillaw the Demented, Lyceum	68	Legendary	KoS	7	154	463	3.01	88.14	308.5	1.58	1.29	397.76	8.57	3409.35	3351.39	20 STR, 20 AGI, 100 Health, 100 Power	1.7/min, 195-324 slashing
Executioners Longbow	\aITE PVP, Evil	68	Legendary		7	153	458	2.99	87.29	305.5	1.58	1.29	393.65	8.57	3374.17	3316.81	25 STR, 18 STA, 15 AGI, 10 WIS, 12 INT, 120 Health, 125 Power, 5 Ranged	On deathblow, 10% chance to Salvage
Rescinding Recurve Bow	\aITE PVP, Good	68	Legendary		7	153	458	2.99	87.29	305.5	1.58	1.29	393.65	8.57	3374.17	3316.81	22 STR, 18 STA, 18 AGI, 10 WIS, 12 INT, 120 Health, 100 Power, 5 Ranged	On deathblow, 10% chance to Salvage
Stonebow of Charasis	\aITE Praetor of the Phylactery, VOES	77	Legendary	RoK	4.5	144	336	2.33	106.67	240	1.48	1.24	298.18	13.33	3975.69	3299.82	40 STR, 70 Health, 100 Power, 10 In-Combat Power Regen	
Torn Ligament Long bow	\aITE Hemogoblin, Unrest	70	Legendary	EoF	6	167	390	2.34	92.83	278.5	1.49	1.24	346.05	10.00	3460.55	3284.06	28 STR, 28 INT, 60 Health, 50 Power	1.7/min, Deaggro 675
Ironstrand	\aITE Myconid Spore King, Sebilis	80	Fabled	RoK	7	190	569	2.99	108.43	379.5	1.58	1.29	489.04	8.57	4191.73	3265.36	52 STR, 52 STA, 38 WIS, 225 Health, 5 Ranged	
Bow of Rapid Trepidation	\aITE Gruplinort, CoA	79	Legendary	RoK	9	238	713	3.00	105.67	475.5	1.58	1.29	612.77	6.67	4085.16	3251.79	25 STA, 20 AGI, 25 INT, 125 Health, 1 Ranged Double Attack	1.6/min, Power Drain 108->131
Ichostrand	\aITE A Virulent Corpuscle, DT	67	Fabled	KoS	4.5	94	283	3.01	83.78	188.5	1.58	1.29	243.08	13.33	3241.12	3241.12	28 STR, 26 AGI, 90 Health, 90 Power, 2 Subjugation, 4 Pierce, 4 Ranged	1.8/min, 20% speed Debuff, 100 arrows
Darkfury Longbow	\aITE The Black Queen, Courts	59	Fabled	DoF	7	91	455	5.00	78.00	273	1.74	1.37	373.84	8.57	3204.38	3204.38	22 STR, 22 AGI, 70 Health, 80 Power, 3 Ranged	
Stretched Sinew Bow	\aITE Undead Jailer, KC	72	Legendary	RoK	7	156	469	3.01	89.29	312.5	1.58	1.29	402.91	8.57	3453.54	3159.99	30 STA, 20 AGI, 130 Health, 125 Power, 5 Defense	
Skleross Poison Launcher	\aITE Quest	70	Treasured	RoK	8	131	524	4.00	81.88	327.5	1.67	1.34	437.84	7.50	3283.82	3116.34	25 AGI, 50 Health, 100 Power, 4 Ranged, 1 Ranged DA	
Hallgloom's Bow of Hobbling	\aITE Ventrek Hallgloom, KC	71	Legendary	RoK	5.5	179	332	1.85	92.91	255.5	1.40	1.20	306.22	10.91	3340.57	3113.41	24 AGI, 45 Health, 65 Power, 1 Ranged Double Attack	1.5/min, Slow 40%
Ghostly Bow of Byize	\aITE Quest	59	Treasured	KoS	9	65	585	9.00	72.22	325	1.87	1.44	466.39	6.67	3109.27	3109.27	10 STR, 9 AGI, 30 Health, 45 Power	
Aquatic Bow of Obedience	\aITE Gok'Chai, Chelsith	80	Legendary	RoK	4.5	174	322	1.85	110.22	248	1.40	1.20	297.13	13.33	3961.67	3086.14	42 AGI, 75 Health, 90 Power, 2 Ranged Double Attack	1.5/min, summons 2 dumbfire pets
Bow of the Flapping Wing	\aITE Ancient, Ascent of the Awakened	63	Legendary	KoS	7	139	418	3.01	79.57	278.5	1.58	1.29	359.09	8.57	3077.91	3077.91	18 STA, 25 AGI, 70 Health, 70 Power	1.7/min, 224 magic, knockback
