Activity Ontology for Process Scenario Mining

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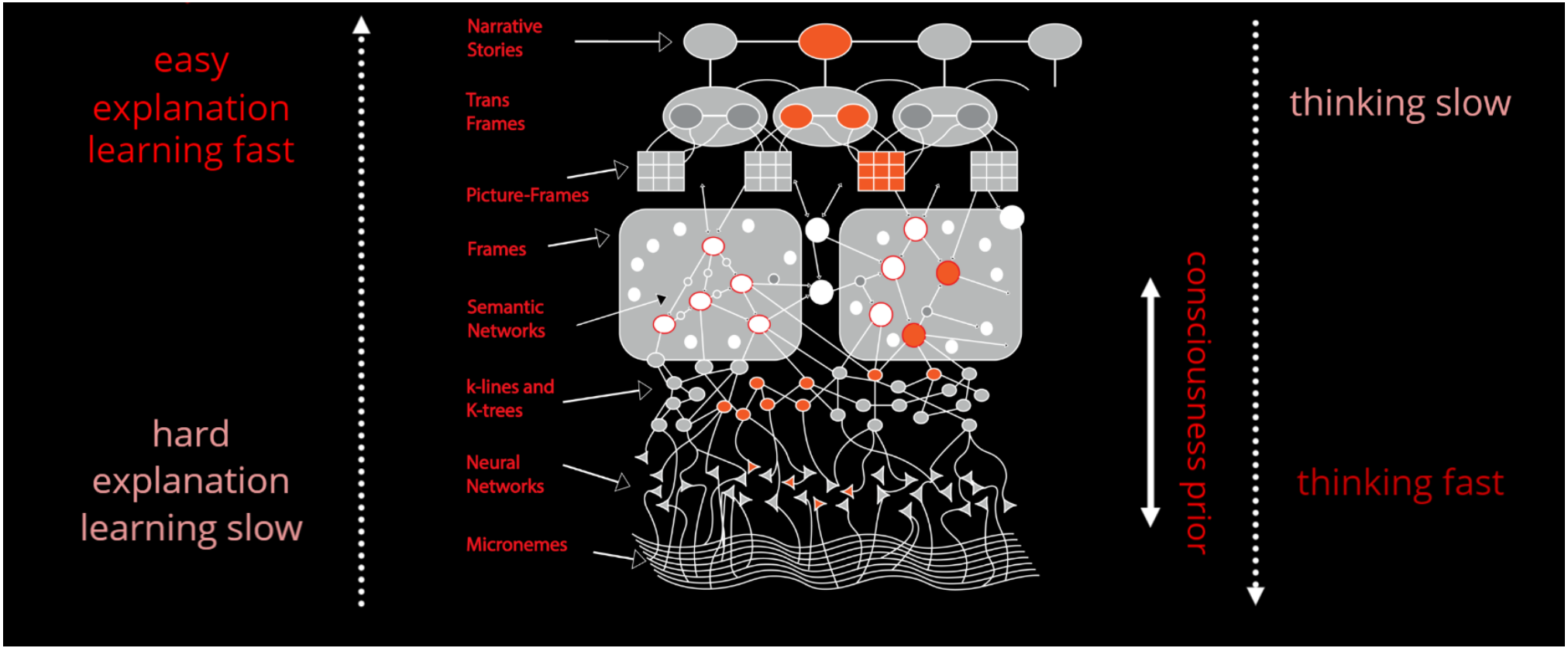
Marvin Minsky's Narrative Story
is a Scenario of a Process



https://towardsdatascience.com/explainable-ai-vs-explaining-ai-part-1-d39ea5053347

Evgeni Vityaev's Invariant Structures

Mining temporally invariant structures ("scenarios") in historical time series data recording financial "processes" with the **Discovery** system.

