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Unraveling the context of context

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HAAPIE 2024 HAAPIE

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Everyone is different…

https://marketinginsidergroup.com/wp-content/uploads/2016/06/150-People.jpg

… and in different situations

https://uproxx.files.wordpress.com/2018/04/runner1-grid-uproxx.jpg?quality=95

https://greatergood.berkeley.edu/images/uploads/meditating-headphones-small.jpg

1000/0*ne9Fr33kmEjJ2pGw.jpg

We can adapt to a person and/or a situation.

		Situationalization	
		no	**yes**
Personalization	**no**	(I) no adaptation	(IV) adaptation to a specific situation
	1:1	(II) adaptation to a specific individual	(V) adaptation to a specific individual and to a specific situation
	1:n	(III) adaptation to a group of individuals	(VI) adaptation to a group of individuals and to a specific situation

The PERSIT Matrix

Christine Bauer & Peter Lasinger (2014). Adaptation strategies to increase advertisement effectiveness in digital media. Management Review Quarterly, 64(2), pp 101-124. DOI: 10.1007/s11301-014-0101-0

Peter Lasinger & **Christine Bauer** (2013). Situationalization: the new road to adaptive digital-out-of-home advertising. Proceedings of the IADIS International Conference e-Society (e-Society 2013). Lisbon, Portugal, 13-16 March, pp 162-169.

“Situation” is not well defined.

There is a wide spectrum of granularity.

e.g.,

- at home
- while doing sports
- at home while doing sports
- at home in a 20 qm room, lights on, in front of a tv set, no other people around, a cat nearby

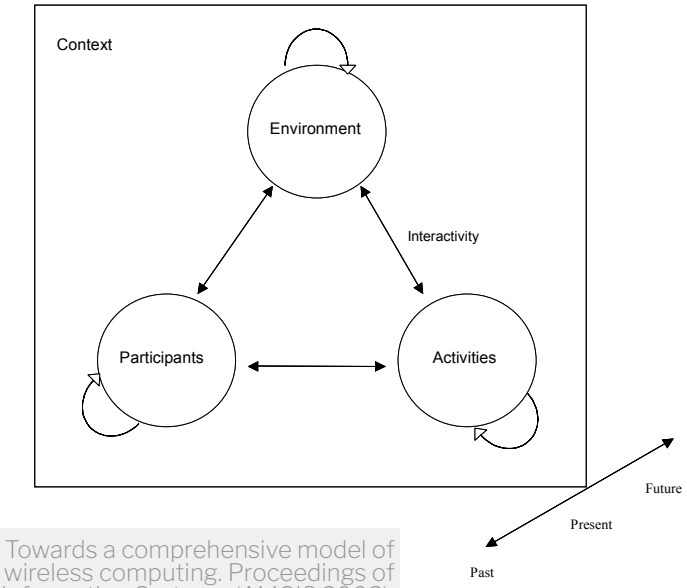
So we usually speak of “context”.

What is context?

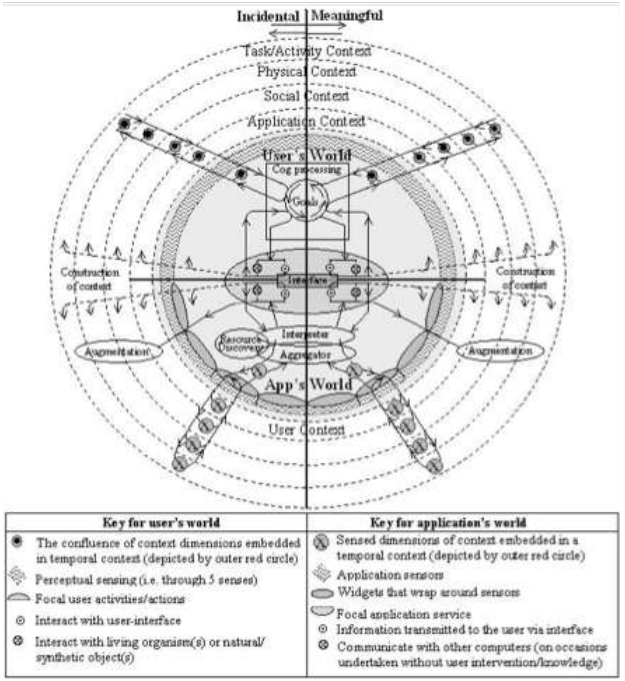
Context is not well-defined either.
There is an ongoing debate on what—more specifically—constitutes context.