Warlord's Long Bow of Defense	\aITE Faction Merchant - Sel'Nok	79	Legendary	RoK	9	333	618	1.86	105.67	475.5	1.40	1.20	569.94	6.67	3799.63	3024.50	42 STA, 20 AGI, 145 Health, 100 Power, 4 Parry	
Bow of Marksmanship	\aITE Butler, Mistmoore Catacombs	65	Legendary	EoF	7	136	409	3.01	77.86	272.5	1.58	1.29	351.36	8.57	3011.62	3011.62	10 STR, 8 AGI, 80 Health, 80 Power, 3 Ranged	Set Bonus - Increase max range by 6%
Bloodstained Bow of Piercing	\aITE A Beserk Drelock, MMCC	65	Legendary	EoF	7	136	409	3.01	77.86	272.5	1.58	1.29	351.36	8.57	3011.62	3011.62	15 STR, 18 AGI, 8 INT, 60 Health, 60 Power, 2 Piercing	
Pris. Imb. Mahogany Recurved Short Bow	\aITE Woodworker	72	Mastercrafted	RoK	4	85	255	3.00	85.00	170	1.58	1.29	219.12	15.00	3286.80	3007.42	50 STR, 25 STA, 25 AGI, 90 Health, 85 Power	1.8/min, 307-571
Pris. Imb. Mahogany Short Bow	\aITE Woodworker	72	Mastercrafted	RoK	4	85	255	3.00	85.00	170	1.58	1.29	219.12	15.00	3286.80	3007.42	45 STR, 45 AGI, 90 Health, 85 Power	1.8/min, 307-571
Pris. Imb. Mahogany Long Bow	\aITE Woodworker	72	Mastercrafted	RoK	6	127	382	3.01	84.83	254.5	1.58	1.29	328.15	10.00	3281.54	3002.61	45 STR, 45 STA, 90 Health, 85 Power	1.8/min, 307-571
Pris. Imb. Mahogany Ornate Long Bow	\aITE Woodworker	72	Mastercrafted	RoK	6	127	382	3.01	84.83	254.5	1.58	1.29	328.15	10.00	3281.54	3002.61	25 STA, 50 AGI, 25 INT, 90 Health, 85 Power	1.8/min, 318-591
Bloodleech Bow	\aITE Veingore, MMCC	61	Legendary	EoF	7	134	403	3.01	76.71	268.5	1.58	1.29	346.20	8.57	2967.42	2967.42	21 STR, 19 STA, 80 Health, 85 Power	
Bow of Firanvious Fury	\aITE Firanvious, Temple of Scale	64	Legendary	KoS	4.5	86	259	3.01	76.67	172.5	1.58	1.29	222.46	13.33	2966.15	2966.15	15 STR, 15 STA, 20 AGI, 60 Health, 60 Power	1.8/min, 154-188
Outer Sebilis Vine Wrapped Longbow	\aITE Quest	73	Treasured	RoK	4.5	118	276	2.34	87.56	197	1.49	1.24	244.84	13.33	3264.59	2931.60	30 STR, 55 Health, 80 Power, 8 In-Combat Power Regen	
Raincaller	\aITE HQ	57	Fabled	EoF	7	131	394	3.01	75.00	262.5	1.58	1.29	338.47	8.57	2901.14	2901.14	20 STR, 15 AGI, 50 Health, 70 Power, 3 Ranged	1.7/min, Stun, 97-181
Grizzfazzle's Bow	\aITE Quest	65	Legendary	KoS	6	140	326	2.33	77.67	233	1.48	1.24	289.39	10.00	2893.89	2893.89	20 STR, 80 Health, 80 Power, 5 Ranged	1.8/min, 248-461
Lyrech Rivebow	\aITE ...	66	Treasured	EoF	7	129	386	2.99	73.57	257.5	1.58	1.29	331.78	8.57	2843.86	2843.86	14 STR, 10 AGI, 55 Health, 45 Power	
Piercing Bow of the Nightstalker	\aITE Veingore, MMCC	61	Legendary	EoF	4.5	82	245	2.99	72.67	163.5	1.58	1.29	210.62	13.33	2808.31	2808.31	18 STR, 17 AGI, 80 Health, 80 Power	
Drakota Sinew Bow	\aITE PVP, Evil	58	Legendary		7	127	381	3.00	72.57	254	1.58	1.29	327.39	8.57	2806.21	2806.21	18 STR, 15 STA, 15 AGI, 10 WIS, 65 Health, 60 Power, 5 Ranged	
Recurved Bow of Absolution	PVP, Good	58	Legendary		7	127	381	3.00	72.57	254	1.58	1.29	327.39	8.57	2806.21	2806.21	Unknown	
Bow of Searing Missles	\aITE The Bloodscale Flamelord, Vaults	67	Treasured	KoS	4.5	81	244	3.01	72.22	162.5	1.58	1.29	209.57	13.33	2794.29	2794.29	18 STR, 18 AGI, 10 INT, 35 Health, 55 Power	17.6/min, 14 heat