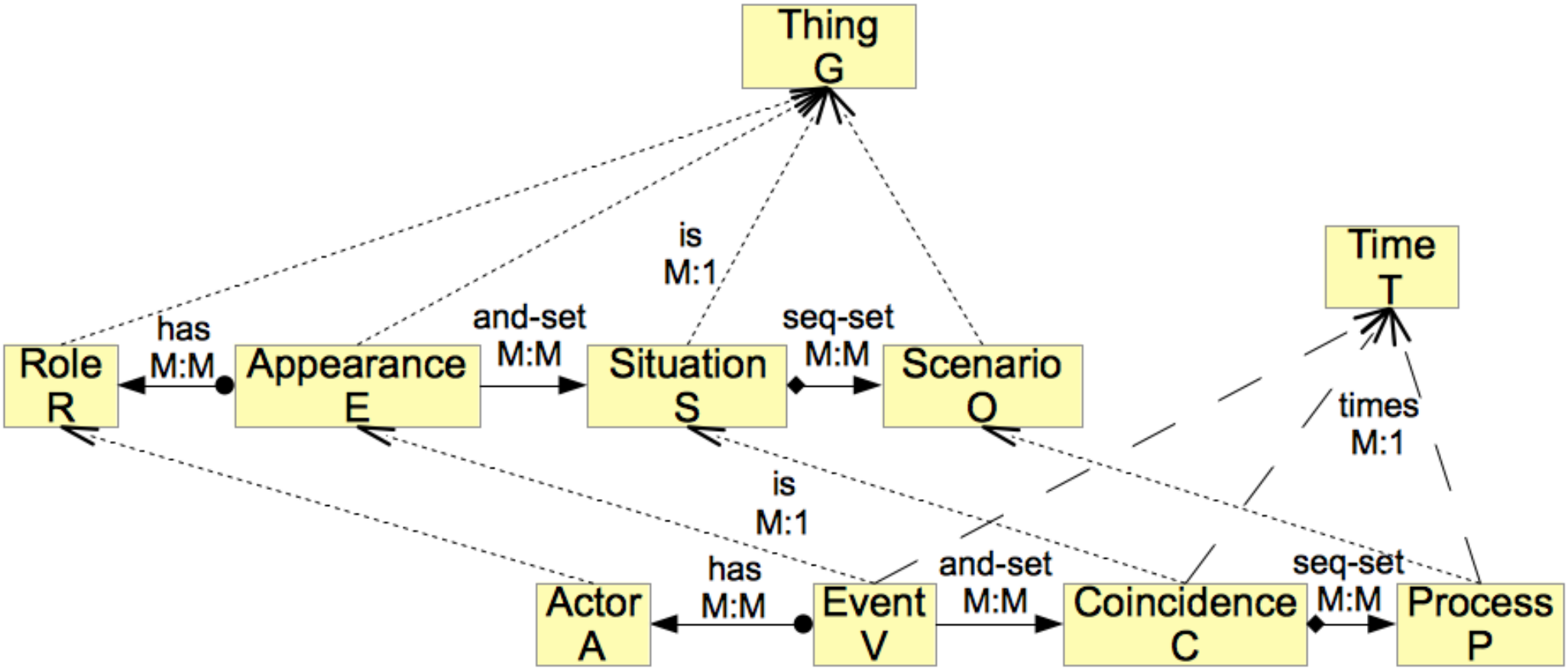
http://www.math.nsc.ru/AP/ScientificDiscovery/PDF/data_mining_for_financial_applications.pdf