"Context is any information that can be used to characterize the situation of an entity."

Anind K. Dey (2001). Understanding and using context. Personal and Ubiquitous Computing, 5(1), pp 4-7.



Peter Tarasewich (2003). Towards a comprehensive model of context for mobile and wireless computing. Proceedings of Americas Conference of Information Systems (AMCIS 2003), Tampa, FL, USA, 4-6 August, pp 114-124.

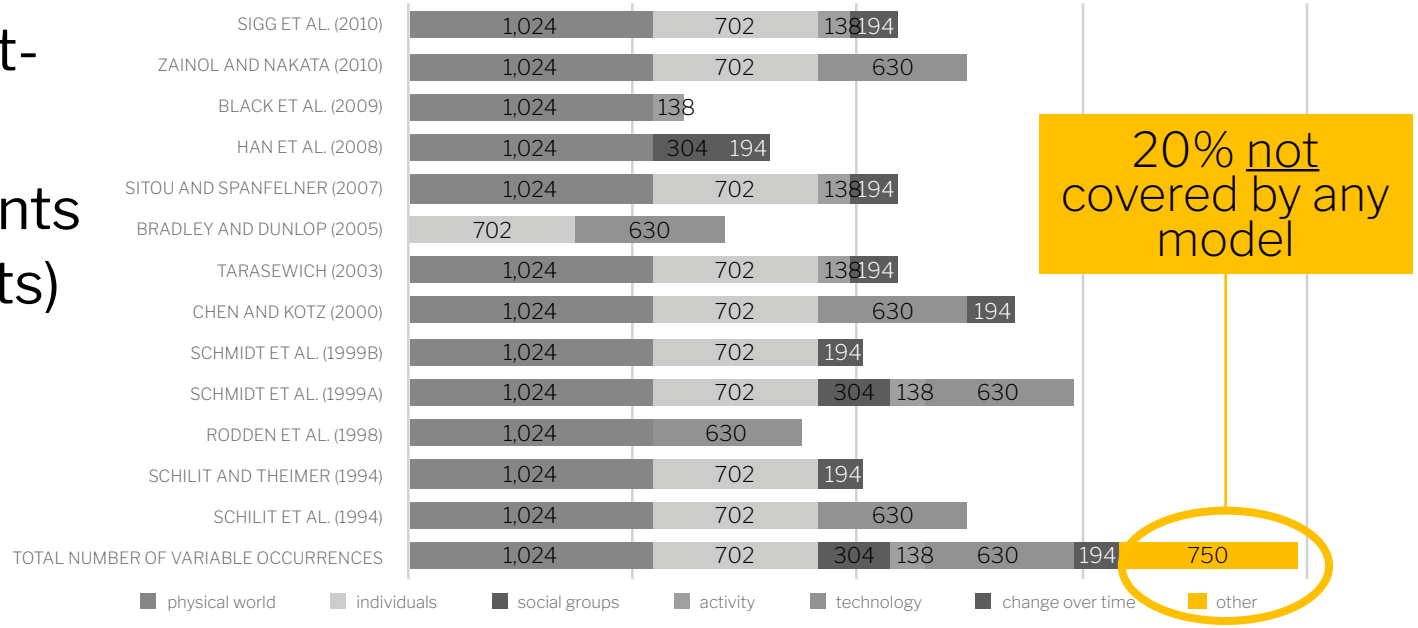


Nicholas A. Bradley & Mark Dunlop (2005). Toward a multidisciplinary model of context to support context-aware computing. Human-Computer Interaction 20(4), pp 403-446.

