To Decay or Not to Decay: Modeling Video Memorability Over Time

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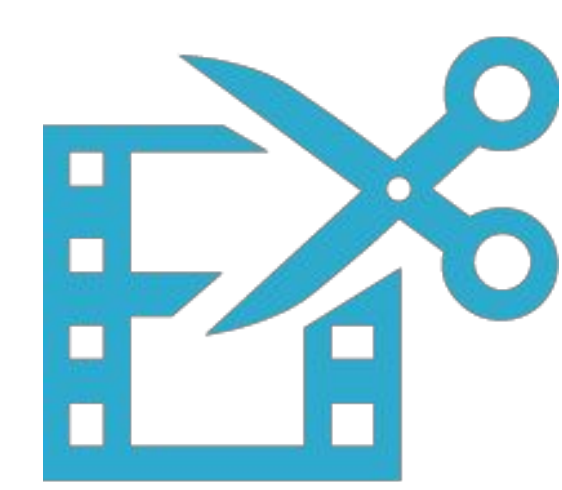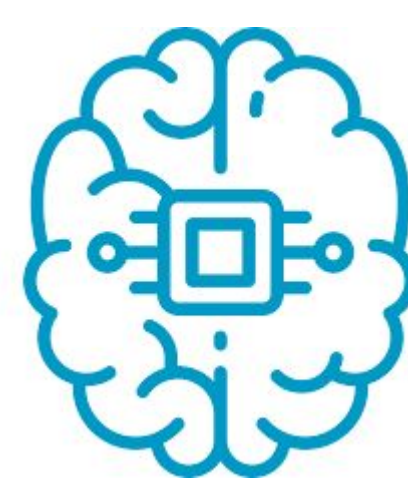
MIT CSAIL

Computational Perception & Cognition
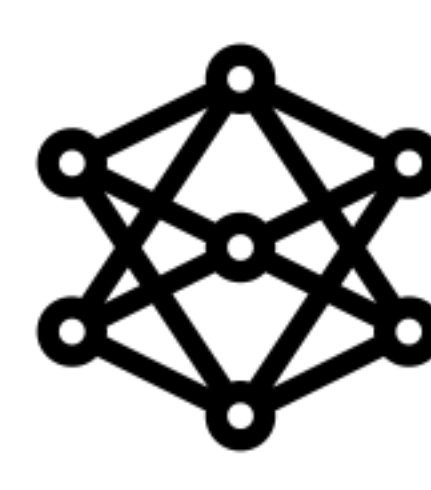
Why predict video memorability?

Video editing

Education

Virtual Assistant

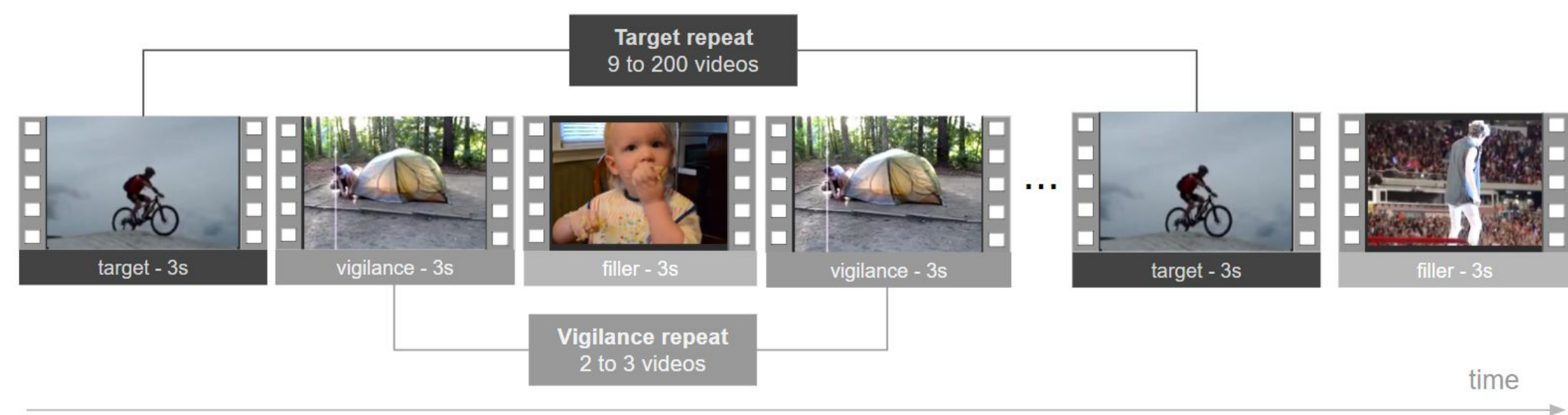Cognitive AI

The Memento project

What is memorable?