https://arxiv.org/pdf/cs/0208022.pdf

ANNEX IN FINANCIAL FORECASTING

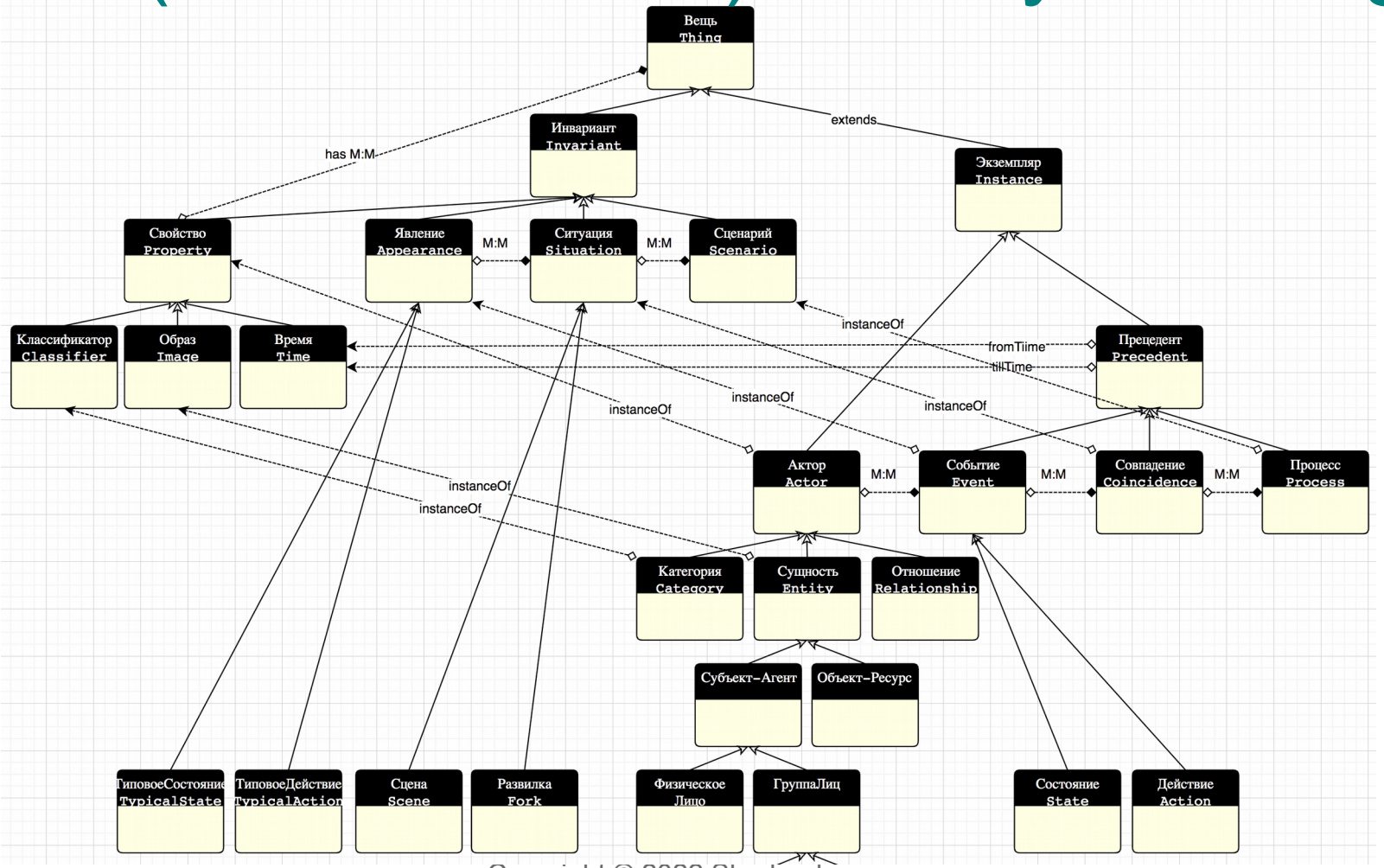
structure1	structure2	structure3	structure4	weekday	week
			forecast for	Friday	forecast week
		forecast for		Thursday	forecast week
			up	Wednesday	forecast week
	forecast for	up		Tuesday	forecast week
forecast for				Monday	forecast week
	up		current day	Friday	current week
				Thursday	current week
up		current day	down	Wednesday	current week
	current day	down		Tuesday	current week
current day			anchor2	Monday	current week
	down	anchor2		Friday	one week ago
	anchor2			Thursday	one week ago
	down anchor1	down		Wednesday	one week ago
down				Tuesday	one week ago
		anchor1		Monday	one week ago
			up	Friday	two weeks ago
				Thursday	two weeks ago
anchor2				Wednesday	two weeks ago
				Tuesday	two weeks ago
up			anchor1	Monday	two weeks ago
anchor1				Friday	three weeks ago
				Thursday	three weeks ago
				Wednesday	three weeks ago
				Tuesday	three weeks ago
				Monday	three weeks ago
training 0.74	training 0.72	training 0.7	training 0.7		
testing 0.78	testing 0.73	testing 0.71	testing 0.82		