Existing models are heterogenous

6 years of literature on context-aware computing research:

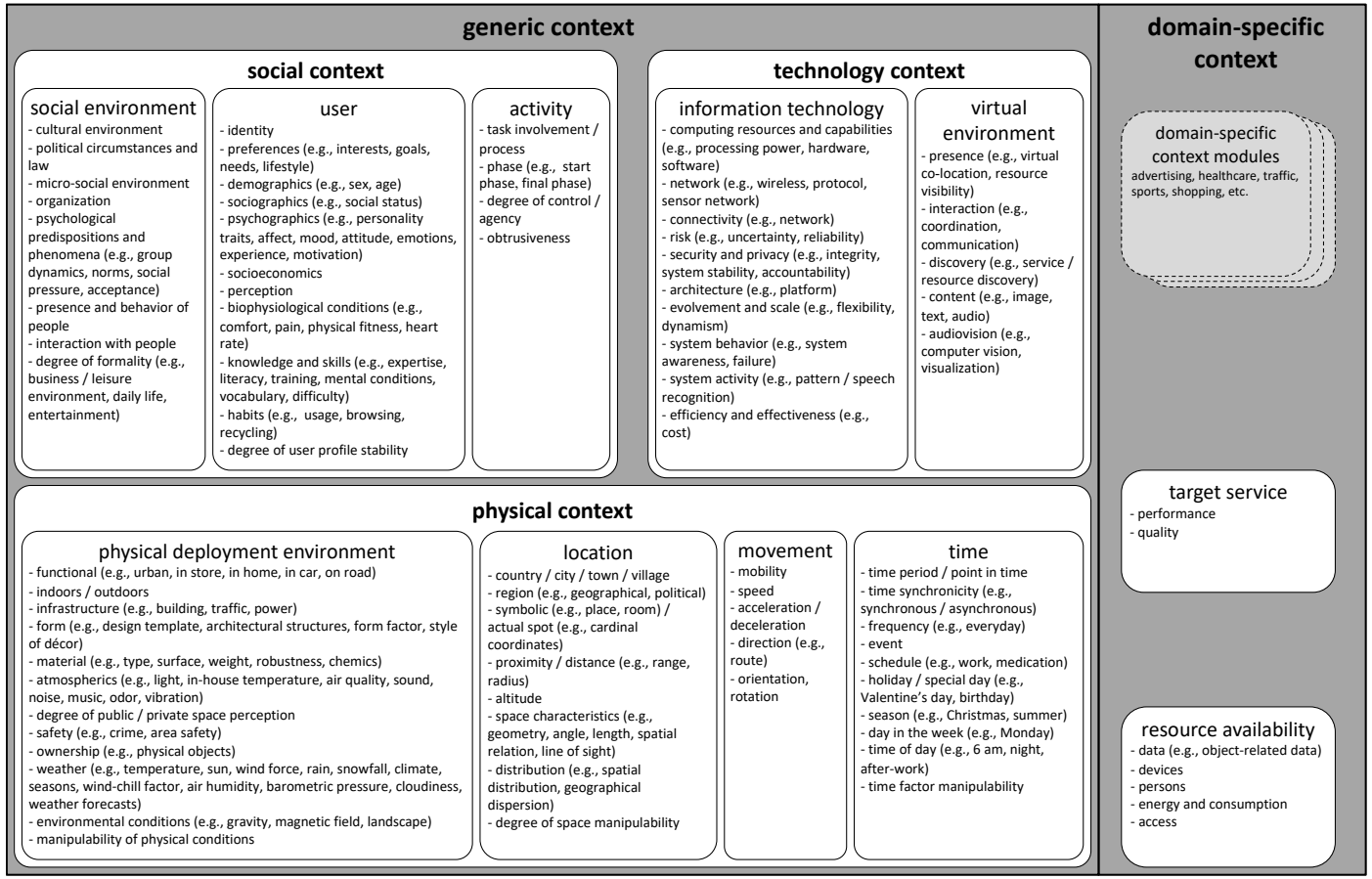
total of **10,498** context elements (**3,741** unique context elements)



Christine Bauer (2012). A Comparison and Validation of 13 Context Meta-Models. Proceedings of the 20th European Conference on Information Systems (ECIS 2012). Barcelona, Spain, 10-13 June.

