Sovereignty

by personalization of information search: A collective wisdom may influence my knowledge

sacerri@didaelkts.it
philippe.lemoisson@cirad.fr

Summary

What do we talk about?

An **experiment** supporting, enhancing and measuring **collective AND informal learning**, in particular **serendipity** (human learning that is not on purpose)

How?

the **ViewpointS Web Application (VWA)** prototype

- a new, collective Knowledge Graph, following the brain metaphor
  → First degree of Soverignity : the Knowledge Graph is local and private
- Knowledge Maps assessing proximities/distances between « nodes » (agents, documents, topics …) are generated on demand
  → Second degree of Soverignity : personalization of information search

Keywords?

Learning as a Side Effect of Interactions, Collaborative and Group Learning, Personalized and Adaptive Learning Environments, Recommender Systems for Learning

SOA: The concept of Serendipity (1)

*… discover, invent, create or imagine **something important** without deliberately being in quest for it. …*

*… If I define true serendipity as the art of making an '**unsought finding**', what do I mean by a 'finding'? …*

*… I speak of a 'finding' when **two or more elements** (observations, hypotheses, ideas, facts, relations or insights) **are combined originally**, for the finder or anybody, to something new and true (science), new and useful (technology), or new and fascinating (arts). …*

Van Andel,P.: Anatomy of the Unsought Finding. Serendipity: Origin, History, Domains, Traditions, Appearances, Patterns and Programmability. *The British Journal for the Philosophy of Science*, Vol. 45, No. 2 (Jun., 1994), pp.631-648 ; Oxford University Press

SOA: The concept of Serendipity (2)

… a rather complete bibliography about serendipity research and systems (more than 100 papers quoted) …

Corneli, J., et al.: *Modelling serendipity in a computational context.* https://arxiv.org/abs/1411.0440 (Submitted on 3 Nov 2014 (v1), last revised 30 Aug 2019 (v7))

… a formal model of serendipity and an associated creative computational system … BUT :

≠ **understanding, forecasting and facilitating *human* serendipitous learning behavior …**

ViewpointS

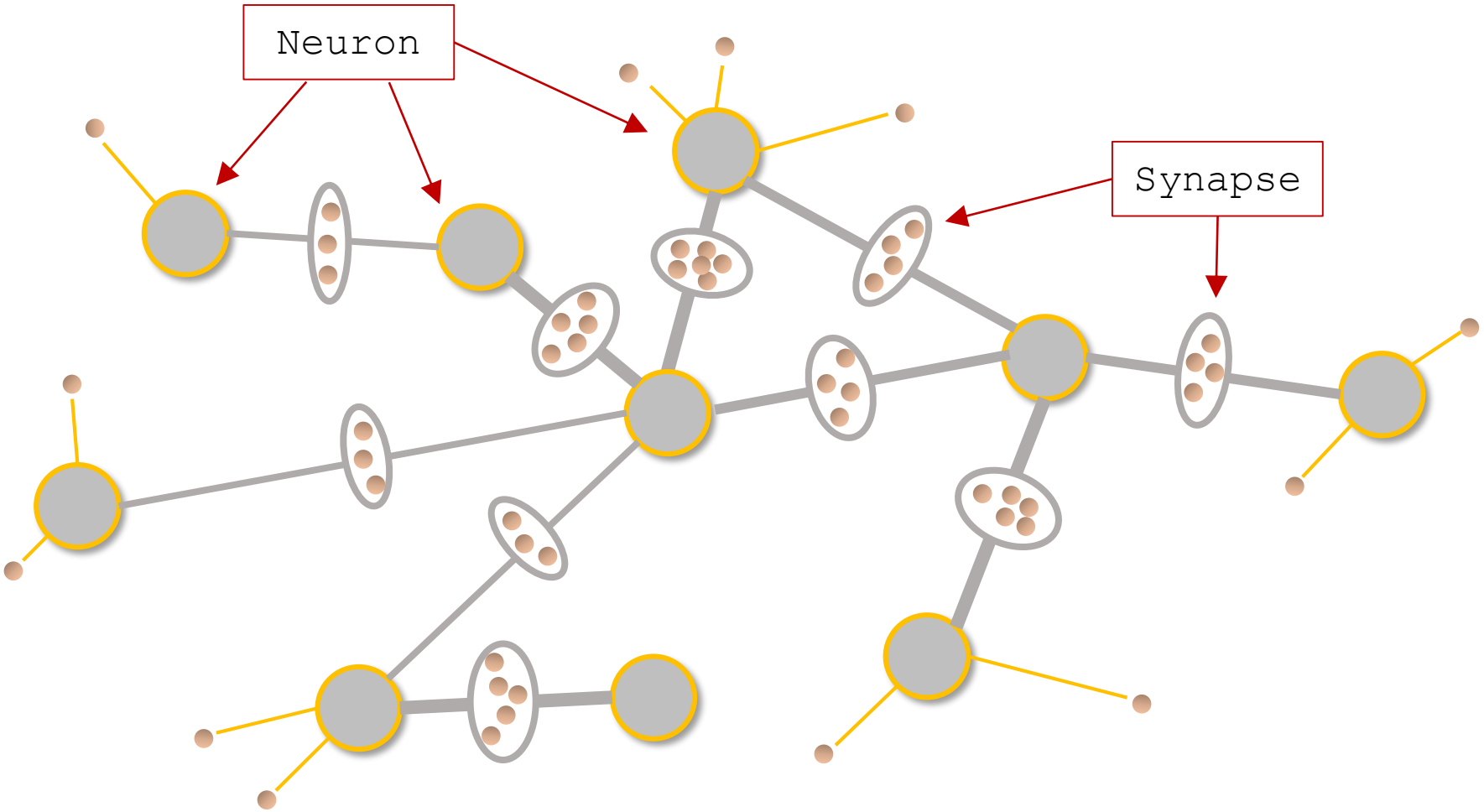
Sovereignity by maintaining a private knowledge graph

philippe lemoisson cirad

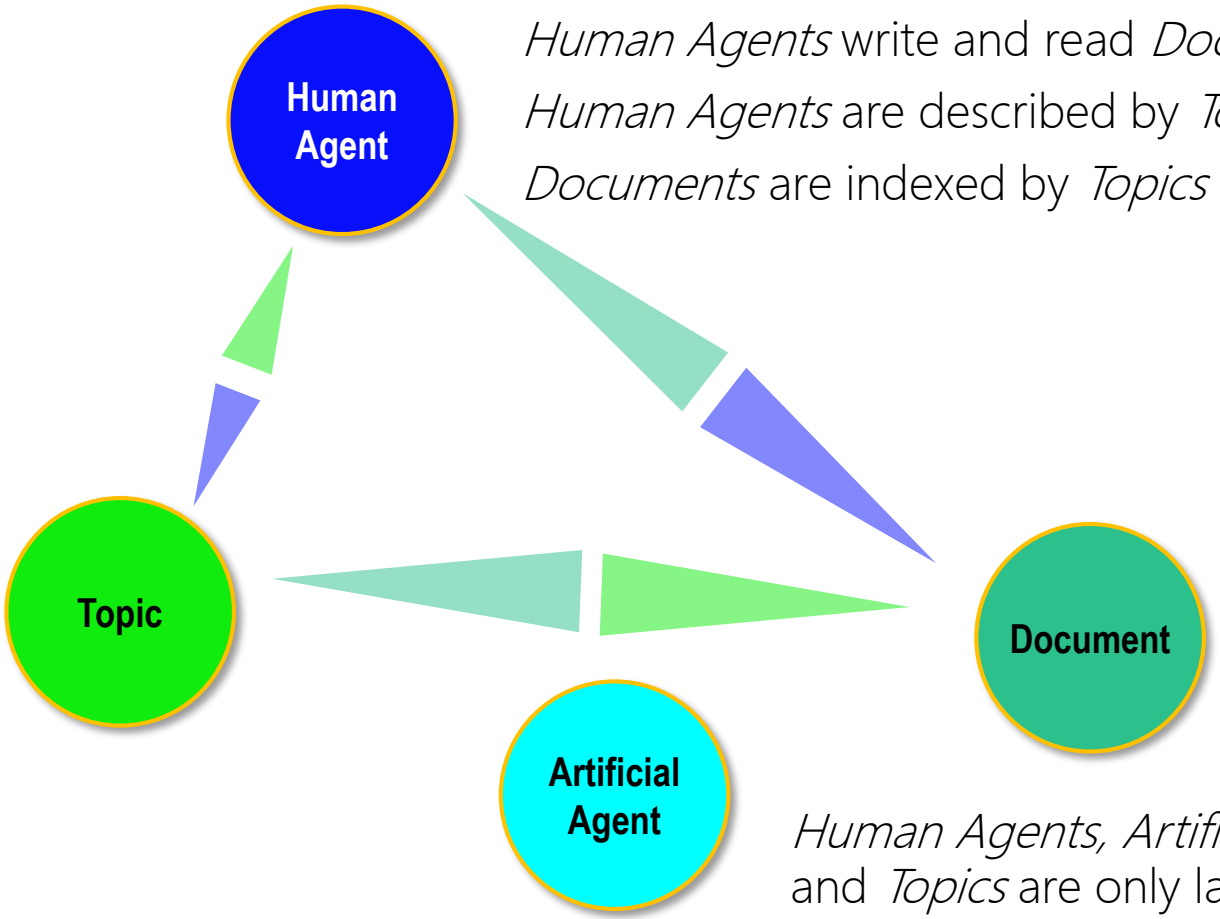
stefano cerri dkts

The brain viewed as a bipartite graph

each synapse interconnects two Nodes (neurons)