Foundation (Generic) Activity Ontology

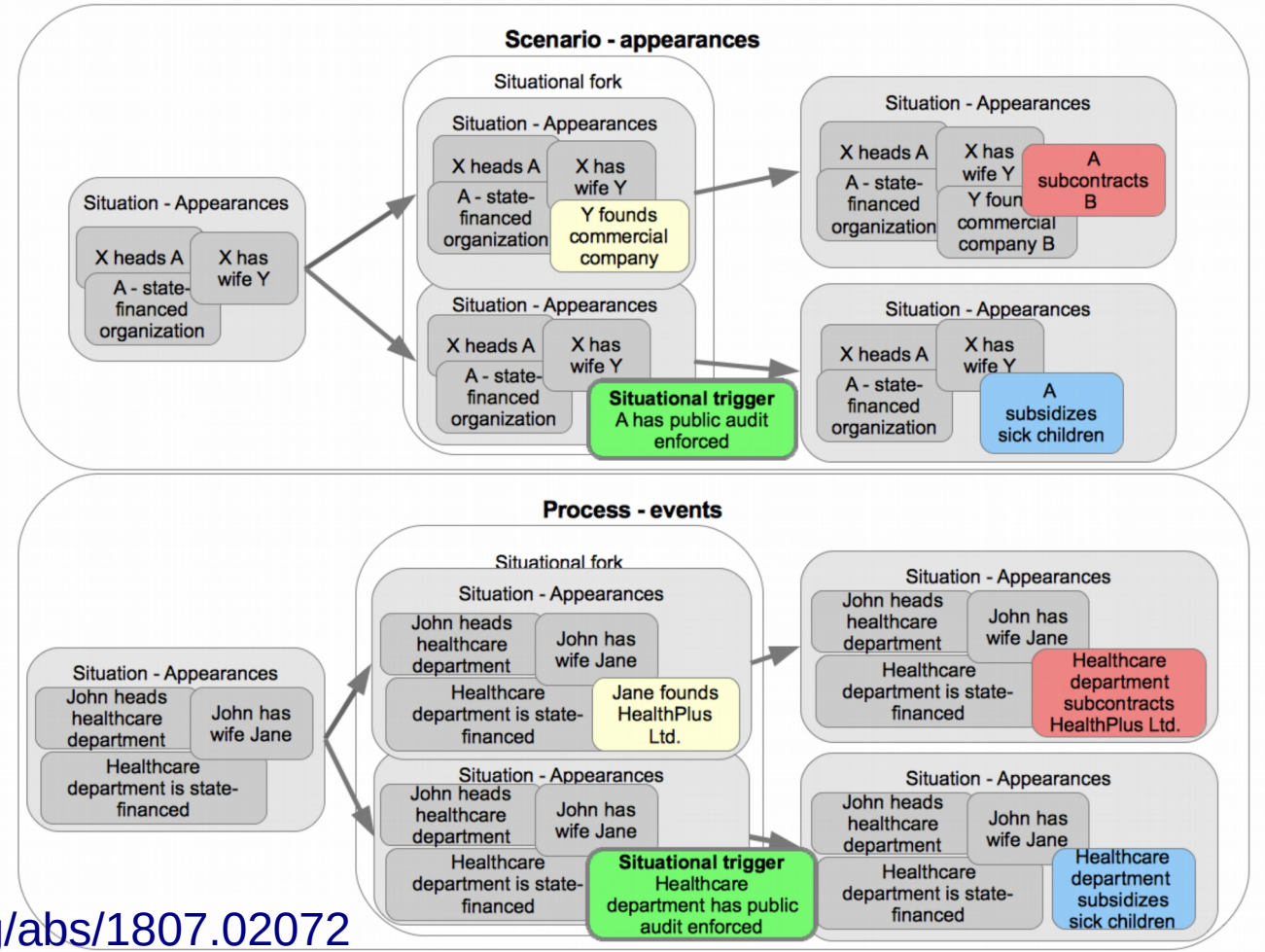


https://arxiv.org/abs/1807.02072

Upper (CRM Domain) Activity Ontology

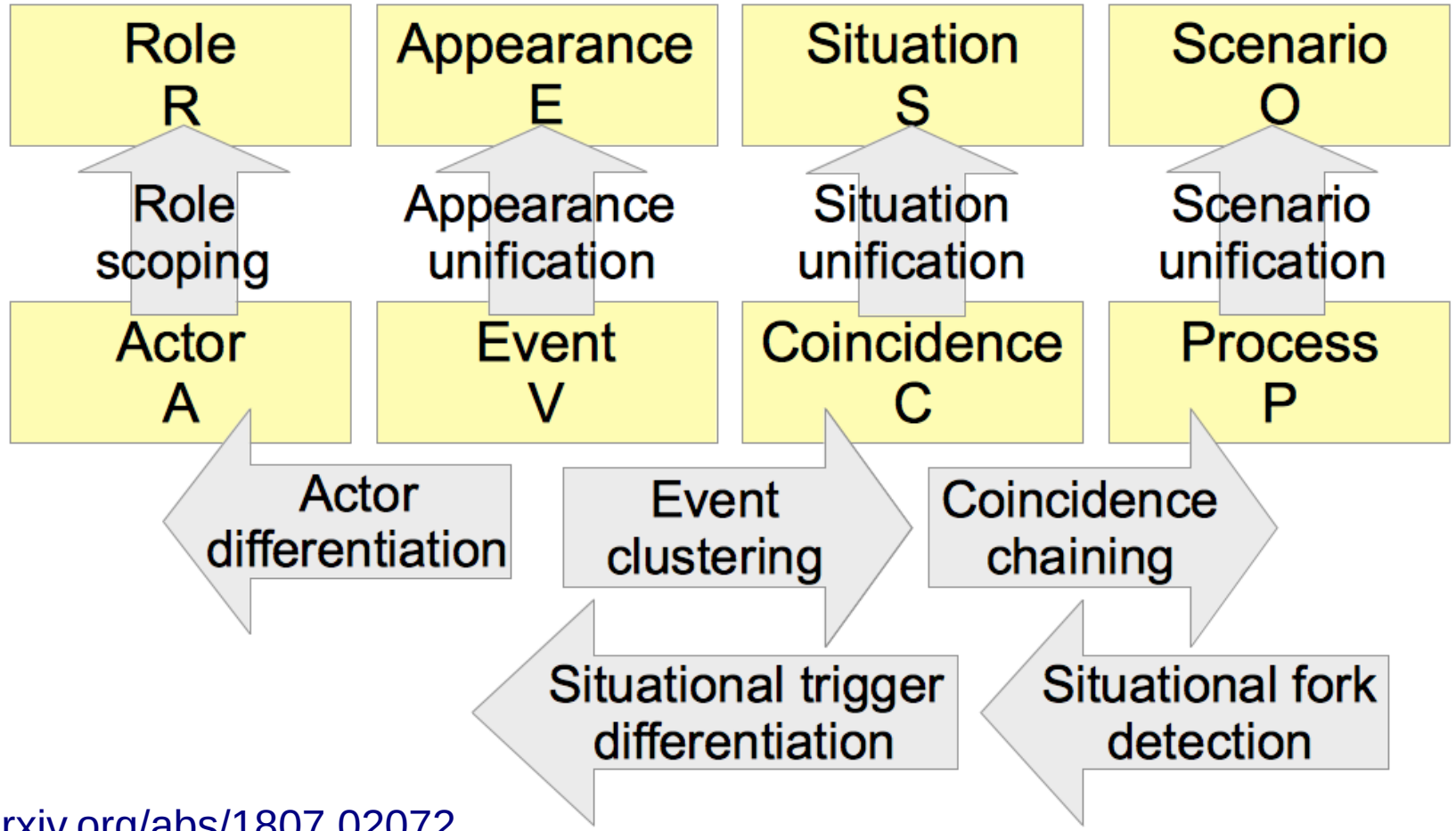


