

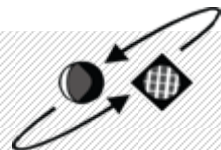


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The Virtual Museum Guide

Mediating expert knowledge and visitor
interest in art work recommendation

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- › Model a cognitive agent (museum tour guide)
- › Successful information selection: predict behavior of a museum tour guide





- › Assist in browsing through a museum
- › Transfer knowledge (Education)
- › Appeal to visitors' interests (Entertainment)



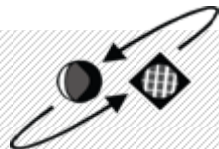


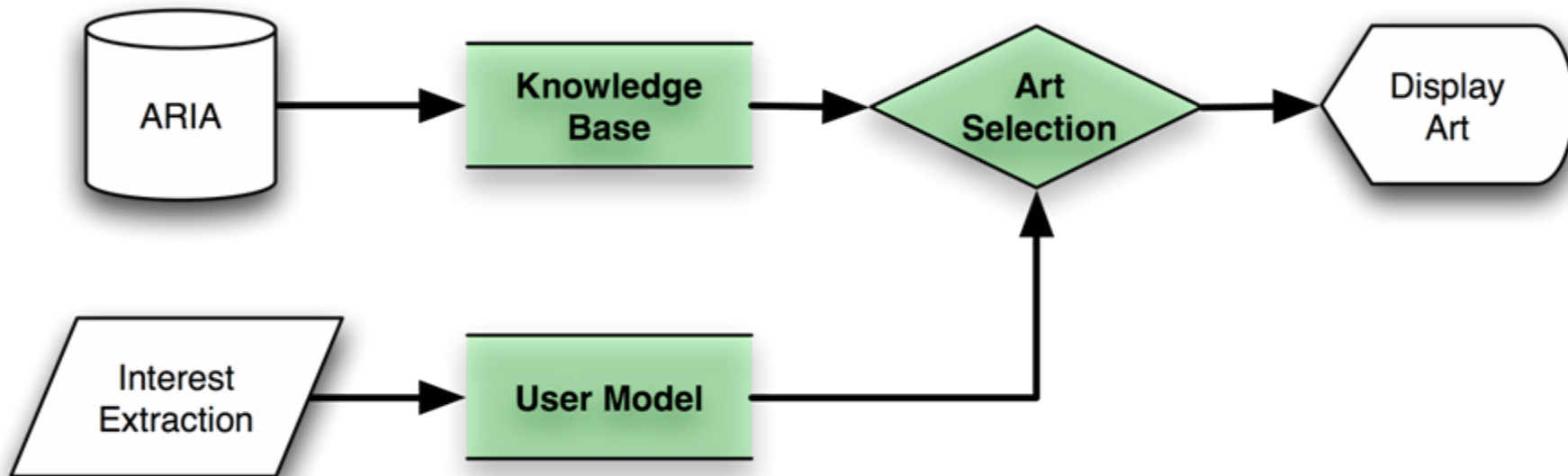
- › Model of declarative memory of the guide
- › ACT-R (Anderson et al. PsychRev 2004)

- Memory is optimally adapted to fit the environment's demands
- Activation:

Probability that you will need a memory fact

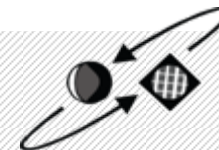
- Recency of occurrences in the environment
- Frequency of occurrences in the environment
- Context (frequency of co-occurrences with other facts in the environment)