Can we predict it?

Why is it memorable?

Memento10k: The biggest video memorability dataset

- 10k+ videos
- 90+ annotations per video
- Nearly 1M annotations

High Memorability

Low Memorability

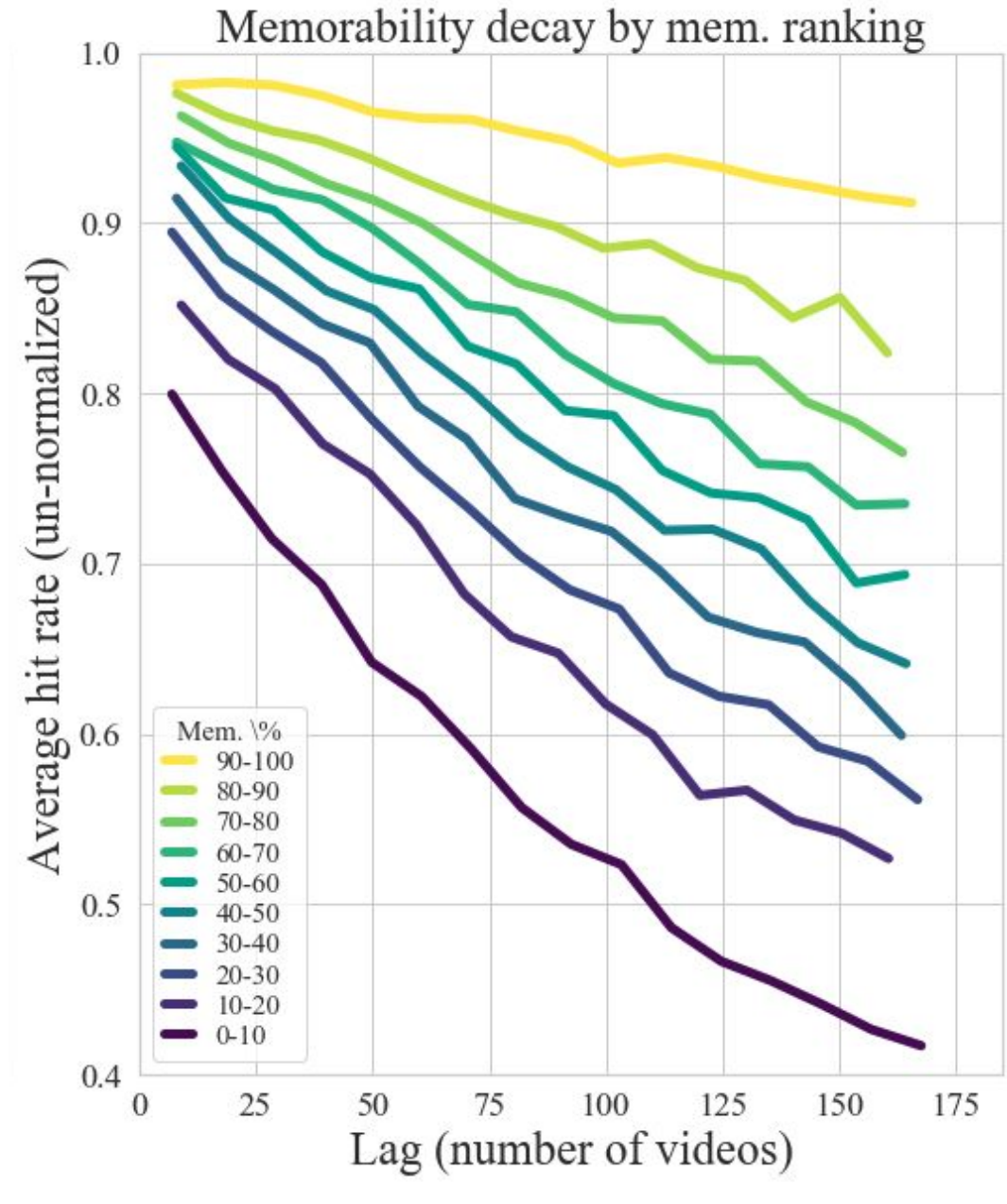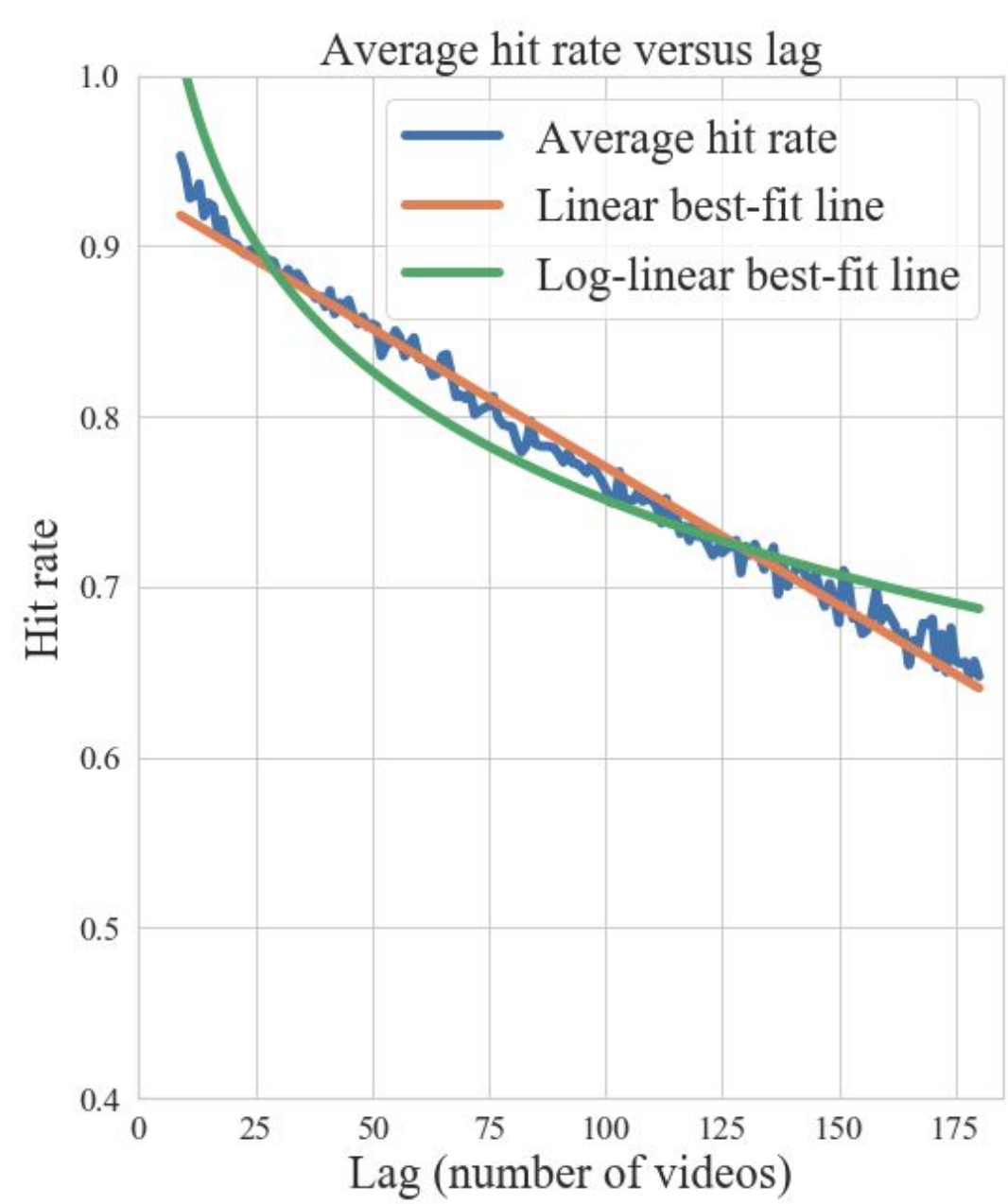