Upper (Domain) Activity Ontology Example



https://arxiv.org/abs/1807.02072

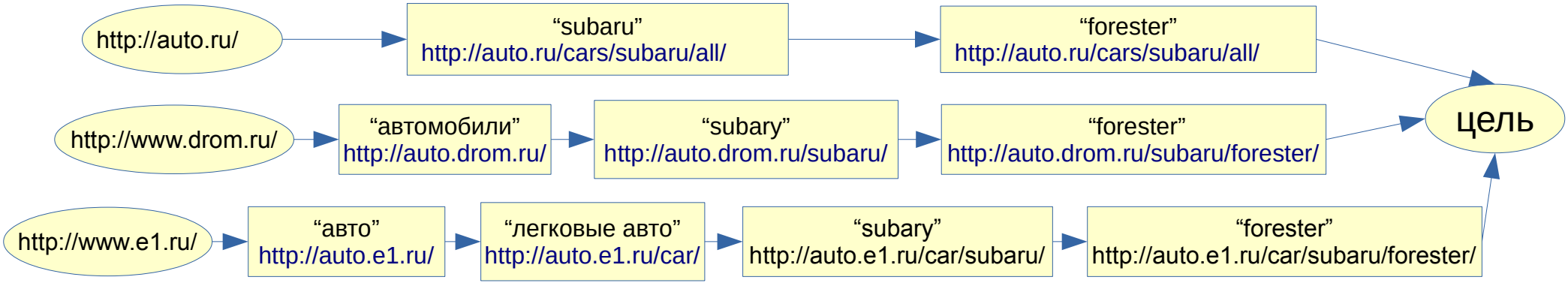
Scenario Mining in Process Data