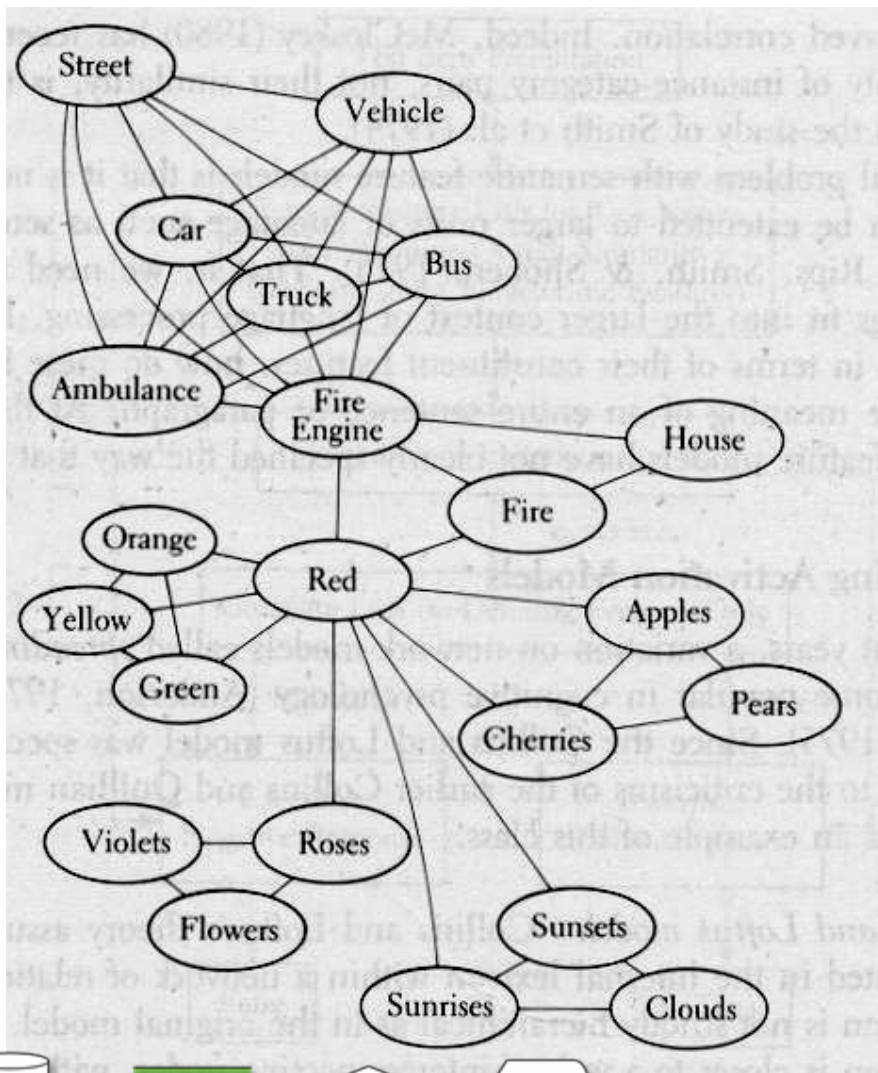
Environment

Memory

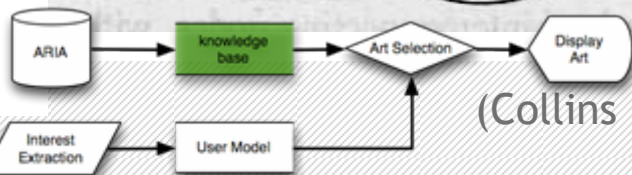




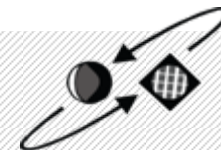
Knowledge Base



- › Structured as associative semantic network
- › Strong associations mean that the connected concepts are often needed in the same context



(Collins & Loftus, 1975)