ViewpointS



Human Agents write and read *Documents*

Human Agents are described by *Topics* of interest

Documents are indexed by *Topics*

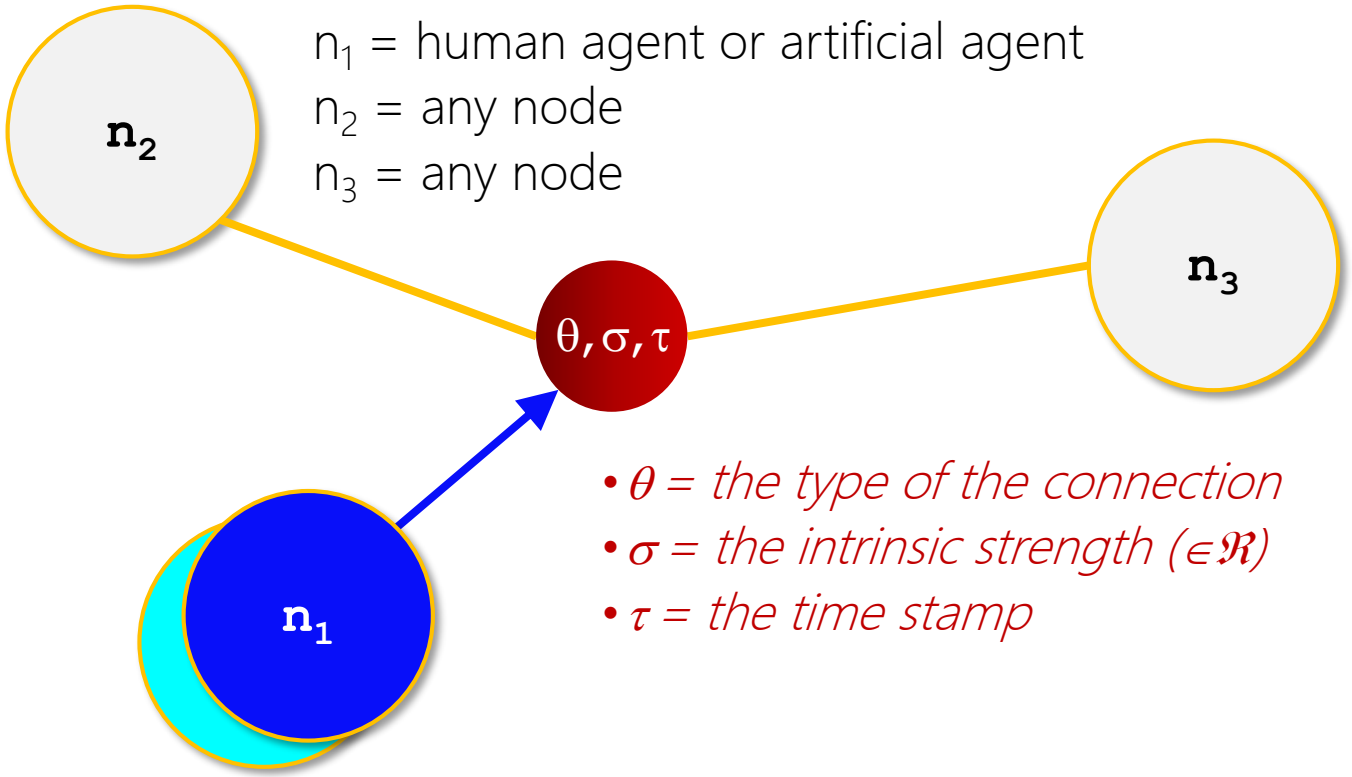
Human Agents, Artificial Agents and *Topics* are only labels ; only the *documents* bear information !

The « collective knowledge » lies in the connections !

The connections are called "viewpoints"

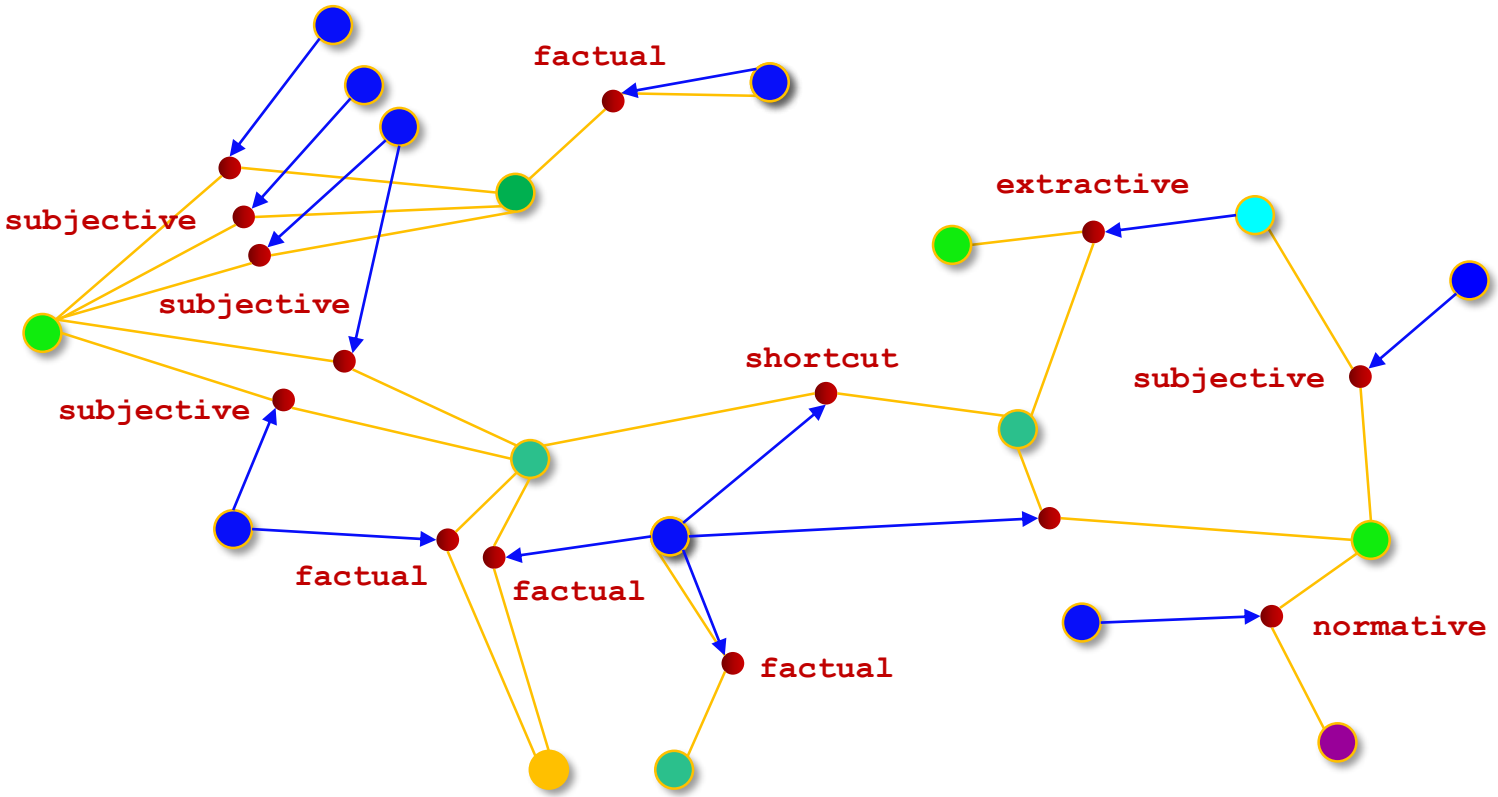
A viewpoint is a 7-uple (KG, n_1, n_2 ,n_3, θ, σ, τ) interpreted as :