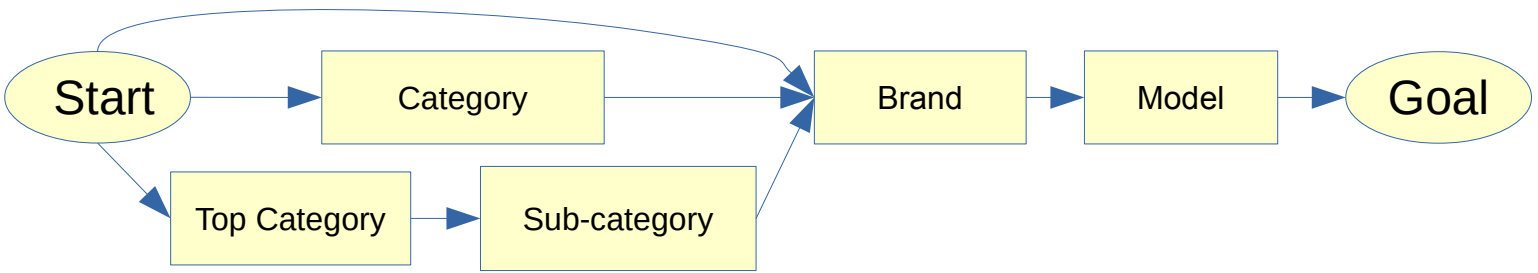
https://arxiv.org/abs/1807.02072

Scenario Mining in Process Data Example

Маршруты интернет-навигации при поиске автомобилей марки “Forester”