Semantic Art Network



Night watch



Ecce Homo

0.8

0.6

0.7

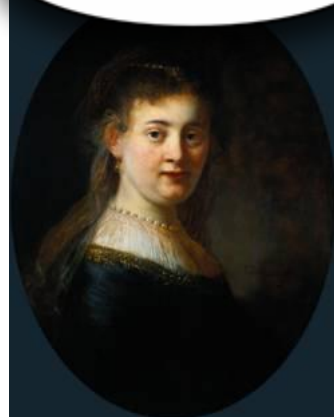
0.6

0.5

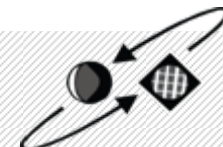
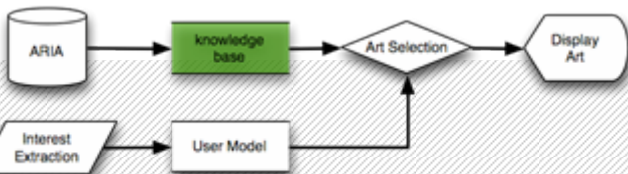


The company
of Albert Bas

Saskia



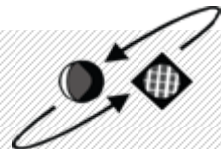
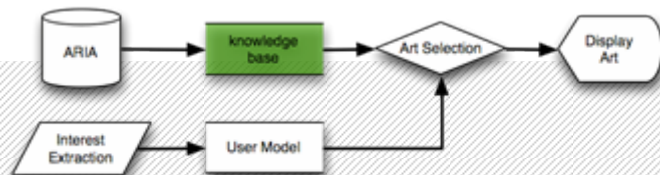
Resurrection





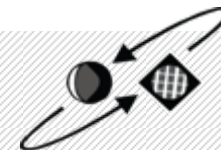
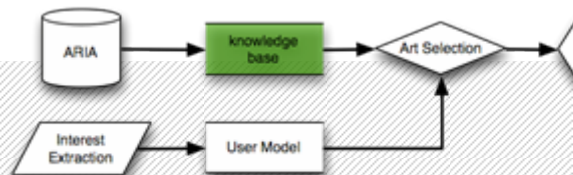
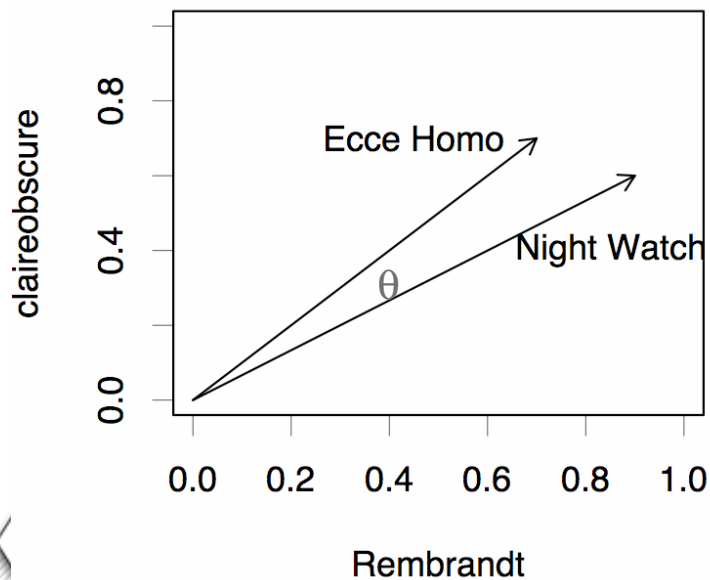
Similar descriptions reflect similarity in art works

1. Extract art descriptions from ARIA
2. Term frequencies
 - Keywords (*Chiaroscuro, Rembrandt's circle*)
 - Artist names (*Johannes Vermeer, Rembrandt Harmensz. van Rijn*)
 - Art work titles (*Ecce Homo, The Kitchen Maid*)





3. Latent Semantic Analysis (Landauer & Dumais 1997)
 - Compute likelihood of two words co-occurring
 - Introduces relatedness between art works that do not have terms in common
4. Cosine between feature vectors