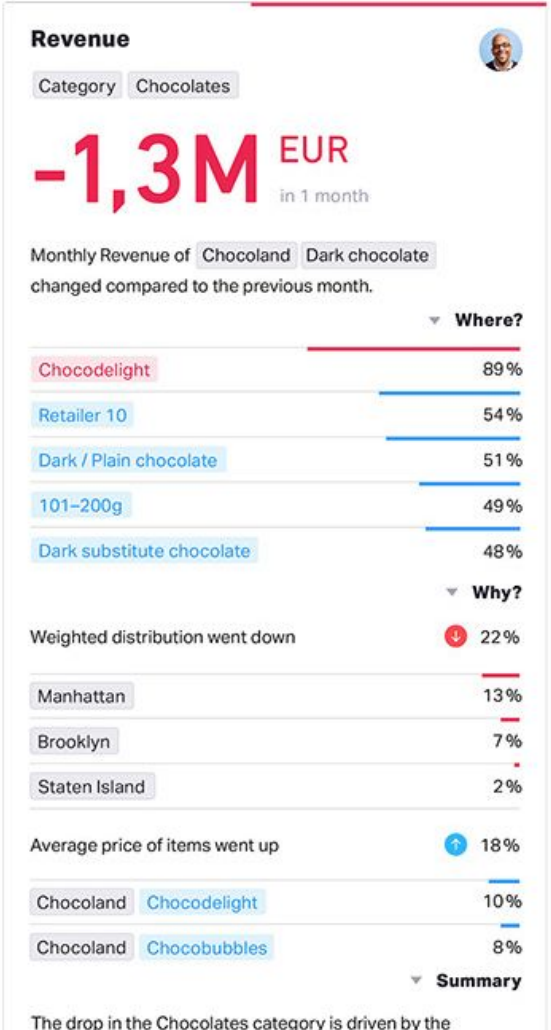
Uděláme z toho tohle:



A tohle:



Abychom zobrazili tohle:

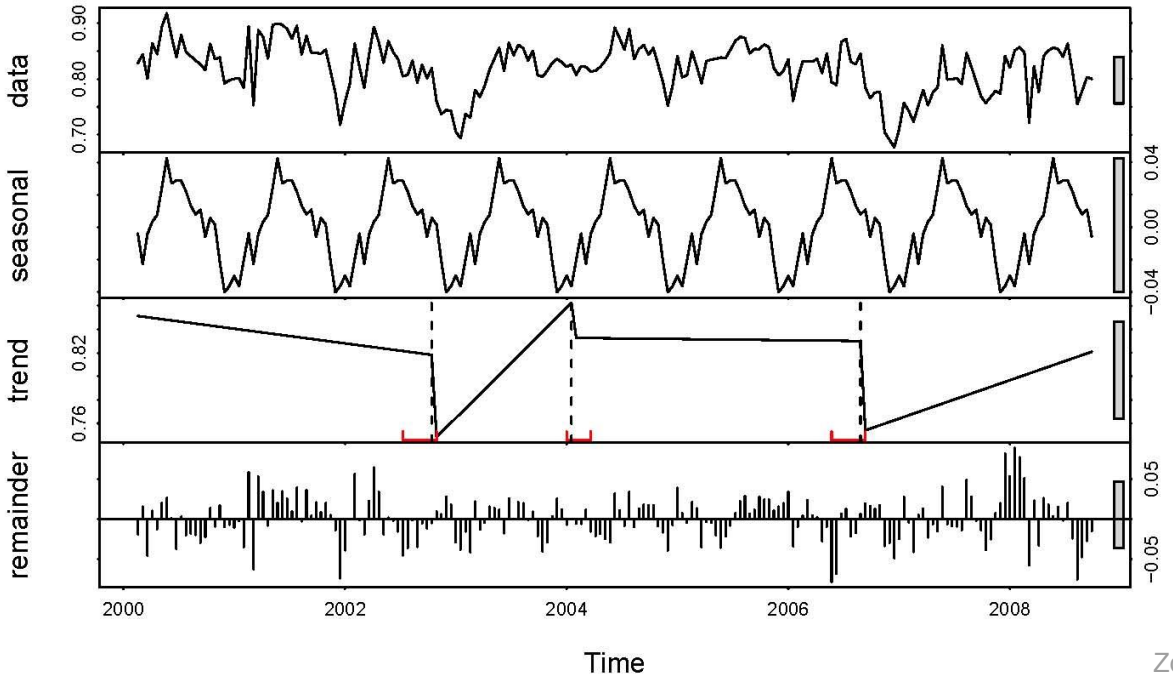


1. úloha: Detekce změny v časových řadách

Businessové otázky

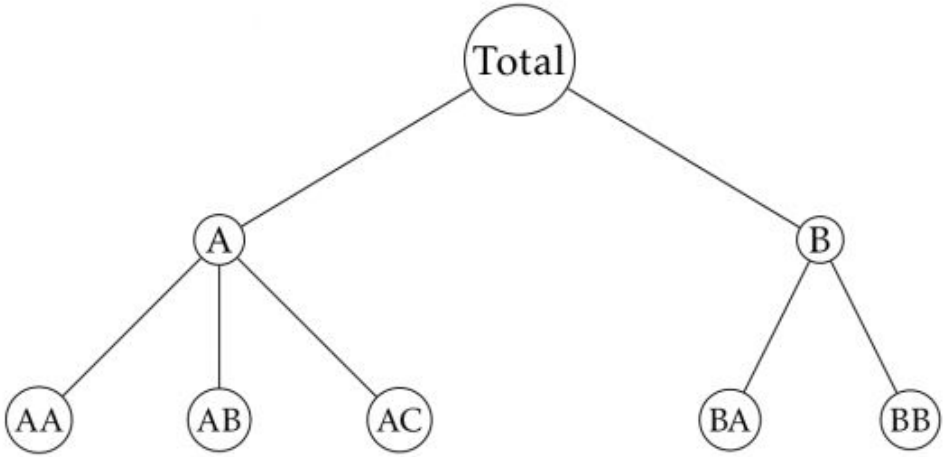
- Vypadly prodeje (hluboký propad),
- Klesají marže (klesající dlouhodobý trend + kde začal),
- Anomální událost,
- Neplním plán (odchylka od predikce).