Alexander Novotny & **Christine Bauer** (2017). What Do We Really Talk About When We Talk About Context in Pervasive Computing: A Review and Exploratory Analysis. Proceedings of the 19th International Conference on Information Integration and Web-based Applications & Services (iiWAS 2017). Salzburg, Austria, 4-6 December, pp 301-310. DOI: 10.1145/3151759.3151760

A consolidated view of context



Christine Bauer & Alexander Novotny (2017). A consolidated view of context for intelligent systems. Journal of Ambient Intelligence and Smart Environments, 9(4), pp 377-393. DOI: 10.3233/ais-170445

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Relevance of context

Few “top” context elements

Context discussed in literature is highly diverse

→ *not* pillared upon few single context elements

→ most frequently mentioned context accounts for only 1.45% of all context occurrences in the sample

rank	element	occurrences
1	time	153 (1.45%)
2	location	146 (1.39%)
3	device	118 (1.12%)
4	communication	83 (0.79%)
5	network	79 (0.75%)
6	infrastructure	77 (0.73%)
…	…	…
3,741		
sum		10,498

Alexander Novotny & **Christine Bauer** (2017). What do we really talk about when we talk about context in pervasive computing: a review and exploratory analysis. Proceedings of the 19th International Conference on Information Integration and Web-based Applications & Services (iiWAS 2017). Salzburg, Austria, 4-6 December, pp 301-310. DOI: 10.1145/3151759.3151760

Context relevance is domain-specific

application domain	healthcare	medicine	traffic	energy systems	household	developing countries	shopping	gaming	sports	robotics	music	public space	office	arctic research	personal information management	agriculture	education	advertising	Second Life	airport services	firefighting	difficult environments	digital media	public transport	perishable goods distribution	emergency equipment	television	pollution	family	cooking	library	social networking	industry	entertainment	tracking and tracing	wearable computing	outdoor workplaces	prototyping	computer security	engineering	military	mobile phones	surveillance	disability	Internet	user innovation	service discovery	tourism
	284	281	252	170	152	133	101	94	91	86	83	83	75	71	67	66	64	61	55	54	54	46	46	44	42	40	40	37	36	35	35	33	31	30	30	28	27	26	24	24	23	23	22	21	19	19	18	18
time	0.130	0.100	0.107	0.100	0.053	0.053	0.149	0.106	0.077	0.058	0.036	0.048	0.107	0.085	0.134	0.045	0.094	0.213	0.055	0.111	0.111	0.087	0.109	0.114	0.095	0.050	0.200	0.054	0.083	0.029	0.029	0.242	0.097	0.067	0.067	0.036	0.037	0.038	0.167	0.083	0.043	0.130	0.000	0.000	0.105	0.053	0.111	0.167
physical	0.144	0.178	0.290	0.218	0.388	0.248	0.149	0.202	0.198	0.244	0.205	0.169	0.160	0.465	0.194	0.470	0.063	0.164	0.218	0.278	0.407	0.413	0.261	0.136	0.476	0.250	0.100	0.405	0.194	0.086	0.057	0.121	0.290	0.300	0.067	0.393	0.148	0.308	0.083	0.125	0.174	0.043	0.227	0.429	0.158	0.000	0.000	0.000
technology	0.197	0.224	0.218	0.300	0.151	0.195	0.208	0.191	0.198	0.128	0.217	0.145	0.333	0.113	0.119	0.167	0.203	0.148	0.255	0.167	0.204	0.109	0.239	0.114	0.000	0.075	0.175	0.189	0.056	0.086	0.314	0.152	0.129	0.167	0.333	0.107	0.370	0.154	0.583	0.375	0.478	0.391	0.227	0.286	0.368	0.316	0.222	0.111
social and individual	0.148	0.053	0.067	0.088	0.105	0.173	0.089	0.170	0.022	0.093	0.169	0.241	0.067	0.028	0.134	0.061	0.141	0.164	0.109	0.019	0.037	0.065	0.043	0.227	0.000	0.150	0.025	0.162	0.528	0.257	0.114	0.303	0.032	0.133	0.300	0.036	0.074	0.077	0.000	0.208	0.087	0.043	0.091	0.048	0.105	0.263	0.111	0.278
activity	0.092	0.057	0.024	0.029	0.079	0.030	0.030	0.085	0.121	0.093	0.024	0.084	0.080	0.000	0.119	0.000	0.016	0.033	0.055	0.056	0.000	0.043	0.000	0.045	0.048	0.025	0.050	0.027	0.028	0.171	0.171	0.030	0.000	0.000	0.000	0.000	0.037	0.154	0.000	0.042	0.043	0.043	0.091	0.048	0.000	0.000	0.111	0.056
others	0.289	0.388	0.294	0.265	0.224	0.301	0.376	0.245	0.385	0.384	0.349	0.313	0.253	0.310	0.328	0.258	0.484	0.279	0.309	0.370	0.241	0.348	0.348	0.364	0.381	0.450	0.400	0.162	0.111	0.371	0.314	0.152	0.452	0.333	0.333	0.429	0.333	0.269	0.167	0.167	0.174	0.348	0.364	0.190	0.263	0.368	0.444	0.389

physical:
- arctic research
- agriculture
- firefighting
- difficult environments
- perishable goods distribution
- wearable computing

social and individual:
- family
- social networking
- tracking and tracing
- tourism
- user innovation

It’s more complex than relevance alone…

Subtleties of context

What does it mean if you say, someone's "running"?