Findings



0.99



0.50



0.87

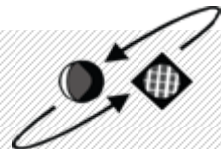
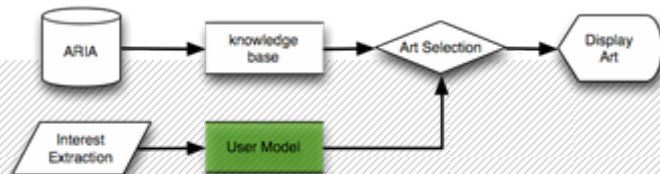


0.47





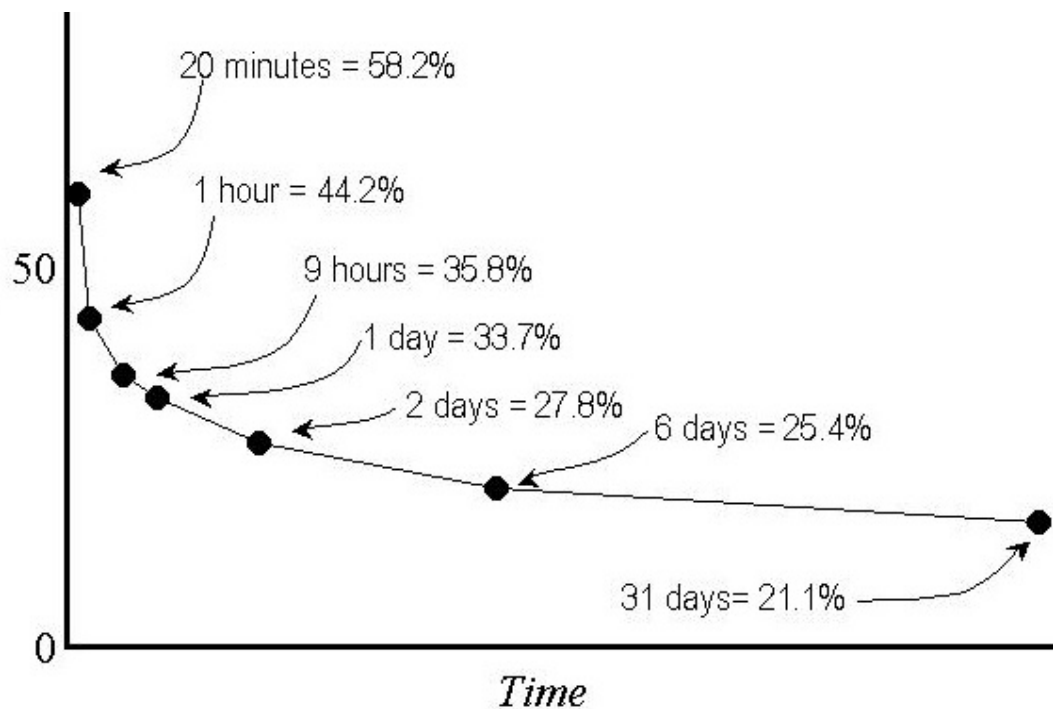
- › The guide generates hypotheses on visitor interests
 - *This user finds the Night Watch not interesting*
 - *This user finds 'Ecce Homo' interesting*
- › Based on user's feedback
 - Explicit: Button presses
 - Implicit: behavior-based hypotheses on visitor interests (e.g., gaze analysis)



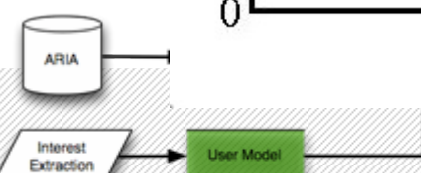


› Hypotheses decay over time

- Similar to forgetting of declarative facts (Anderson & Schooler, 1991)