Sezónnost, šum



Zdroj: http://bfast.r-forge.r-project.org/

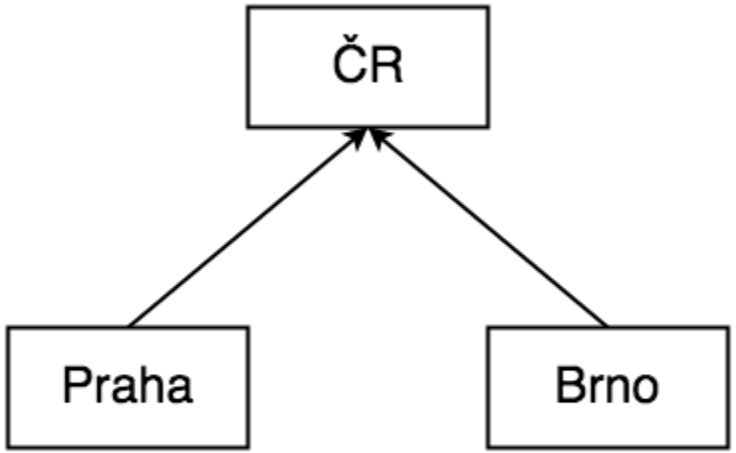
Jak využít strukturu v datech?



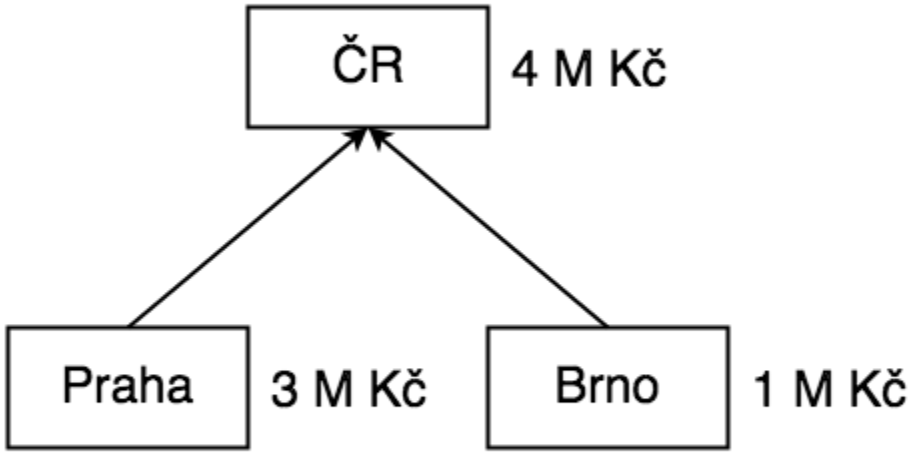
$$\begin{bmatrix} y_t \\ y_{A,t} \\ y_{B,t} \\ y_{AA,t} \\ y_{AB,t} \\ y_{AC,t} \\ y_{BA,t} \\ y_{BB,t} \end{bmatrix} = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} y_{AA,t} \\ y_{AB,t} \\ y_{AC,t} \\ y_{BA,t} \\ y_{BB,t} \end{bmatrix}$$