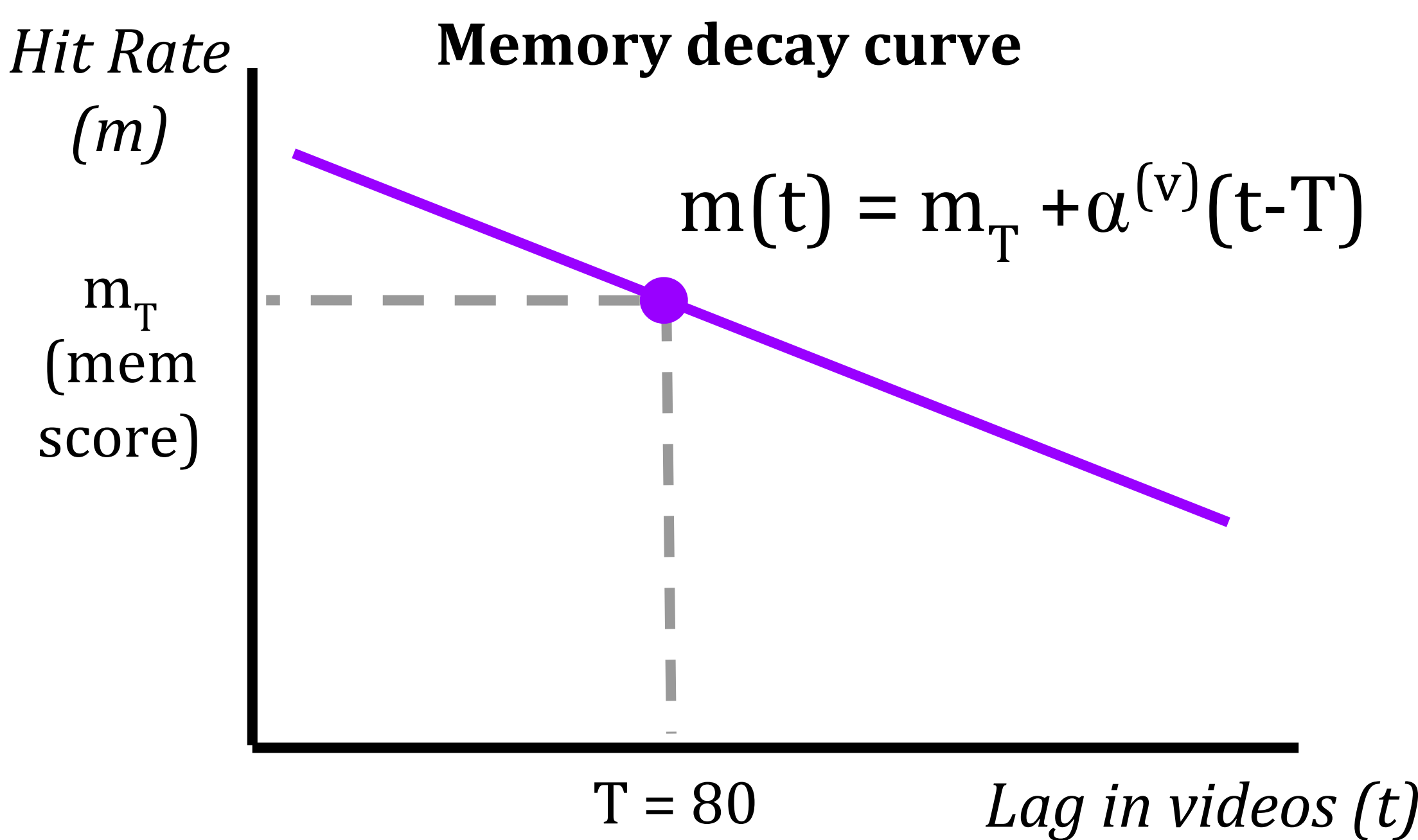Crowdworkers play an online memorability game and indicate when they see a repeat