What is location?

- At 53○4′N,1○17′W (absolute position)
- In A1.15 (named space)

- In a conference room (named class)

- In her (Maria's) office (subject's static space) (a functional space related directly to the individual)

- In her car (subject's dynamic space) (related directly to the individual)

- At 10:00, she will be . . . (in the future; expectation)

- At 08:00, she was . . . (in the past)

- Near/Within . . . metres of . . . (in vicinity)
- Between . . . and . . . (on path)

- Either at . . . or. . . or . . . (discrete set)

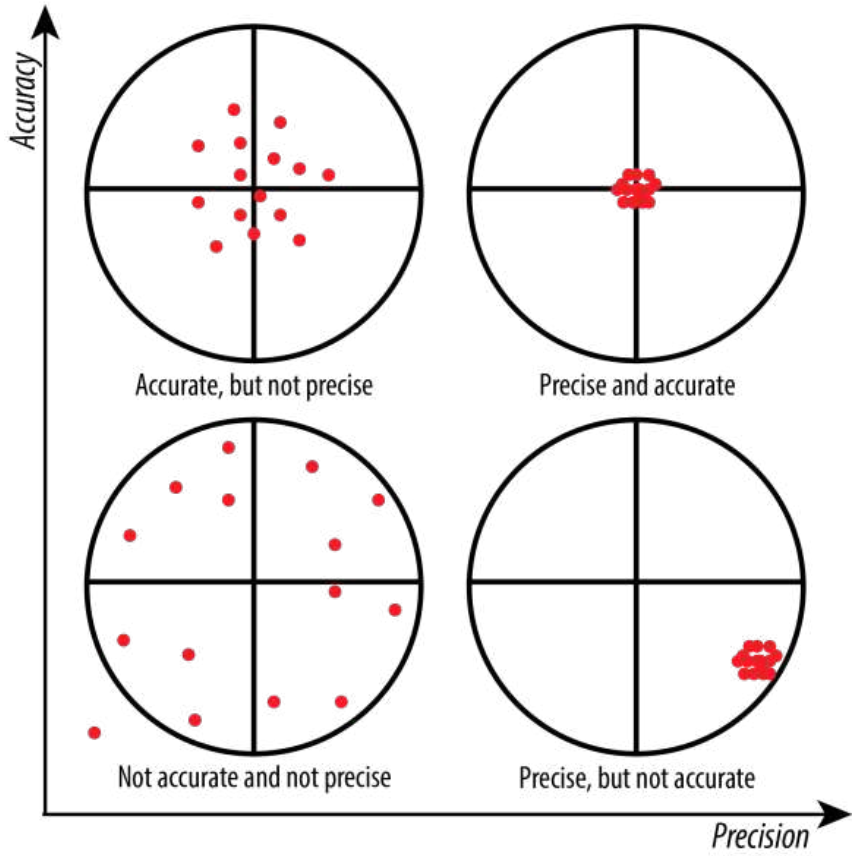
- At this time, she is usually . . . (by default)

- Not . . . (by negation)

- Out/on holiday (non-located task)

Simon Dobson (2005). Leveraging the subtleties of location. In Proceedings of the 2005 joint conference on Smart objects and ambient intelligence: innovative context-aware services: usages and technologies (sOc-EUSAI '05). ACM New York, NY, USA, 189–193. DOI: 10.1145/1107548.1107597

What fine-granularity level do we need?



Is a certain region sufficient or do we need exact coordinates?

Is "not in region X" sufficient?

How problematic is low preciseness?