in KG, n_1 connects n_2 and n_3 with type θ and strength σ at time τ



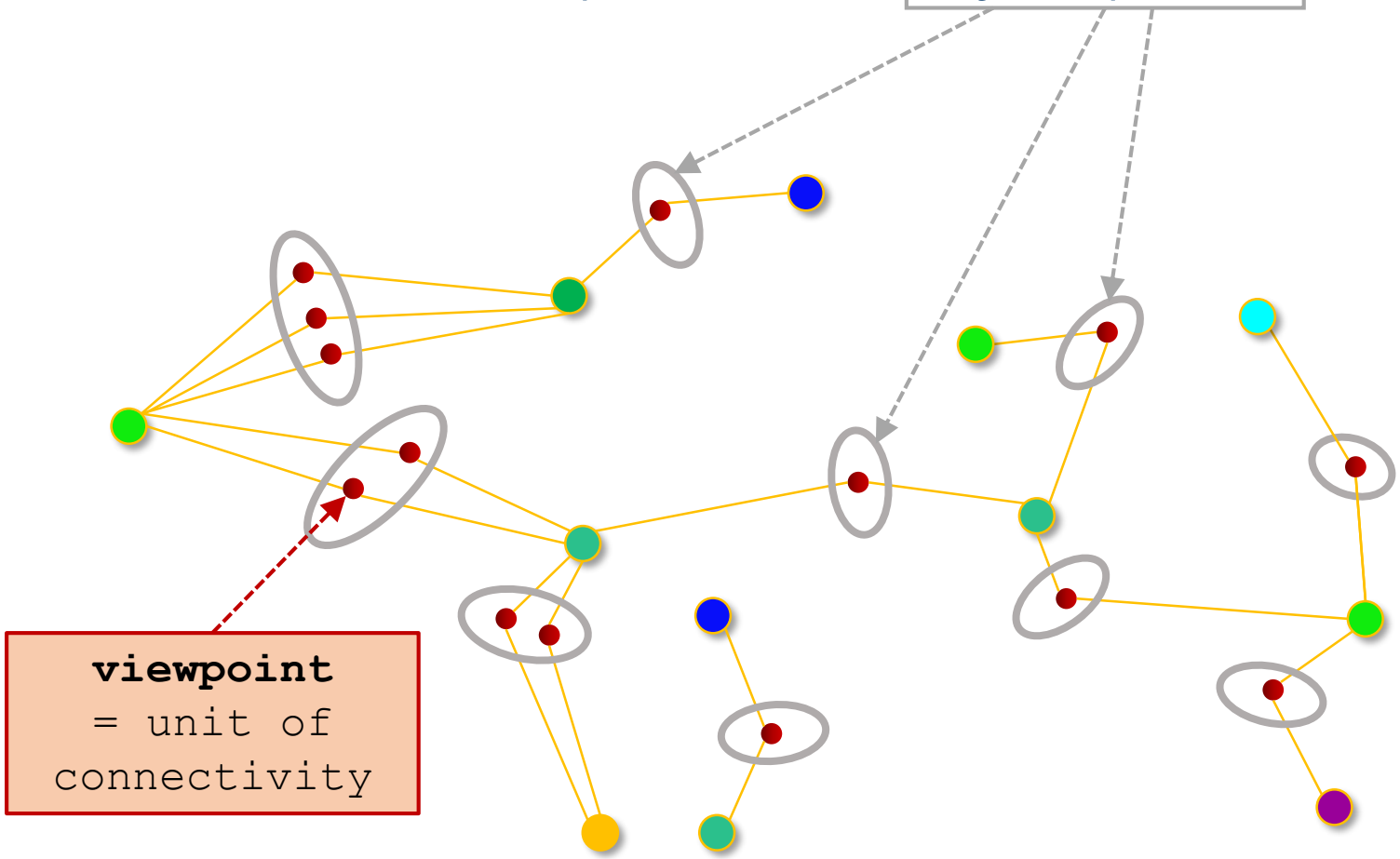
ViewpointS: the Knowledge Graph (KG)

KG is bipartite : each viewpoint interconnects two Nodes



Human Agent | Event | Document | Topic | Topic Hub | Artificial Agent

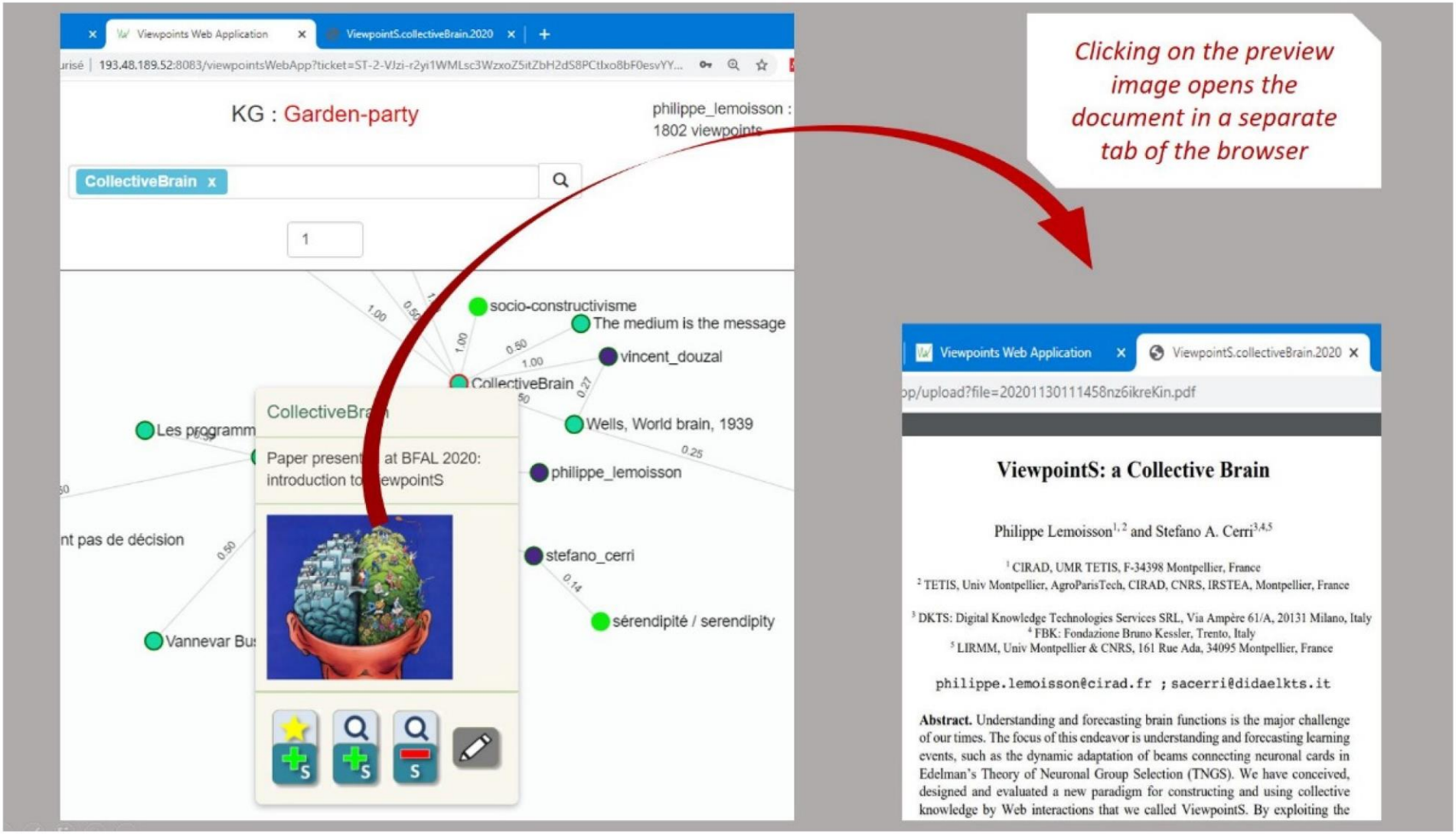
viewpoints → "synapses"