Play the game! memento-game.csail.mit.edu

Explore the data! memento-vis.csail.mit.edu
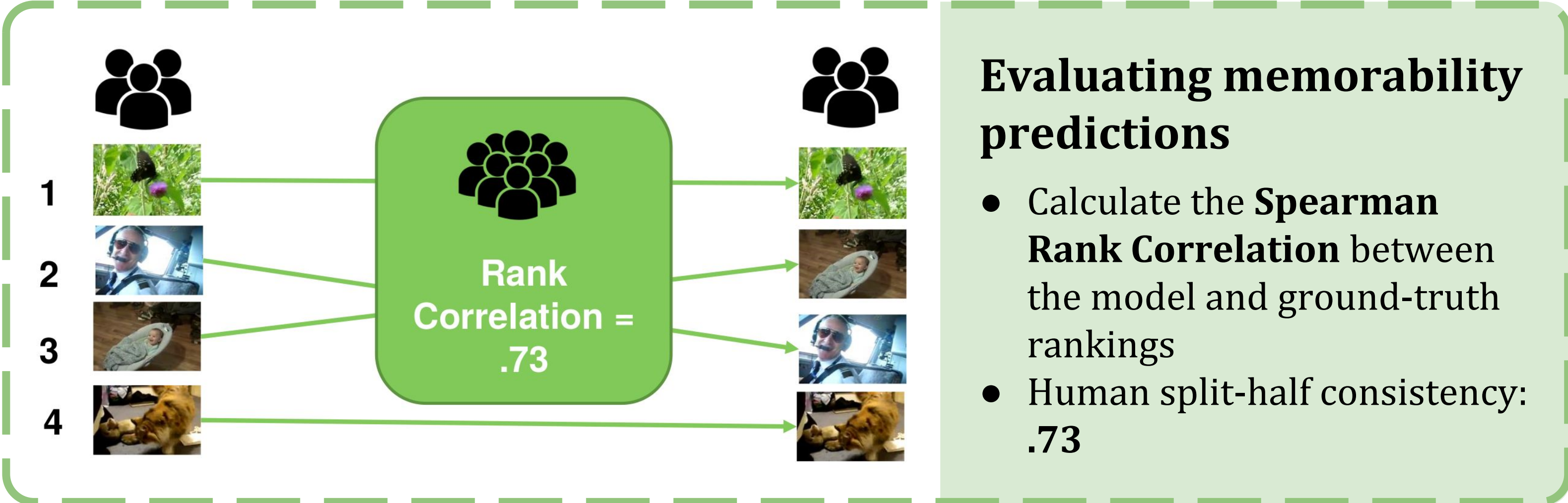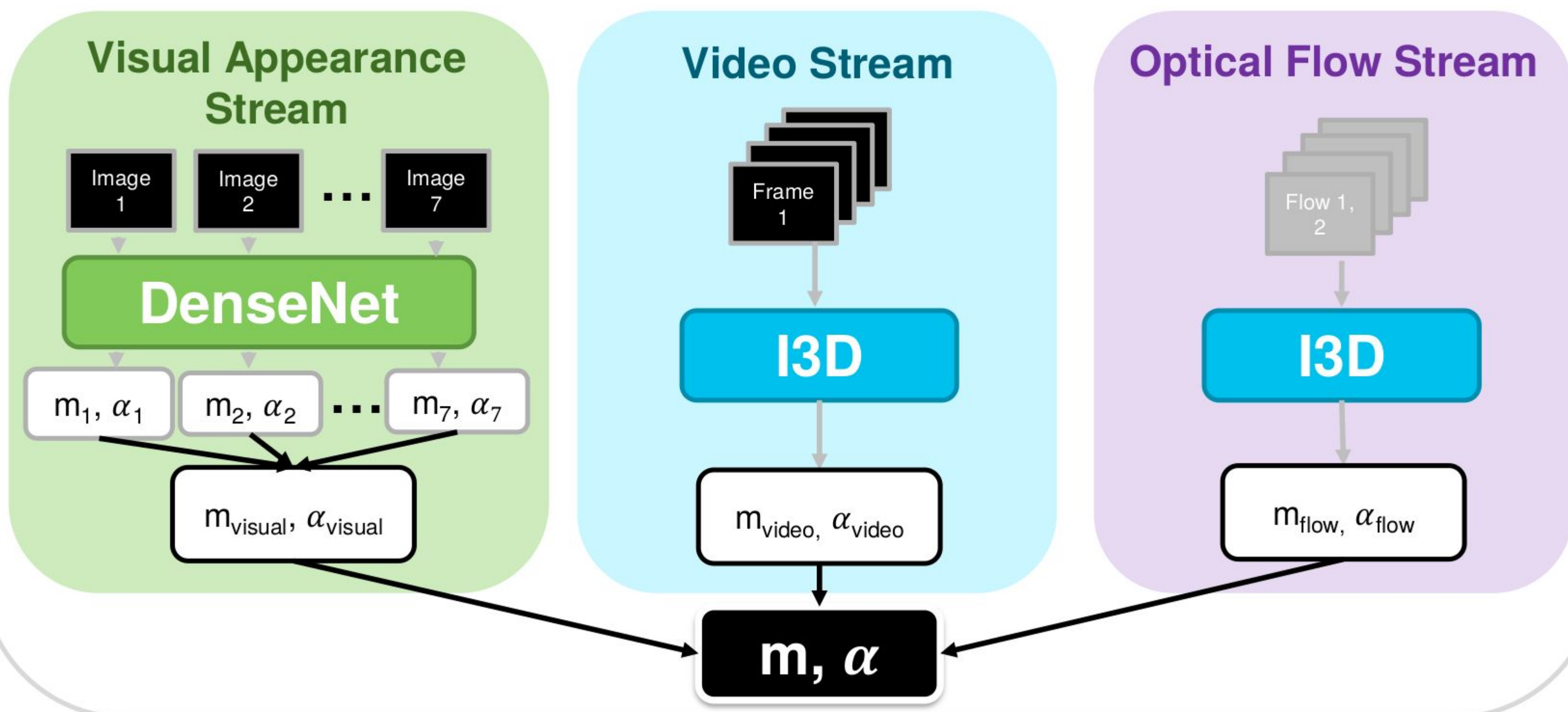
Modeling the memory decay curve