Zdroj: https://www.otexts.org/fpp/9/4

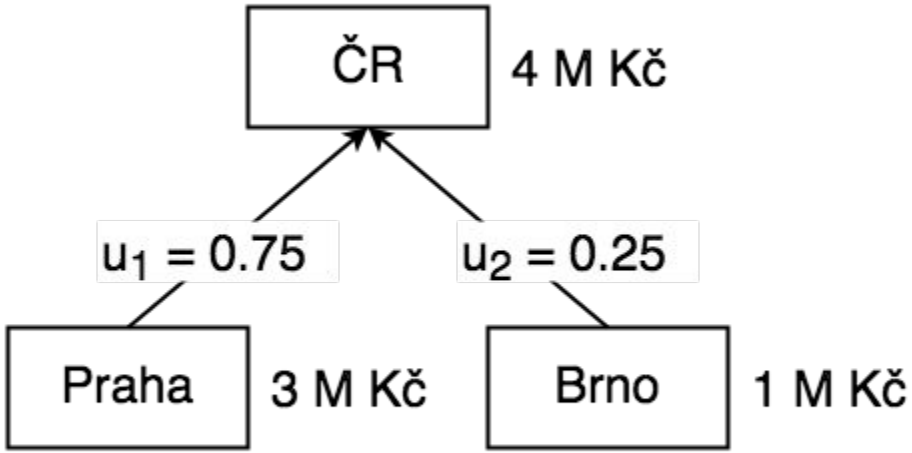
2. úloha: Kauzalita mezi detekovanými signály