viewpoint
= unit of connectivity

Human Agent | Event | Document | Topic | Topic Hub | Artificial Agent

SNAPSHOT #1 FROM VWA



ViewpointS

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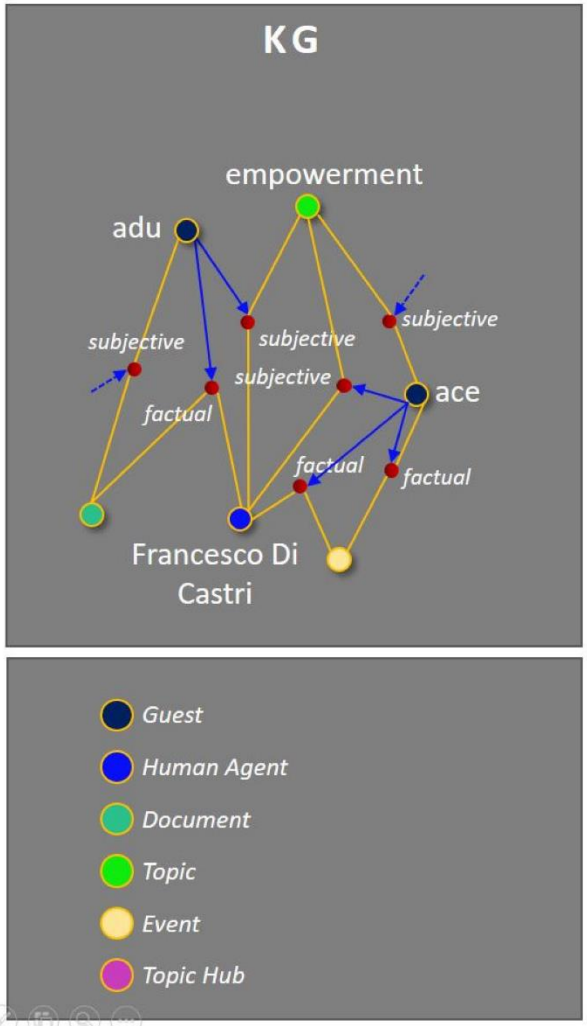
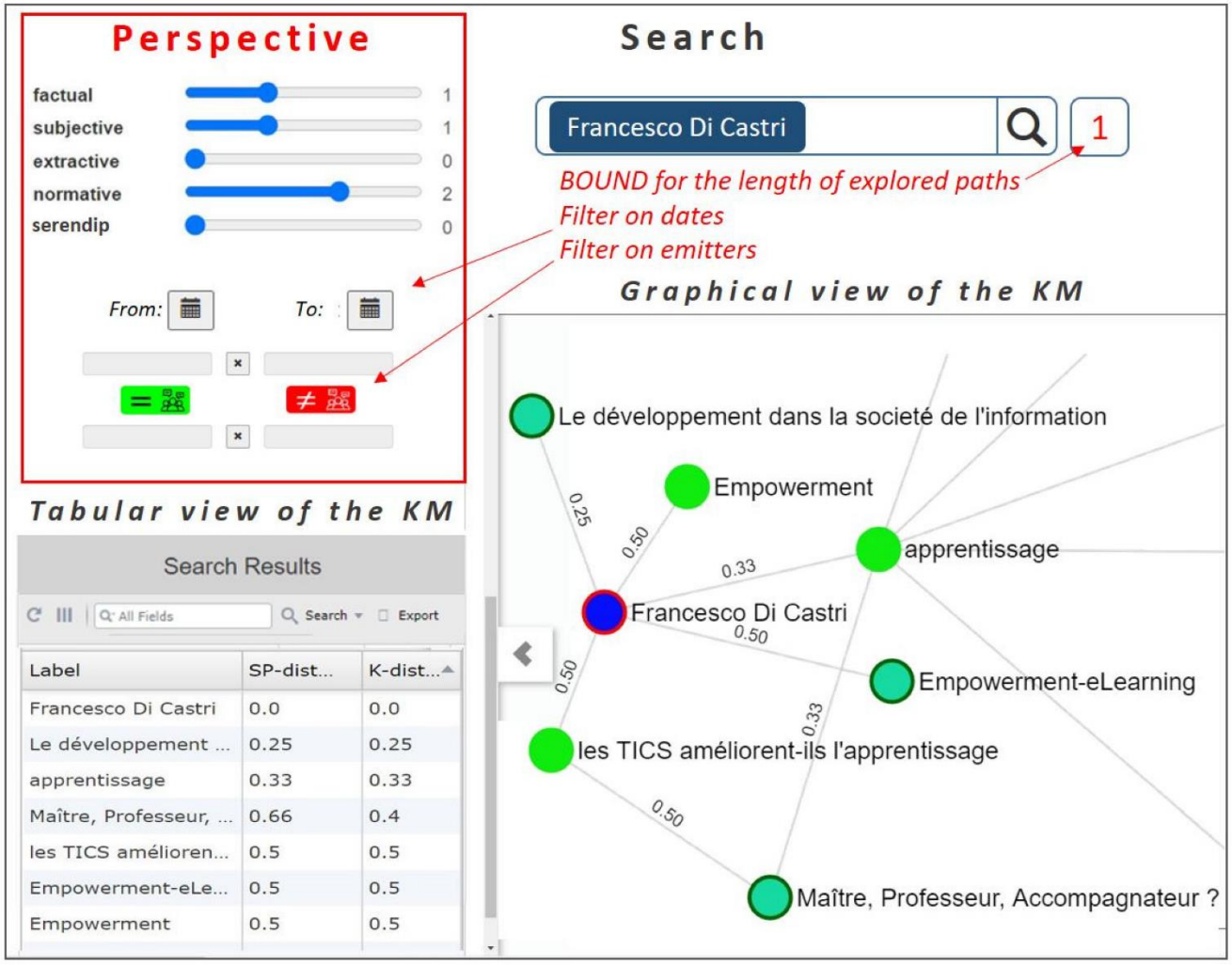
philippe lemoisson cirad

stefano cerri dkts

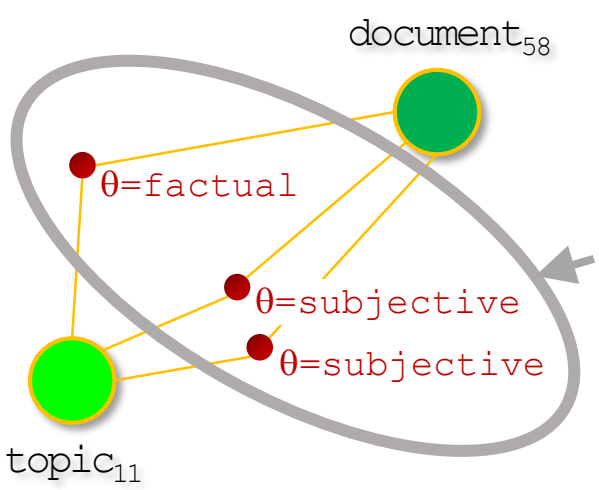
SNAPSHOT #2 FROM VWA

KG ⊗ Perspective ⊗ Search → *a metric KM centered on the target*

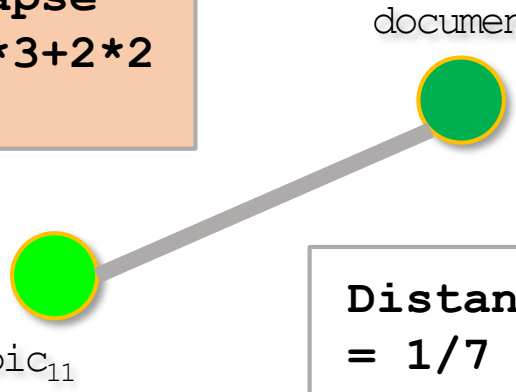




ViewpointS : you filter when you read

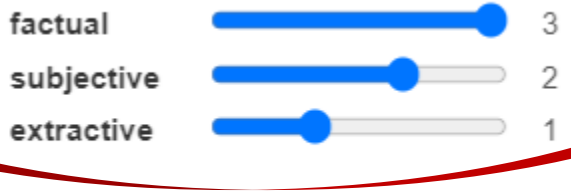


Synapse
= 1*3+2*2
= 7



Distance
= 1/7
= 0,14

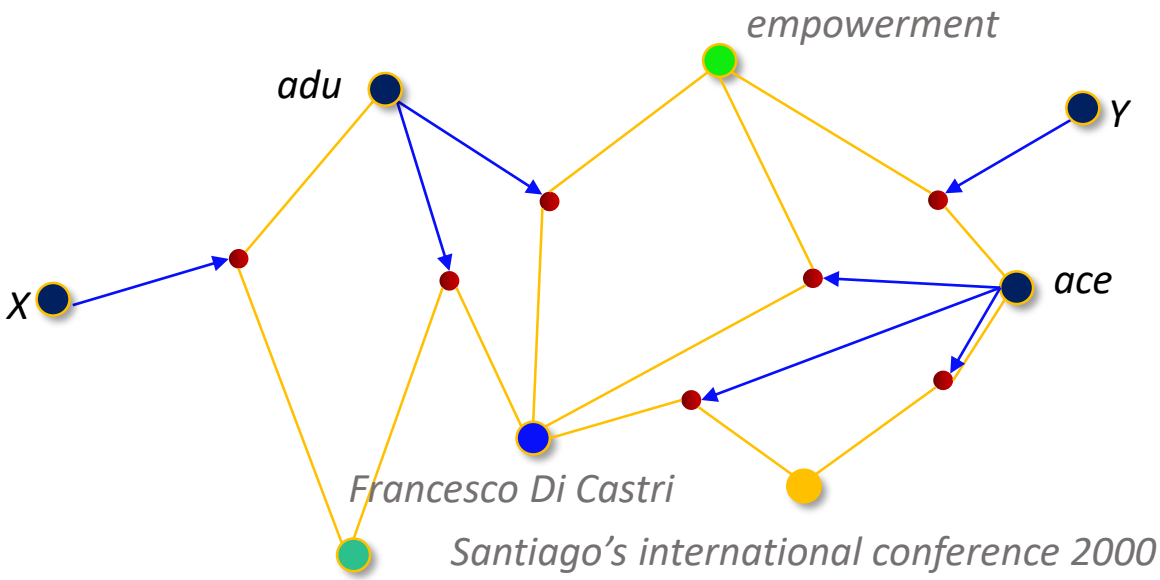
Perspective



The knowledge map depends on the pair of glasses you choose!