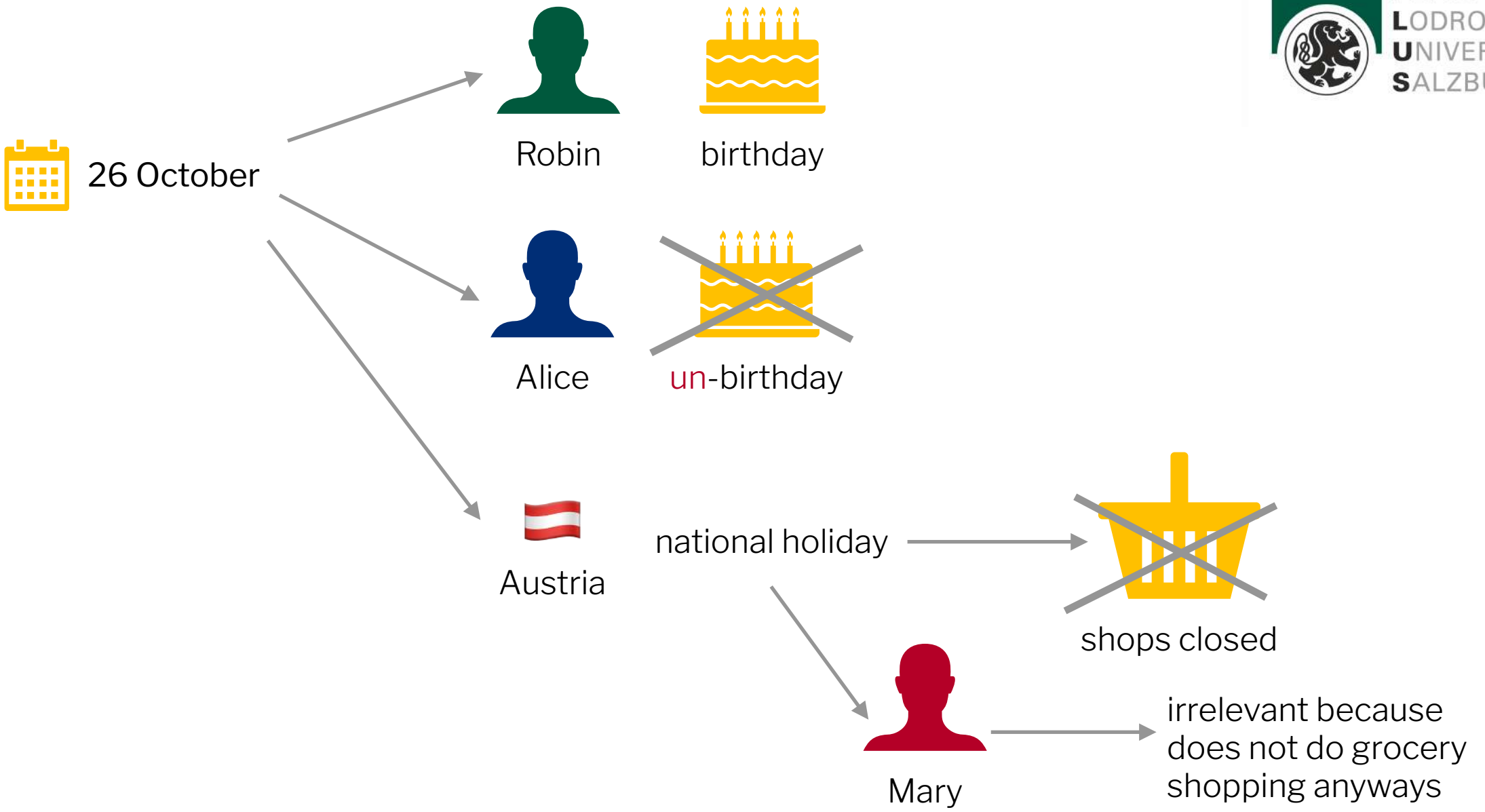
e.g., navigation system vs region detection