2. úloha: Kauzalita mezi detekovanými signály

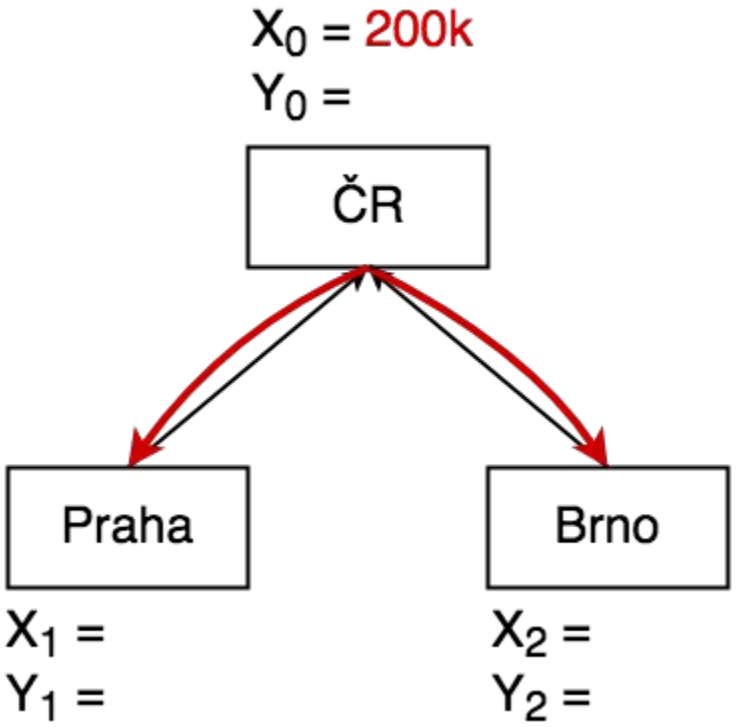


2. úloha: Kauzalita mezi detekovanými signály

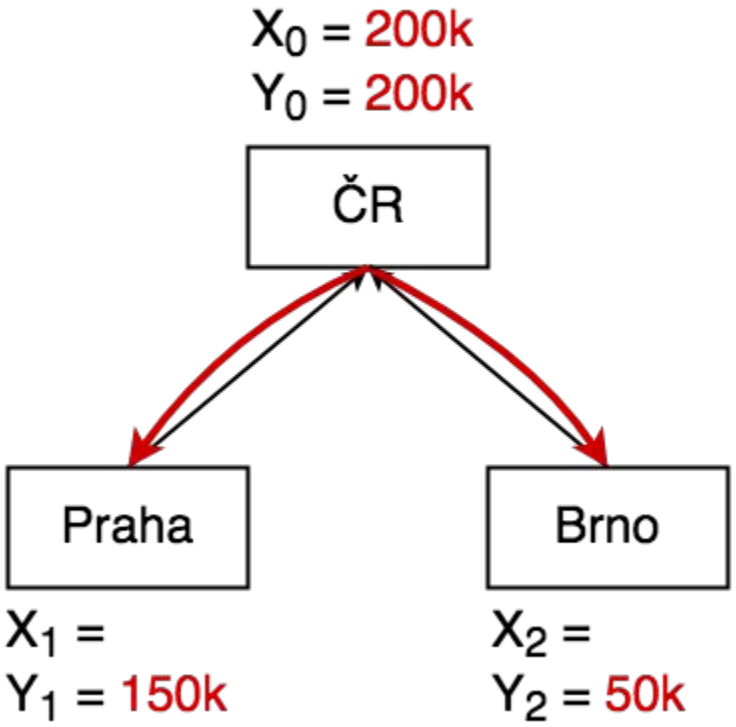


$$u_1 + u_2 = 1$$

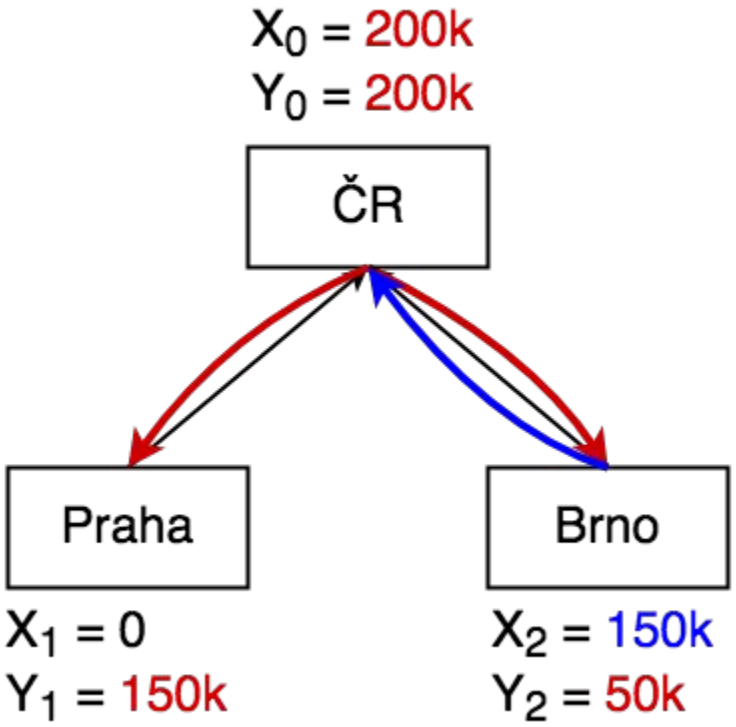
2. úloha: Kauzalita mezi detekovanými signály



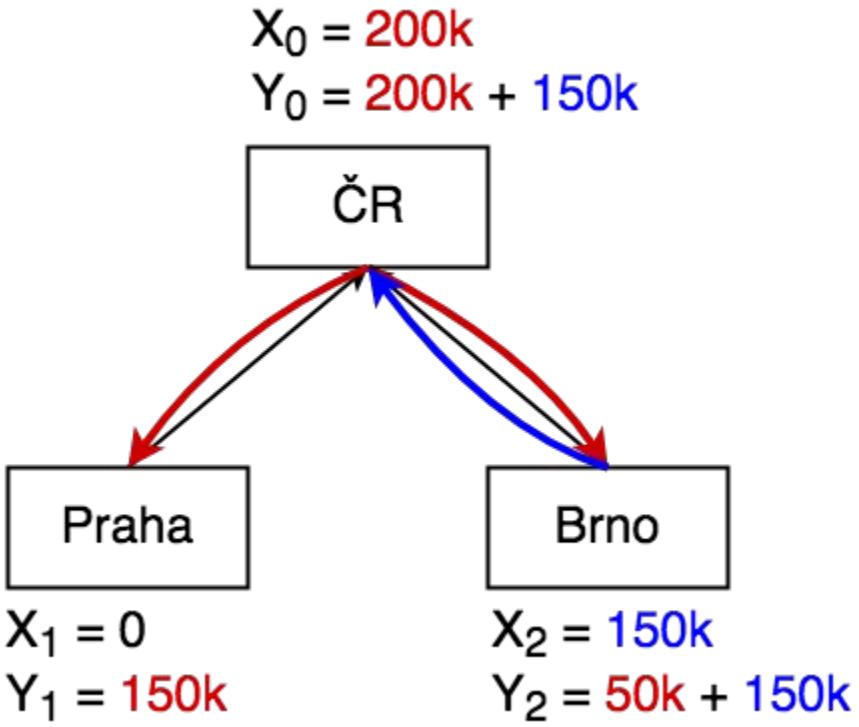
2. úloha: Kauzalita mezi detekovanými signály