ViewpointS: each *perspective* on the Knowledge Graph yields a new Knowledge Map !

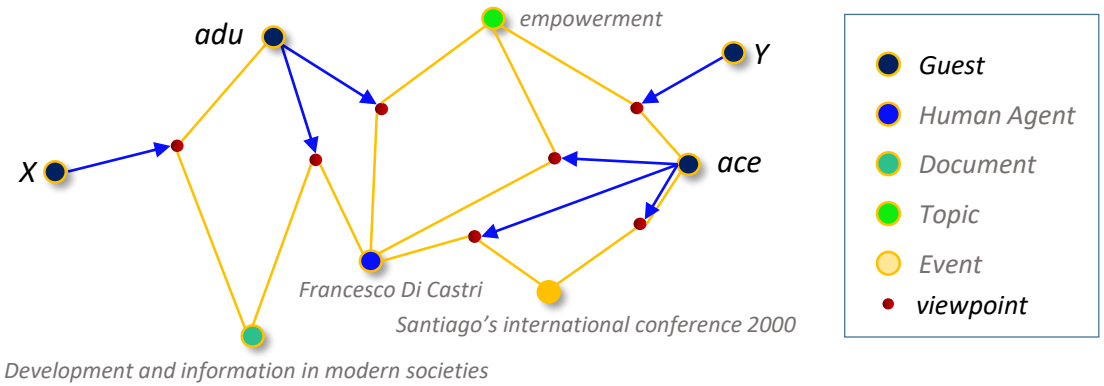
The Knowledge Graph



Development and information in modern societies

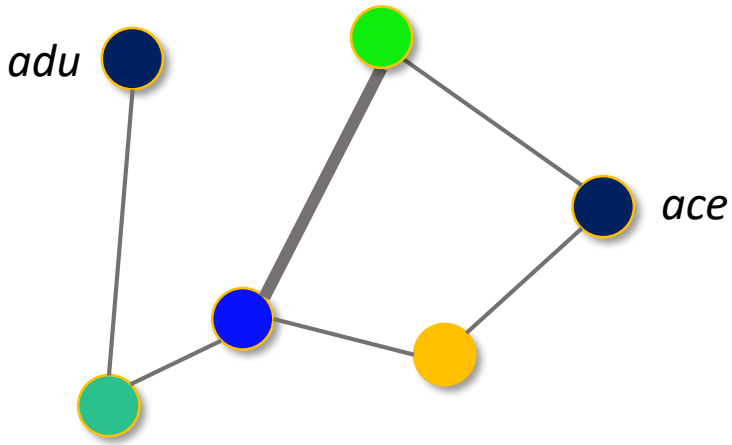
ViewpointS: each *perspective* on the Knowledge Graph yields a new Knowledge Map !

The Knowledge Graph



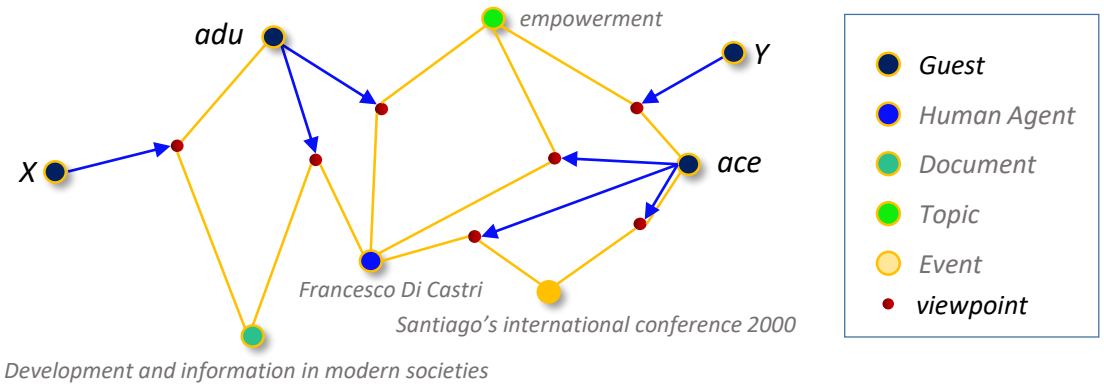
A Knowledge Map under the perspective P_X

all the viewpoints



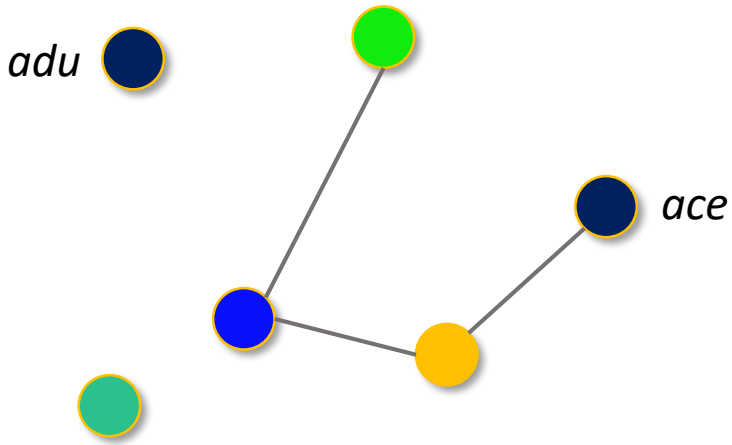
ViewpointS: each *perspective* on the Knowledge Graph yields a new Knowledge Map !

The Knowledge Graph



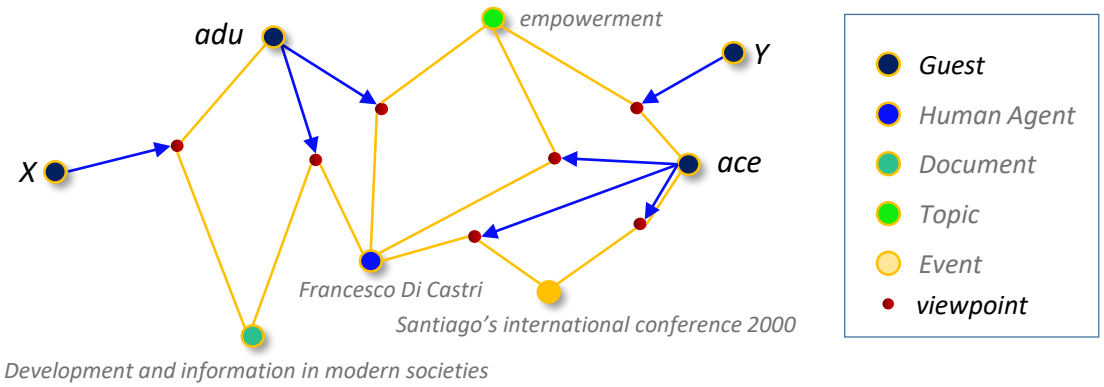
A Knowledge Map under the perspective ${}^{ace}P_A$

only the viewpoints of « ace »



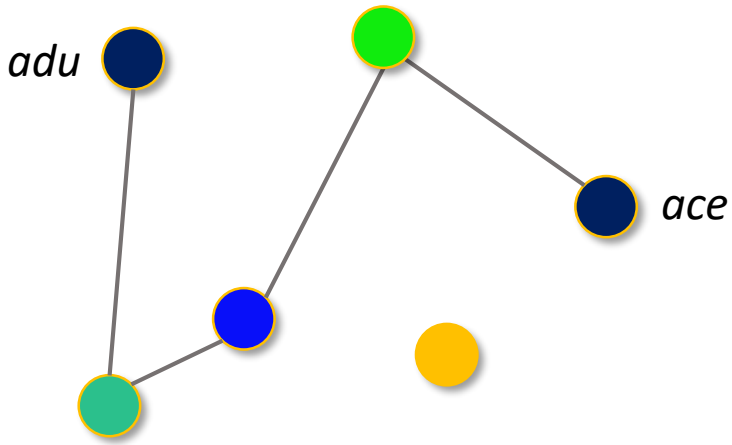
ViewpointS: each *perspective* on the Knowledge Graph yields a new Knowledge Map !