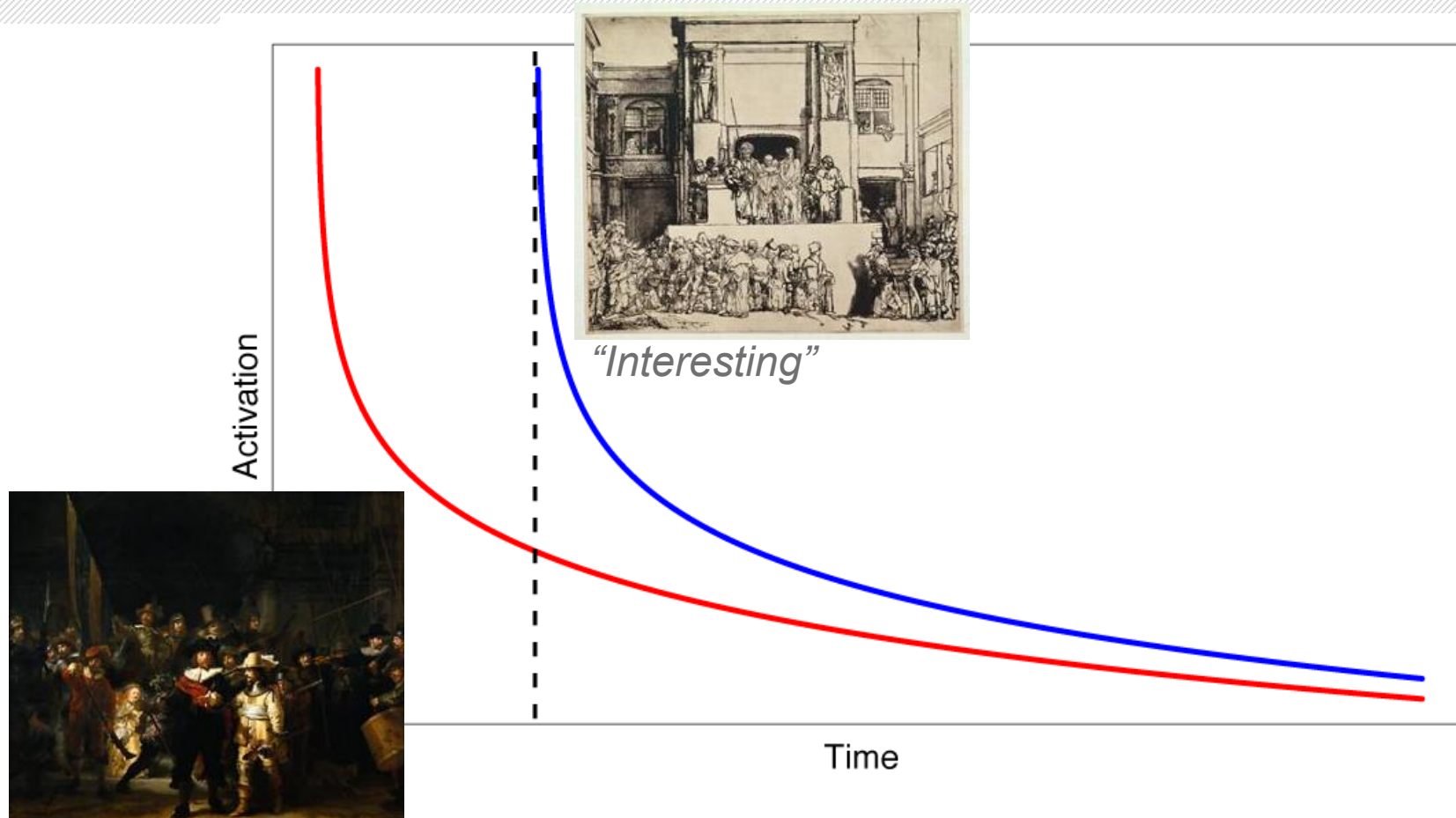


$$A_i = \ln \left[\frac{\alpha}{\sqrt{t_i}} \right]$$





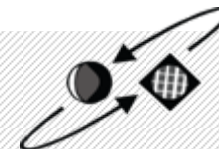
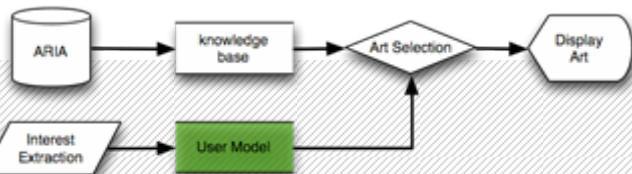
Forgetting of interests