- Video memory decays **linearly** with lag
- Videos decay at **different** decay rates
- Video decay is parametrized by decay rate α and mem score m_T

Memory decay curve

$$m(t) = m_T + \alpha^{(v)}(t-T)$$

Hit Rate (m)

m_T (mem score)

T = 80   *Lag in videos (t)*

Average hit rate versus lag
- Average hit rate
- Linear best-fit line
- Log-linear best-fit line

Memorability decay by mem. ranking

Left: A linear trend fits our memorability data.
Right: Videos decay at different rates.

Predicting video memorability

Temporal MemNet

Visual Appearance Stream

Image 1, Image 2, ... Image 7

DenseNet

m_1, α_1 m_2, α_2 ... m_7, α_7

$m_{visual}, \alpha_{visual}$

Video Stream

Frame 1

I3D

$m_{video}, \alpha_{video}$

Optical Flow Stream

Flow 1, 2

I3D

m_{flow}, α_{flow}

m, α

Evaluating memorability predictions

Rank Correlation = .73

- Calculate the **Spearman Rank Correlation** between the model and ground-truth rankings
- Human split-half consistency: .73

Model	Visual Only	Video Only	Optical Flow Only	Visual + Optical Flow	Temporal MemNet
Spearman's Rank Correlation	.61	.62	.56	.64	**.66**

Example Predictions:

—— Predicted decay curve (Temporal MemNet)   —— Ground truth decay curve

Predicted Score 1.00

Predicted Score 0.86

Predicted Score 0.53

Predicted Score 0.98

Predicted Score 0.79

Predicted Score 0.56

Future work

- Improve memorability prediction by adding semantic supervision
- Use recurrent network to estimate memorability at different lags
- Use probabilistic approach to learn from raw annotations
- Study impact of motion on memorability