The Knowledge Graph



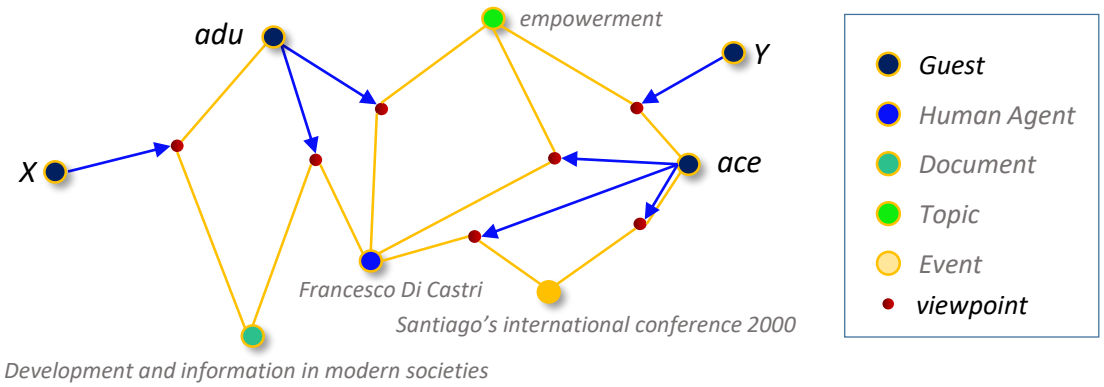
A Knowledge Map under the perspective ${}^{ace}P_B$

all the viewpoints except those of « ace »



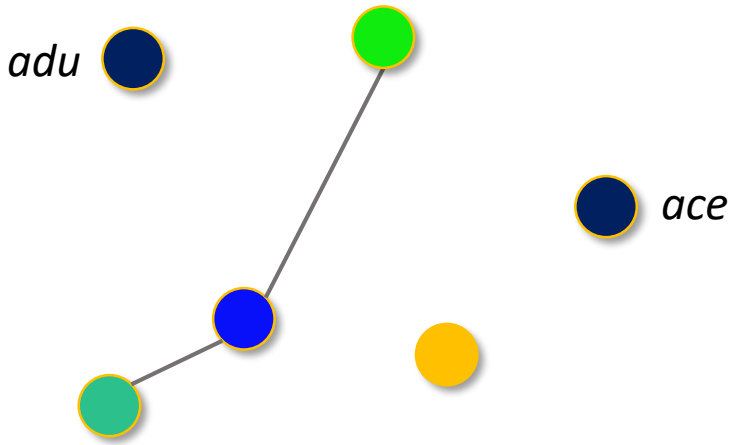
ViewpointS: each *perspective* on the Knowledge Graph yields a new Knowledge Map !

The Knowledge Graph



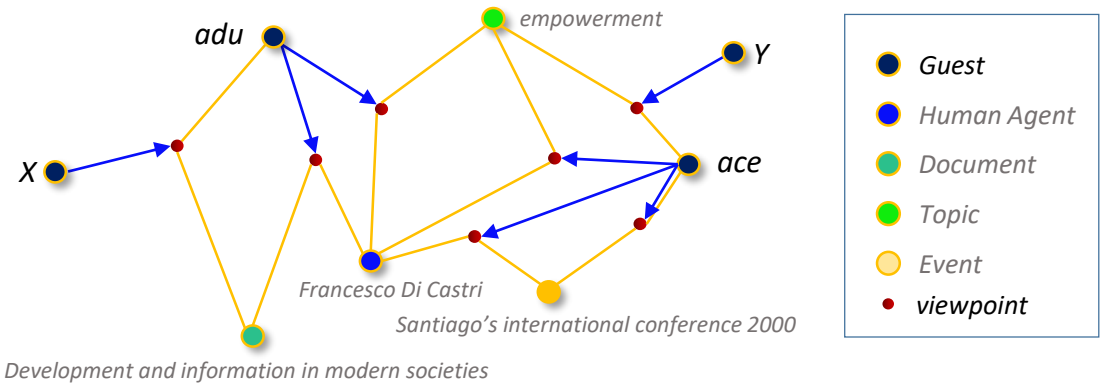
A Knowledge Map under the perspective ${}^{adu}P_A$

only the viewpoints of « adu »



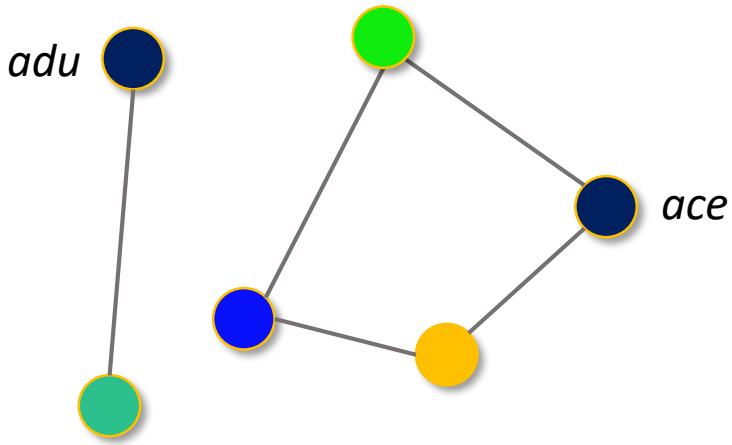
ViewpointS: each *perspective* on the Knowledge Graph yields a new Knowledge Map !

The Knowledge Graph



A Knowledge Map under the perspective $^{adu}P_B$

all the viewpoints except those of « adu »



Conclusions #1: serendipity

Serendipitous learning / discovering / inventing / creating
is very diffuse, important and documented but underestimated

We have a model & prototype & experiment that may be used to
« understand, forecast and foster» serendipitous learning:
ViewpointS and VWA (**ViewpointS Web Application**).

VWA may be exploited to trace human learning by exploiting …
not only ***rational*** but also ***emotional***,
not only ***individual*** but also ***collective reactions***

in order to
study (understand and forecast) **serendipity in human-web interactions;**
then: foster serendipitous encounters (learning, …).

Conclusions #2: sovereignty

Personalization and **protection of individual and collective sovereignty**

1. First degree of sovereignty : *A subset of "relevant and trusted" resources*, organized in a bipartite graph called **Knowledge Graph (KG)** ;
2. Second degree of sovereignty : a **Knowledge Map (KM)** is built *dynamically* according to each set of user's *preferences* (called a "perspective") ;
3. Collective sovereignty: the user may share with a community of trust (a group) the same KG in such a way that ***other trusted Agents may contribute*** (dynamically) with *new resources and/or new viewpoints, leading to the strengthening or weakening of synapses*.

More info available about the experiment (31 pages, open access)

Lemoisson, P.; Cerri, S.A.; Douzal, V.; Dugénie, P.; Tonneau, J.-P.

Collective and Informal Learning in the ViewpointS Interactive Medium.

Information **2021**, *12*, 183.