Обобщенный сценарий переходов по ссылкам при поиске товаров

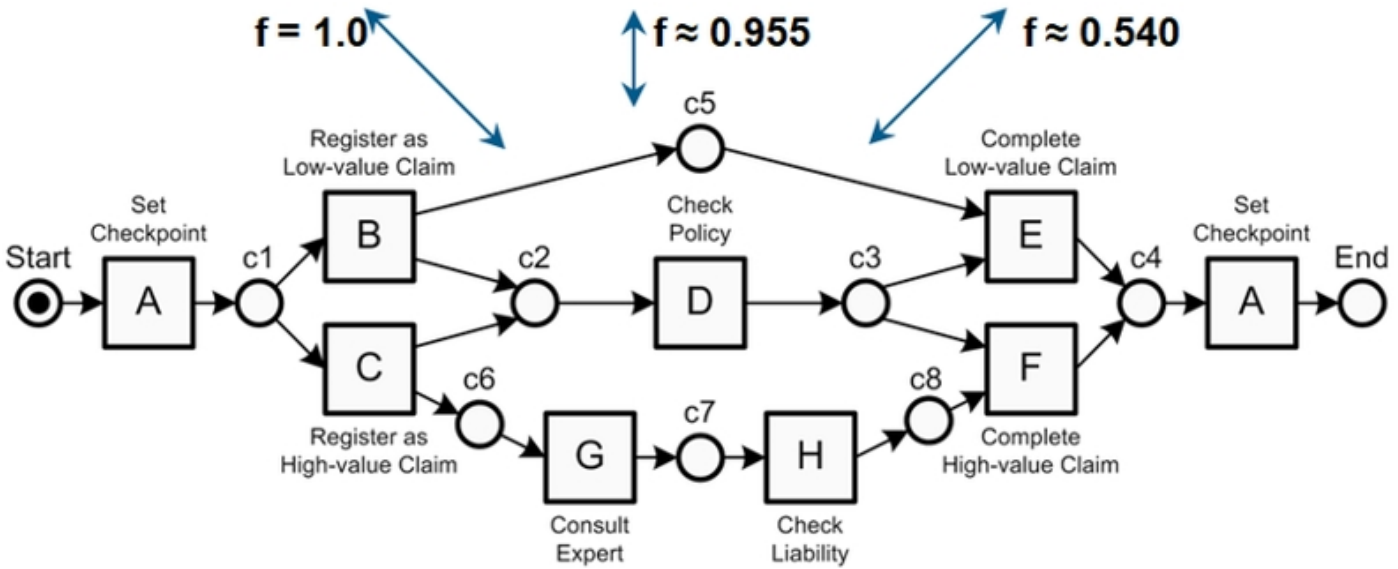


Process Mining in Business Log Data

No. of Instances	Log Traces
4070	ABDEA
245	ACDGHFA
56	ACGDHFA

No. of Instances	Log Traces
1207	ABDEA
145	ACDGHFA
56	ACGDHFA
23	ACHDFA
28	ACDHFA

No. of Instances	Log Traces
24	BDE
7	AABHF
15	CHF
6	ADBE
1	ACBGDFAA
8	ABEDA



https://www.puzzledata.com/process-mining_eng/

Applied to NLP and Language Modeling

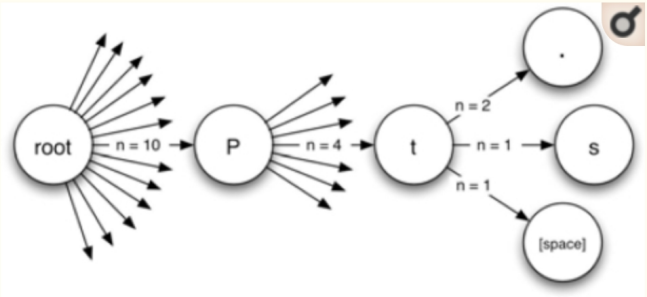


Figure 1

Trie data structure. The probability of observing an 's' given the preceding string "Pt" is ¼, or 25%. The freedom following "pt" is 3.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2655800/

Contrastive Evaluation: Test Specific Phenomena

To test if your LM knows something very specific, you can use contrastive examples. These are the examples where you have several versions of the same text which differ only in the aspect you care about: one correct and at least one incorrect. A model has to assign higher scores (probabilities) to the correct version.

The roses in the vase by the door __?__ Competing answers: is, are

P(The roses in the vase by the door are)
P(The roses in the vase by the door is)

Is the correct answer ranked higher?
P(...are) > P(...is)?

A very popular phenomenon to look at is subject-verb agreement, initially proposed in the Assessing the Ability of LSTMs to Learn Syntax-Sensitive Dependencies paper. In this task, contrastive examples consist of two sentences: one where the verb agrees in number with the subject, and another with the same verb, but incorrect inflection.