"Not interesting"

"Interesting"

Time





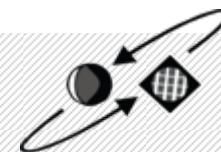
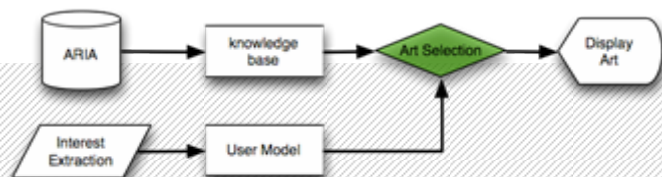
- › Combine perceived (dis)interests and prior knowledge to recommend a suitable art work
- › Spreading Activation

$$A_i = \sum_j A_j^{IH} S_{ji}$$

A_i : Prediction of presentation

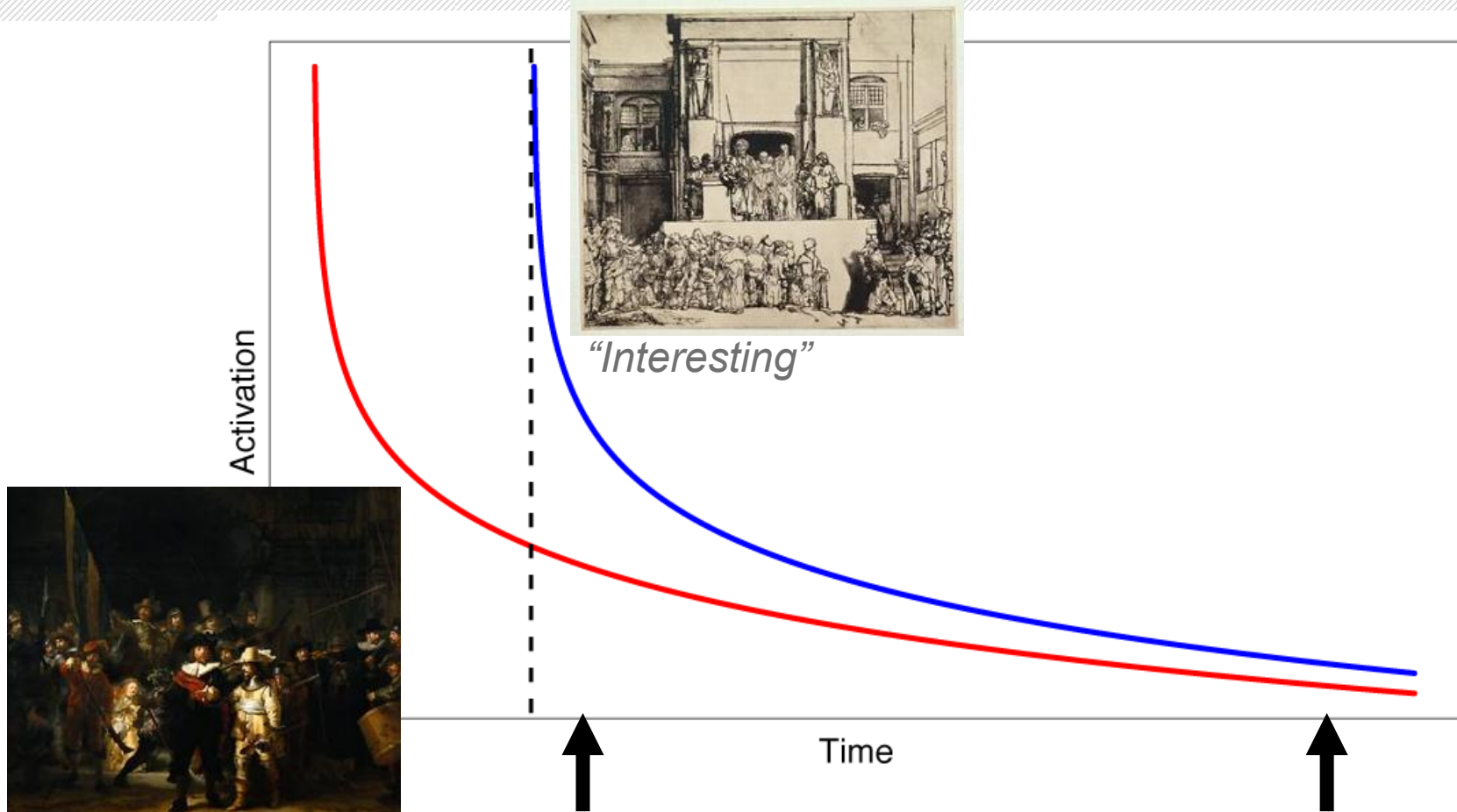
A_j^{IH} : Activation of interest hypothesis