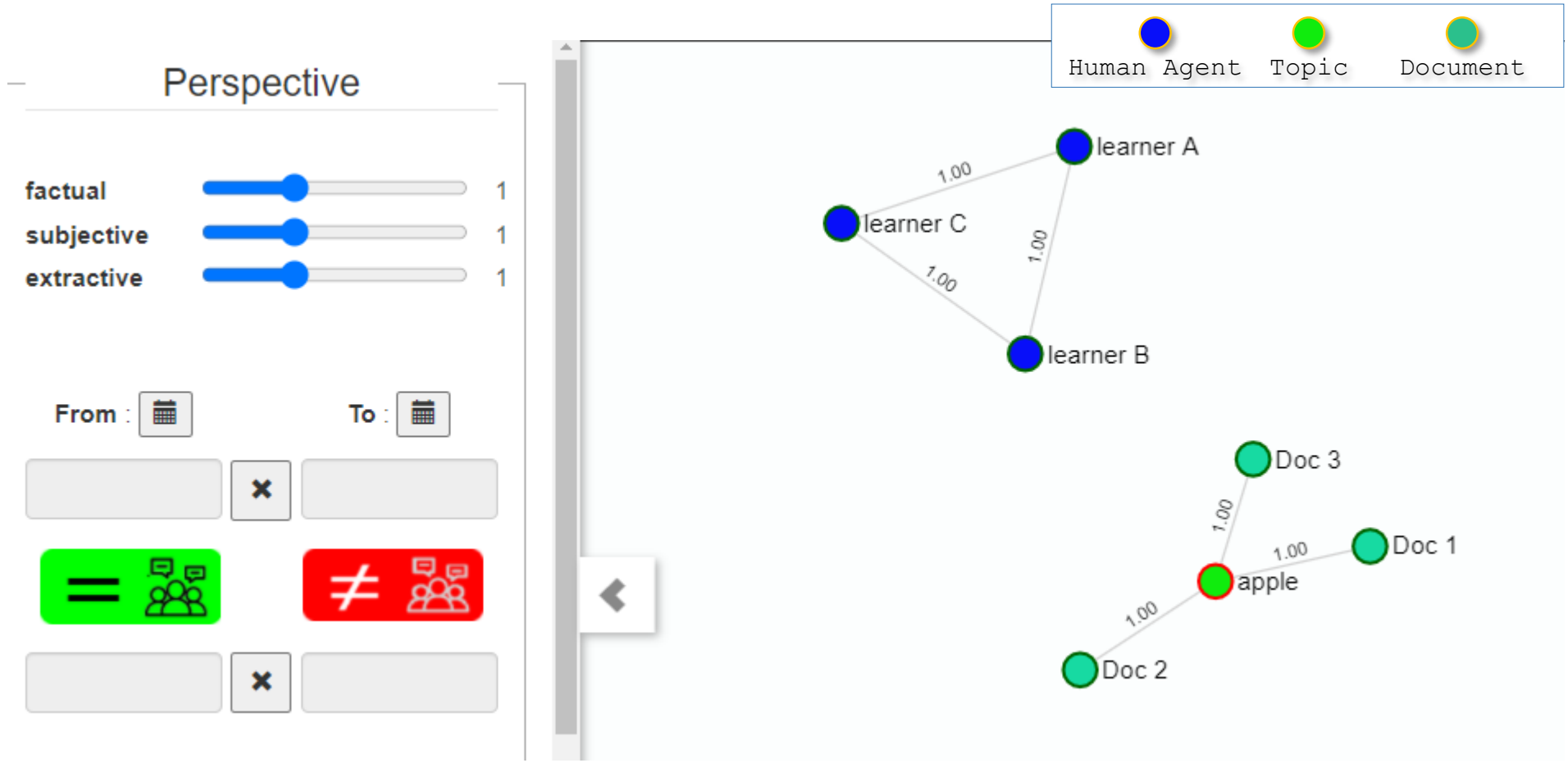
https://doi.org/10.3390/info12050183

https://www.mdpi.com/2078-2489/12/5/183

An imaginary case (mock-up). Learners select documents inside an Intelligent Tutoring System (ITS). Snapshots from the current prototype: ViewpointS Web Application

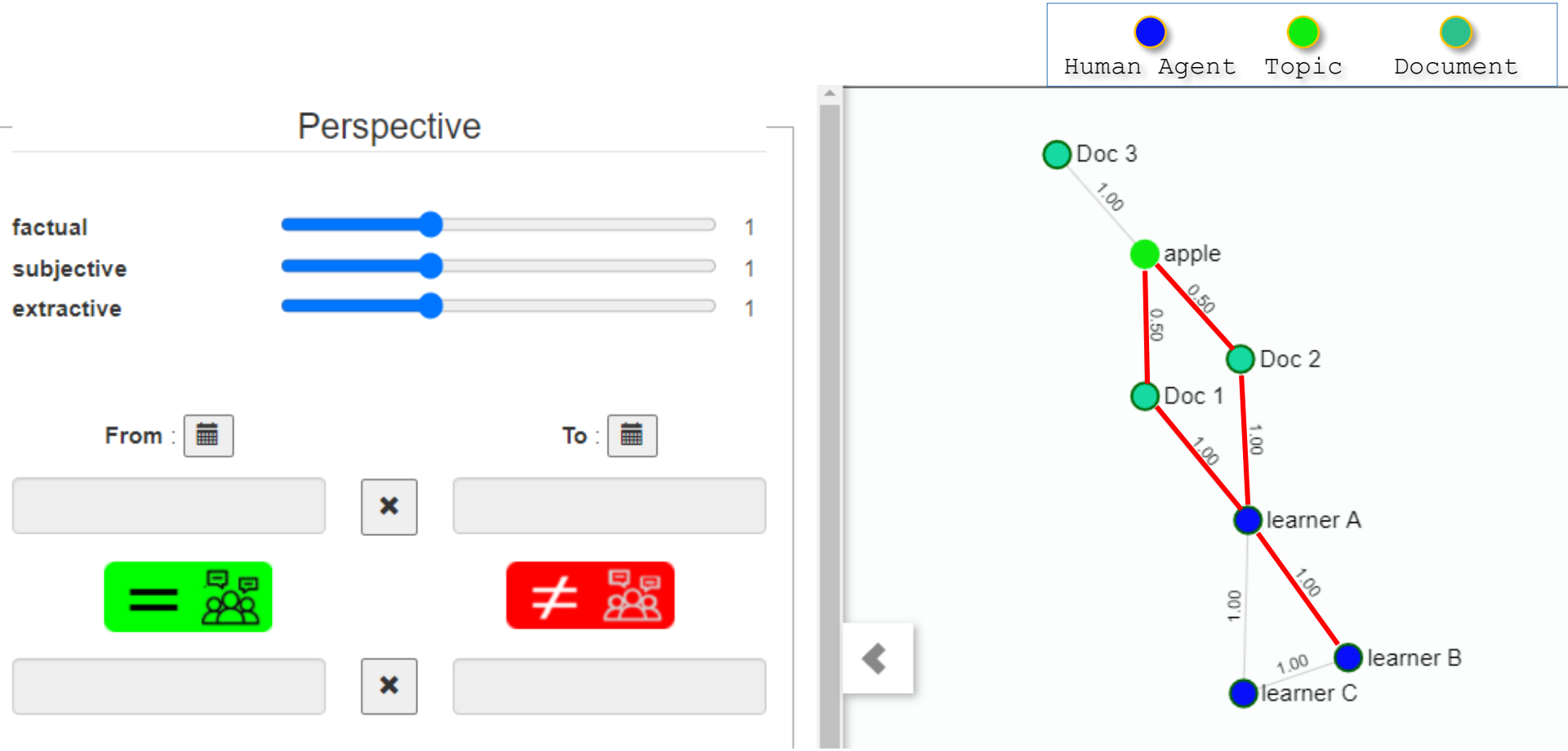
Before interaction

Initial state of the collective knowledge :
3 co-learners (a team), and 3 documents about 1 topic: « apple ».
The 3 learners use the same perspective and therefore view the same Knowledge Map.



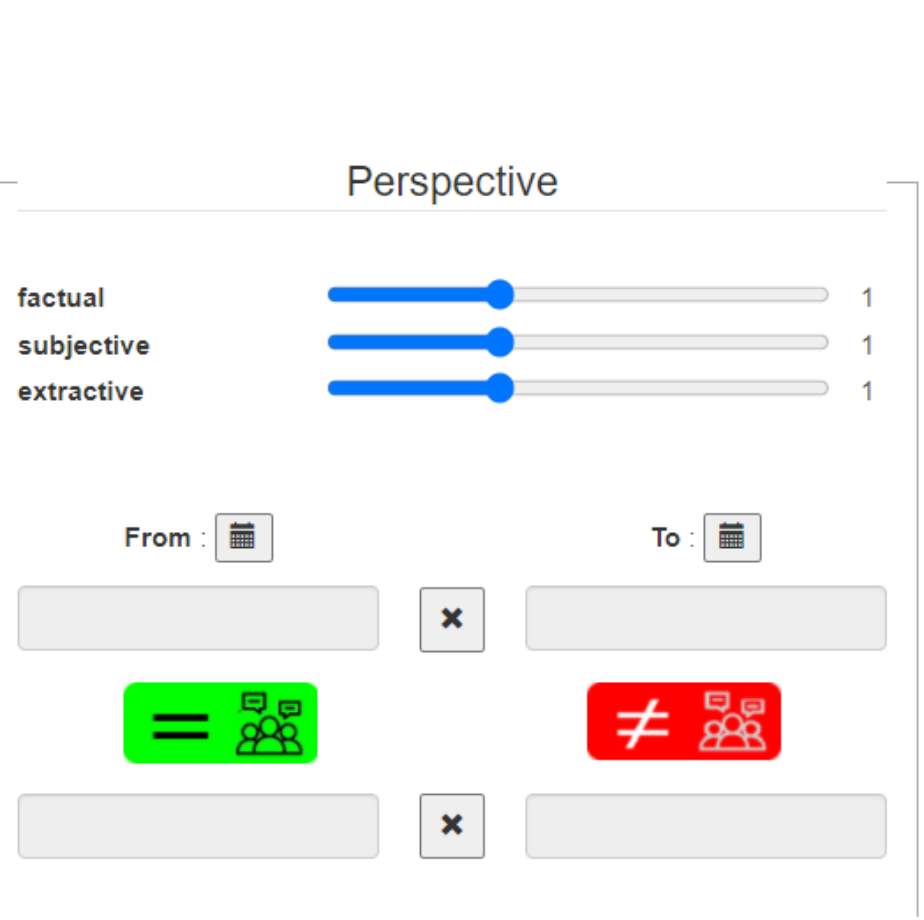
‘A’ evaluates, ‘B’ benefits from ‘A’