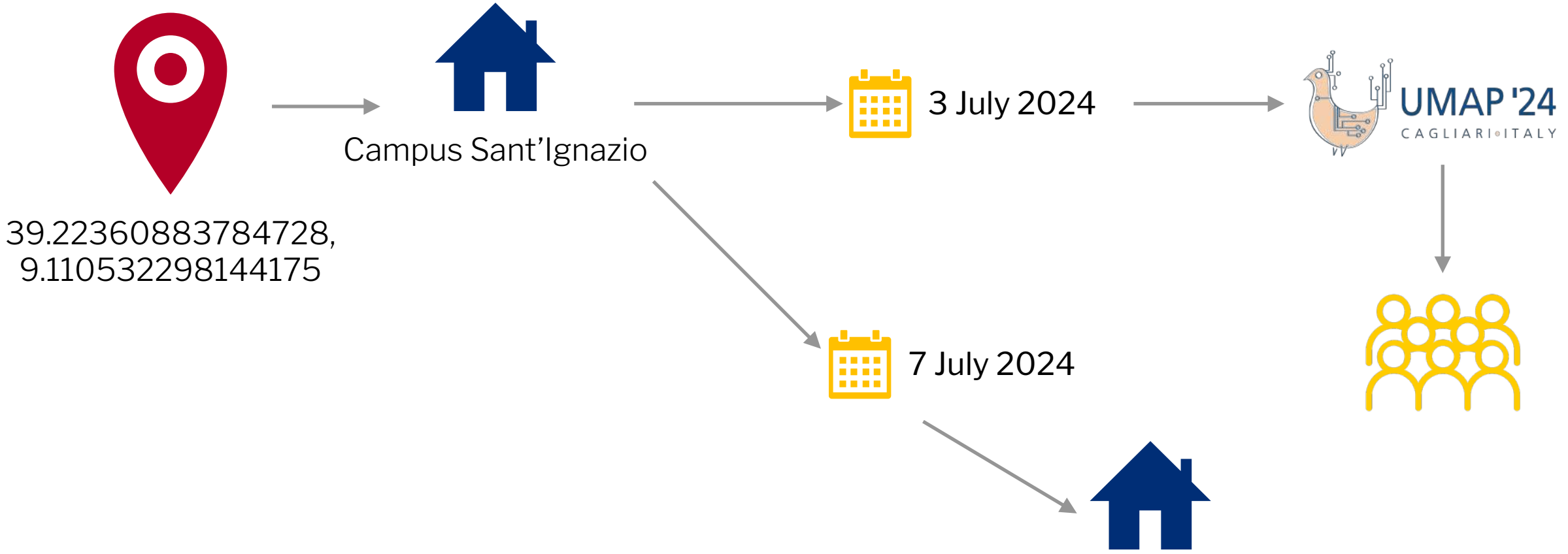
What confidence or probability do we need?
What is the harm of getting it wrong?

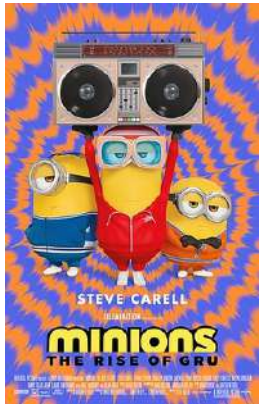
e.g., inferring information from calendar entry

https://wp.stolaf.edu/it/gis-precision-accuracy/#:~:text=Precision is how close measure,are both precise and accurate.

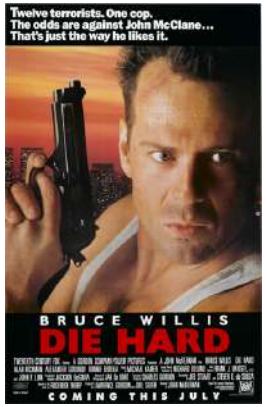
Compound of context elements matters


26 October
Robin
birthday
Alice
un-birthday
Austria
national holiday
shops closed
Mary
irrelevant because
does not do grocery
shopping anyways

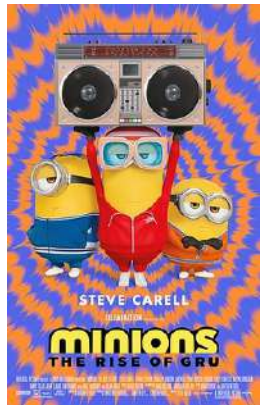

39.223608837847 28,
9.110532298144175
Campus Sant'Ignazio
3 July 2024
7 July 2024
UMAP '24
CAGLIARI • ITALY