S_{ji} : Similarity





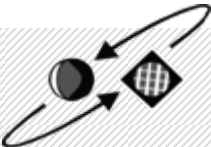
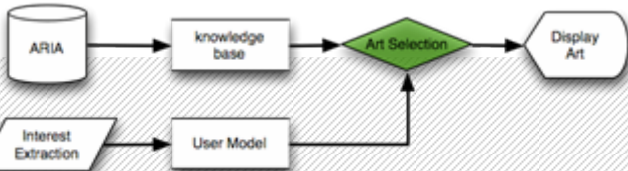
Art selection



"Not interesting"

"Interesting"

Time





Art selection



Night watch

0.8

Ecce Homo



0.6

0.7

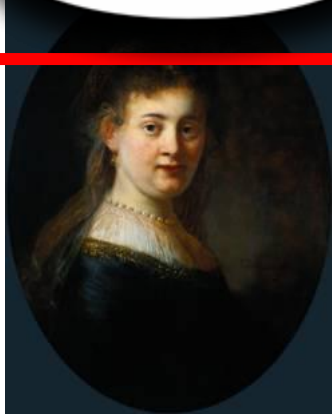
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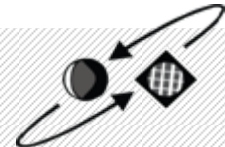
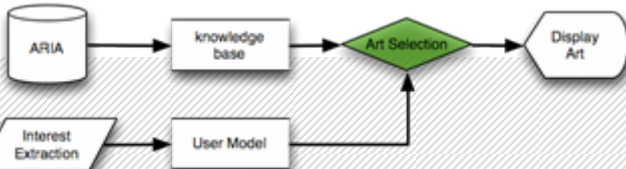
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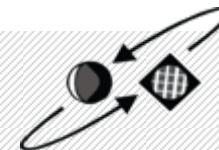
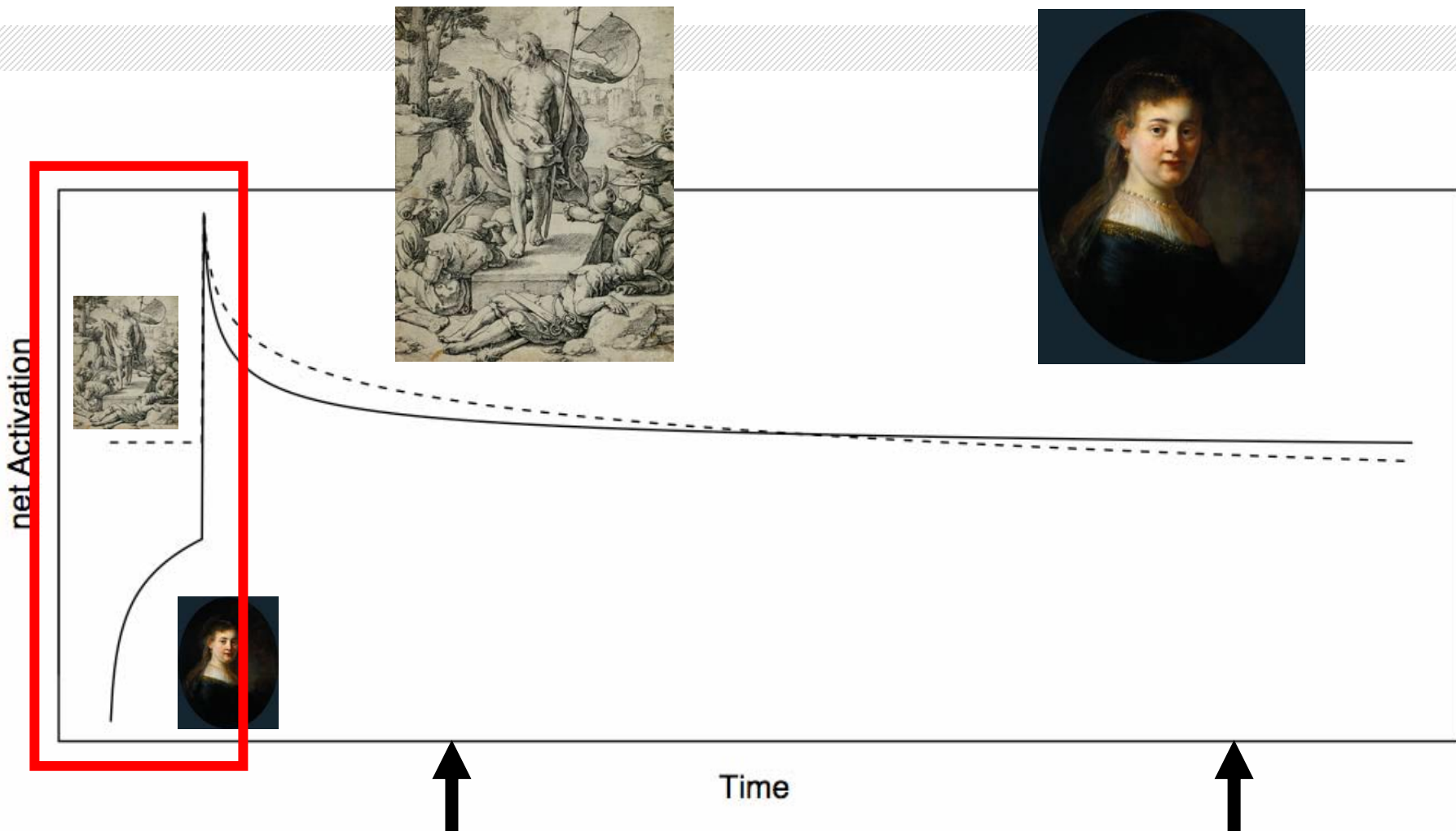


Resurrection





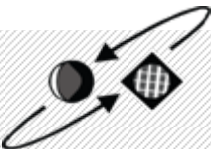
Art Selection





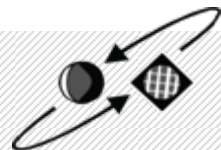
Does it all work?

- › Technically it works
 - Relate art works to previously shown
 - Incorporate visitor's (dis)interest
- › Currently a user study is being performed to assess user satisfaction
 - Relation between various selection algorithms and user feedback





- › Knowledge Base
 - Classification of art works
 - Semantic network
- › User Model
 - Interest hypotheses
 - Temporal decay
- › Art Selection
 - Spreading activation
 - Dual role of museum will be preserved





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Thank you for your attention

Art works from collection Rijksmuseum Amsterdam

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www.ai.rug.nl/~leendert