Examples can be of different complexity depending on the number of **attractors**: other nouns in a sentence that have different grammatical number and can "distract" a model from the subject.

is/are

The roses ? — Simple: no attractors
The roses in the vase ? — Harder: 1 attractor
The roses in the vase by the door ? — Harder: 2 attractors

Attractors: nouns with different number than the subject

https://lena-voita.github.io/nlp_course/language_modeling.html

Everything is a Process of a Scenario!

	Spoken language recognition	Written language recognition	Identification of patterns in the text	Causal analysis
Actor	Coefficient on spectrogram for particular frequency	Property of specific stroke: On the top, at the bottom, long, short, skewed, etc.	Object property value: Name “John”	Specific actor: John Doe
Event	Combination of coefficients on spectrogram	Period or stroke composing the letter: .	Object class instance: Name “John”, surname “Doe”	Specific event: John Doe cleaning the window on the second floor.
Coincidence	Specific sound	Coincidence: i	Co-occurrence of object of class person properties: “John Doe”	Specific coincidence: Window on the second floor is dirty, John Doe is cleaning it.
Process	Specific spoken word	Specific written word: ping	Specific phrase: “John Doe cleans the window”	Specific process: Window on the second floor was dirty, John Doe has cleaned it and now it is clean.
Role	Pitch frequency	Property of symbol: orientation, extent, symmetry, etc.	Domain of the object class property: person’s surname	Typical role: Cleaner
Appearance	Spectral cluster on the spectrogram	Element of symbol: .	Class of the variable object: person	Typical appearance: Someone cleaning something
Situation	Sound of speech	Symbol: i	Pattern variable: $subject	Typical situation: Someone is cleaning something which is dirty.
Scenario	Spoken word accordingly to the language model	Written word: ping	Phrase pattern: “$subject cleans $object”	Typical scenario: Something was dirty, someone has cleaned it, it is clean now.

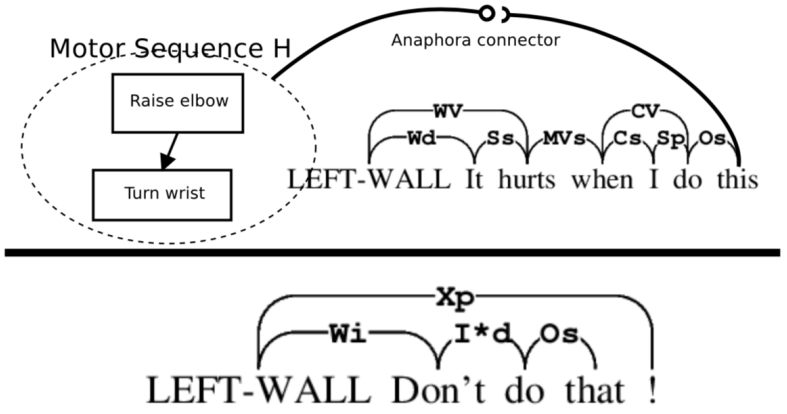
https://arxiv.org/abs/1807.02072

Text vs. Non-Text

Common Sense Reasoning

Rules, laws, axioms of reasoning and inference can be learned.

$$\frac{A \wedge A \rightarrow B}{B}$$



Naively, simplistically: Learned Stimulus-Response AI (SRAI)[9]

[9] Metaphorical example: Mel'čuk's Meaning Text Theory (MTT) SemR + Lexical Functions (LF) would be better.

Thank you and welcome!

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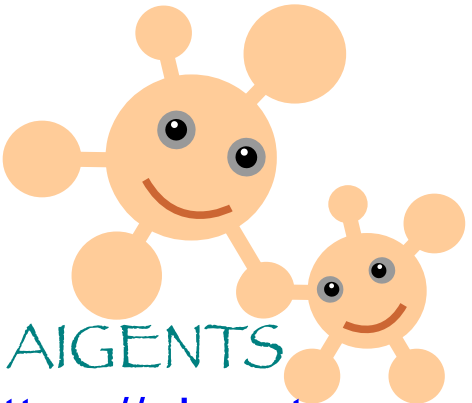

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