STEVE CARELL
MINIONS
THE RISE OF GRU

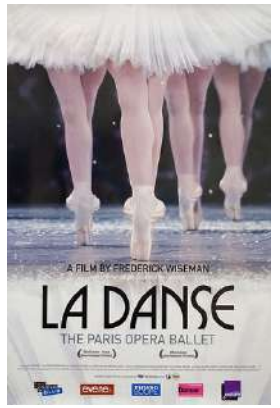

SCHWARZENEGGER
TERMINATOR 2
JUDGMENT DAY

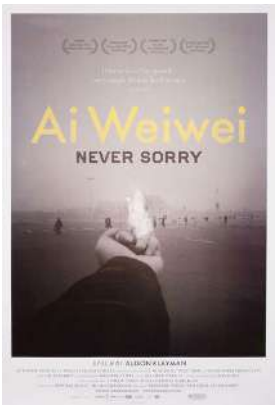

Twelve terrorists. One cop.
The odds are against John McClane...
That's just the way he likes it.
BRUCE WILLIS
DIE HARD
COMING THIS JULY

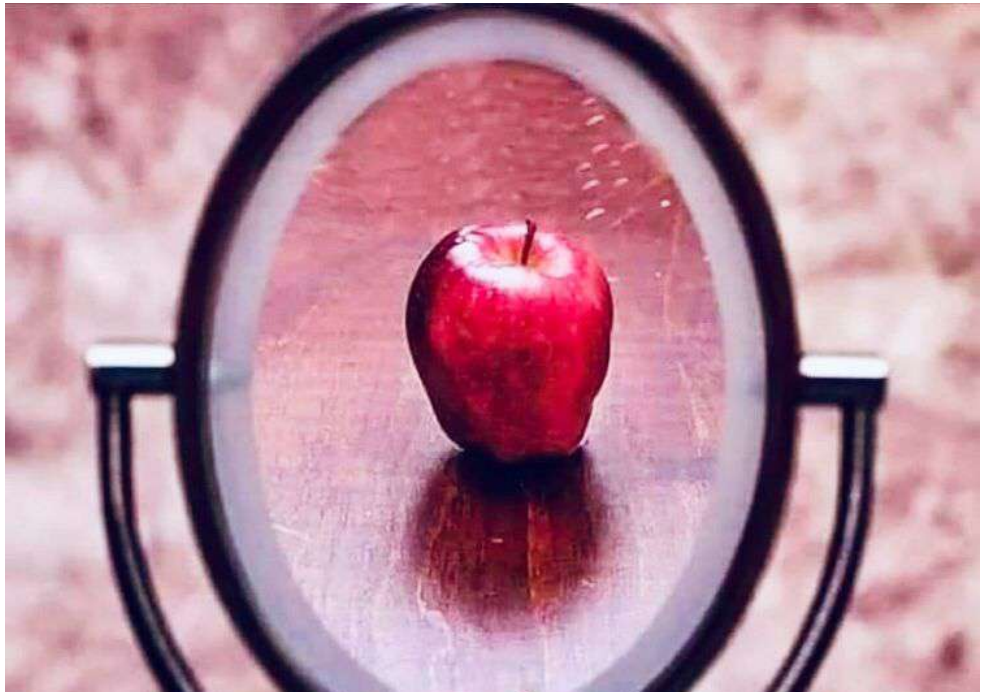

RETURN OF THE JEDI


STEVE CARELL
MINIONS
THE RISE OF GRU


IRIS APFEL
アイリス・アプフェル!
94歳のニューヨーカー


A FILM BY FREDERICK WISEMAN
LA DANSE
THE PARIS OPERA BALLET


Ai Weiwei
NEVER SORRY



Experienced context

Experienced context

Intersubjective differences

Hot or cold?

https://southernseasonsair.com/wp-content/uploads/2020/03/hotcold.jpg

Perfect weather for cycling?

https://bicycledutch.wordpress.com/wp-content/uploads/2017/12/snow2017-01.jpg

Context-dependent perception

Differences perceptions before and after (order matters!)

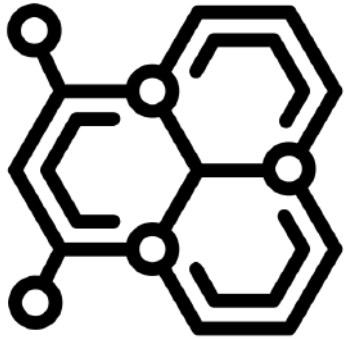
https://www.thenakedscientists.com/get-naked/experiments/how-we-sense-temperature

Relevance

!

Precision, accuracy

Compound



from

what we can measure

to

experienced context

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