2. úloha: Kauzalita mezi detekovanými signály



2. úloha: Kauzalita mezi detekovanými signály



$$u_1 + u_2 = 1$$

$$Y_0 = X_0 + X_1 + X_2$$

$$Y_1 = X_1 + u_1 X_0$$

$$Y_2 = X_2 + u_2 X_0$$

$$\begin{pmatrix} 1 & 1 & 1 \\ u_1 & 1 & 0 \\ u_2 & 0 & 1 \end{pmatrix} \begin{pmatrix} x_0 \\ x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} y_0 \\ y_1 \\ y_2 \end{pmatrix} \tag{1}$$

$$\begin{pmatrix} 1 & 1 & 1 \\ u_1 & 1 & 0 \\ u_2 & 0 & 1 \end{pmatrix} \begin{pmatrix} x_0 \\ x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} y_0 \\ y_1 \\ y_2 \end{pmatrix} \tag{1}$$

$$\mathbb{A}x = y \tag{2}$$

$$\begin{pmatrix} 1 & 1 & 1 \\ u_1 & 1 & 0 \\ u_2 & 0 & 1 \end{pmatrix} \begin{pmatrix} x_0 \\ x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} y_0 \\ y_1 \\ y_2 \end{pmatrix} \tag{1}$$

$$\mathbb{A}x = y \tag{2}$$

$$D(x, y) = \|\mathbb{A}x - y\|_2^2 \tag{3}$$

$$\begin{pmatrix} 1 & 1 & 1 \\ u_1 & 1 & 0 \\ u_2 & 0 & 1 \end{pmatrix} \begin{pmatrix} x_0 \\ x_1 \\ x_2 \end{pmatrix} = \begin{pmatrix} y_0 \\ y_1 \\ y_2 \end{pmatrix} \tag{1}$$

$$\mathbb{A}x = y \tag{2}$$

$$D(x, y) = \|\mathbb{A}x - y\|_2^2 \tag{3}$$

$$\min_x \{D(x, y) + \lambda R(x)\} \tag{4}$$

3. Úloha: Jak signály seřadit podle důležitosti?

12M	Kč
37	%
14k	kusů
125	hodin
...	

Ostatní analytické úlohy

“Most firms that thinks they want advanced AI/ML really just need linear regression on cleaned-up data.” -- Robin Hanson (@Twitter)

-- predikce (zpoždění kamionů, prodeje v maloobchodech), klasifikace (analýza košíku)

-- rychlé iterování metod (vždy začnětě něčím jednoduše interpretovatelným)

-- zohledňování business vazeb a jejich dopad na model

-- pro high-end metody musí firma vyvinout velký závazek (fine-tuning parametrů, A/B testování, nasazení v produkci a garance správnosti celé pipeline)

Co čekat od práce s daty ve firmách?

-- nebojte se vracet zadání

-- připravte se na zahazování vašich projektů

-- opakovatelná použitelnost

-- data-quality check

-- vždycky začněte nejjednodušším (správným) řešením, pokud nebude fungovat, ušetříte si spousty budoucího smutku

-- lidi na to nekoukaj (a nerozumí)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