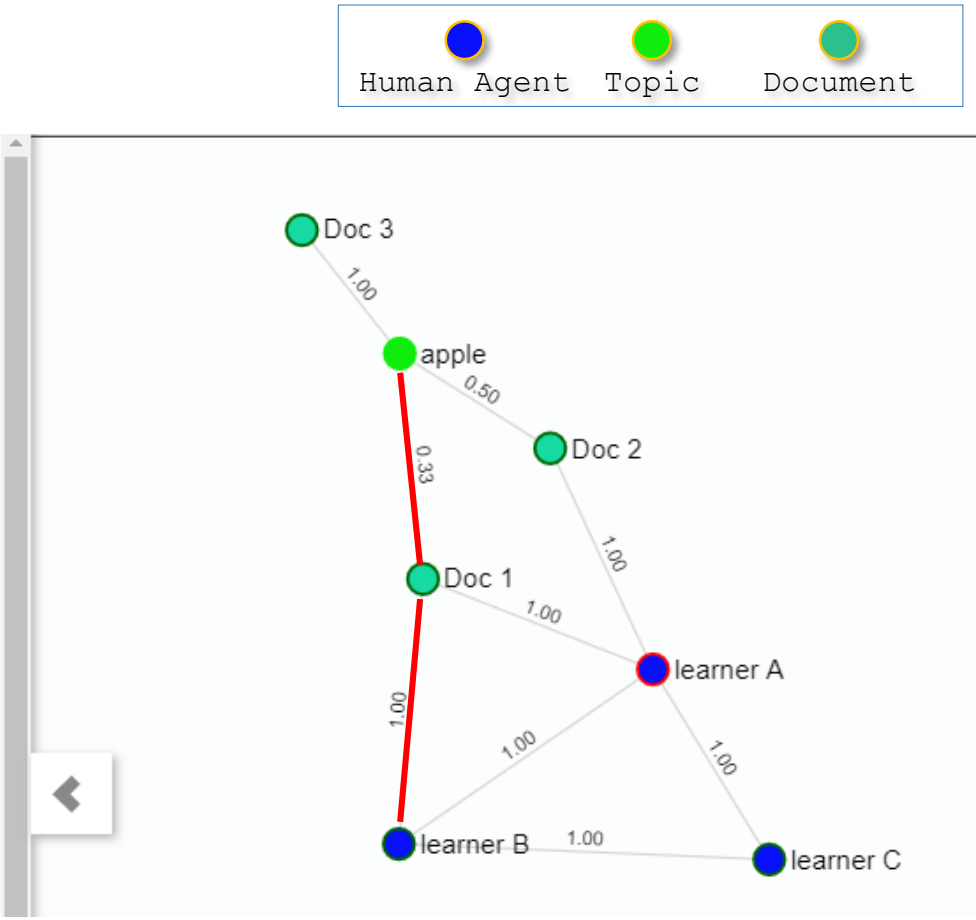
‘A’ evaluates the 3 documents. ‘A’ has “a positive emotion” about Doc 1 and Doc 2 (she finds them relevant with respect to ‘apple’); this feedback from ‘A’ connects ‘A’ to the two documents and reinforces their **proximity** to ‘ apple’. When ‘B’ asks for the **shortest path** from him to ‘apple’ (search for information about ‘apple’) ; he finds Doc 1 and Doc 2 on his way.



‘B’ evaluates

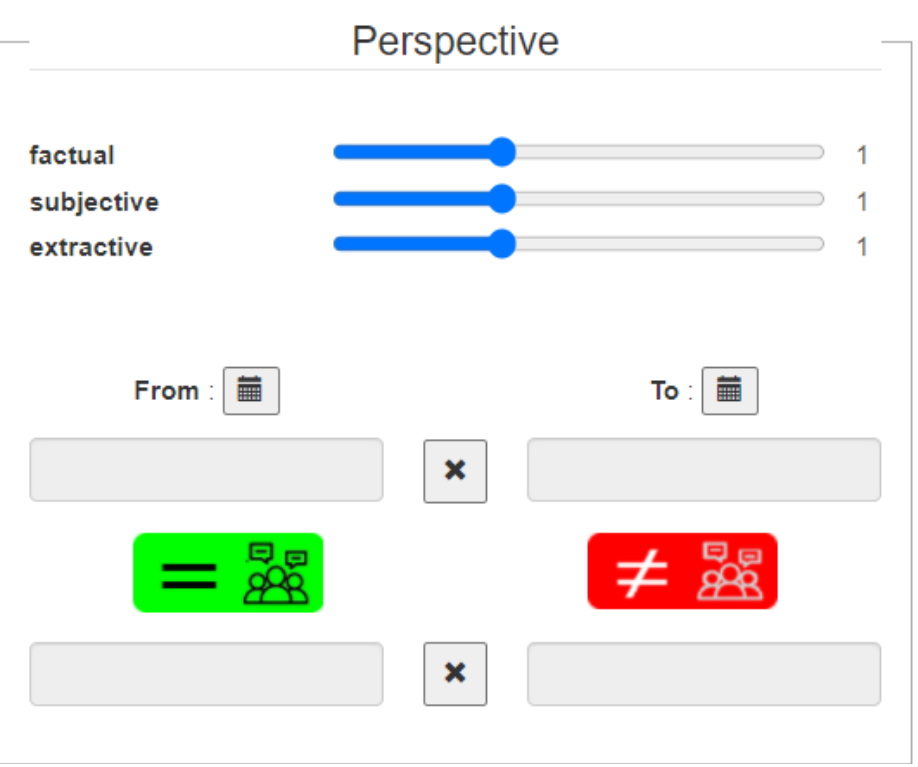
‘B’ has a “positive emotion” about Doc 1 but not about Doc 2; this results in reinforcing the path ‘learner B’-Doc 1-‘apple’. Now the shortest path from him to ‘apple’ goes through ‘Doc 1’.

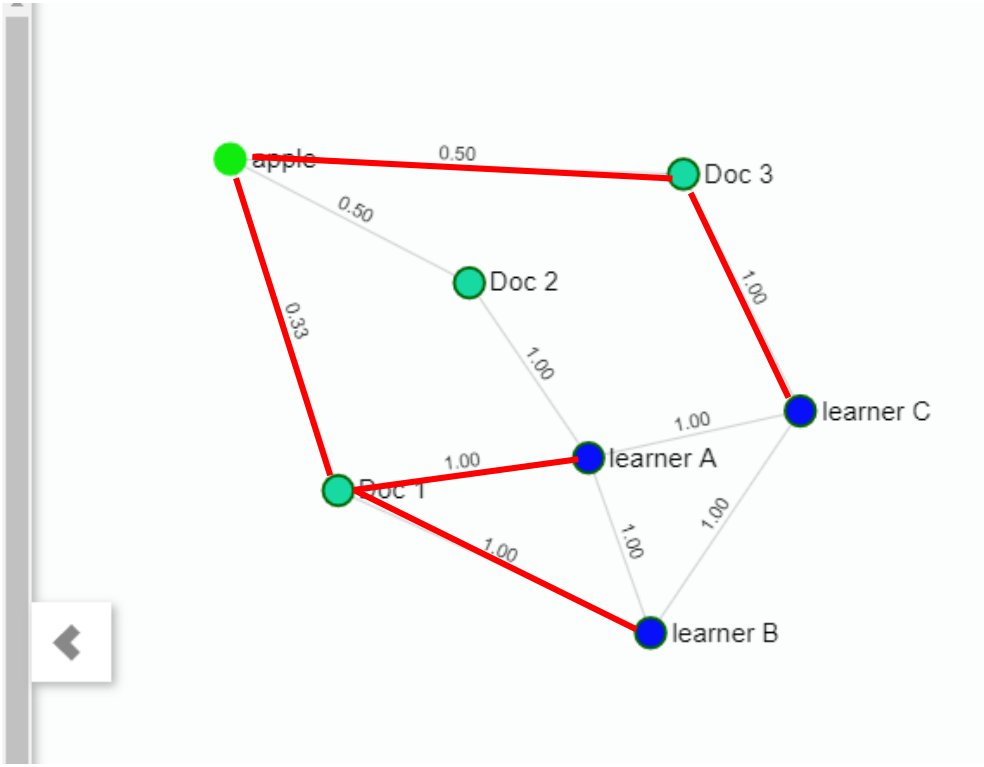




‘C’ evaluates

‘C’ evaluates the 3 documents. ‘C’ has a “positive emotion” about Doc 3; this feedback connects ‘C’ to Doc 3 and reinforces the proximity between Doc 3 and ‘apple’.
At this stage, if ‘A’, ‘B’ and ‘C’ asked for the shortest path to ‘apple’, they would respectively get Doc 1, Doc 1 and Doc 3.





‘B’ changes his perspective

‘B’ has studied Doc 1 and is not fully satisfied. He asks again for a short path, but in order to discover new sources of knowledge, he changes his perspective by filtering viewpoints with the criteria : “only learner C’s viewpoints”. Now the shortest path between him and ‘apple’ goes through ‘learner C’ and ‘Doc 3’.