

# Image-based User Preferences Analysis: Towards Advanced User Modelling

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## Images as decision-makers



Images may influence our **behaviour** on the Web in various ways.

They can be used to capture our **preferences**, while picking up fashion items, furniture, movies, and many more.

However, they have not been reflected in the **recommendation** process yet.

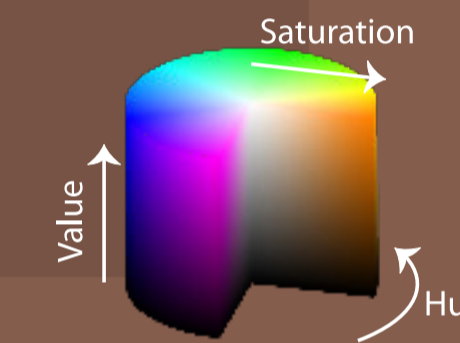
## Analysis of the movie genres



**Goal:** To reveal, whether the features extracted from the images fit into genres.

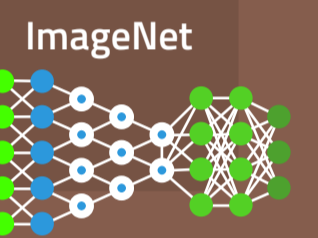
### Features extracted using color analysis

Genre	Similarity	Variance
Children	0.09	0.06
Animation	0.10	0.07
All	0.19	0.09
War	0.23	0.13
Western	0.33	0.15



### Features extracted with neural network

Genre	Similarity	Variance
Children	0.35	0.07
Animation	0.40	0.09
All	0.38	0.06
War	0.37	0.07
Western	0.34	0.07



## Our recommendation approach

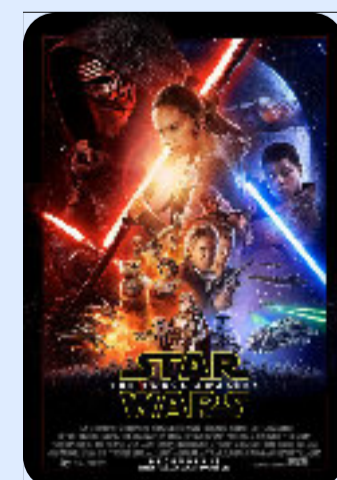
Hybrid recommender (illustrated in the movie domain).

### 1 Retrieve content features

For each movie we pick genre, actors, keywords, plot, and name of the collection (e.g., Star Wars movies).

### 2 Extract image features

Using a convolutional neural network we extract latent image features that represent content and visual stimuli. Pairwise cosine similarity is calculated - **visual similarity**.



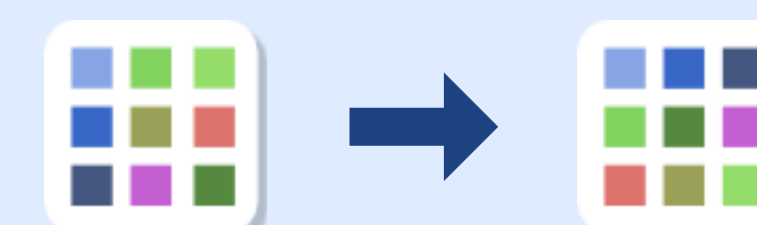
### 3 Generate recommendation

Based on the similarity between the content features of (1) the movies user had seen and (2) the unseen movies, recommender generates Top N movies.



### 4 Re-rank using visual similarity

Recommended movies generated by the content recommender are **ranked** using the visual similarity between the recommended movies and the movies user had seen.



## Evaluation

We evaluate our solution using **MovieLens 20M dataset** (20M ratings from 130k users). Performance of the ranking of the baseline (content-only) is compared to the hybrid method.

	MAP mean average precision	NDCG@10
baseline	0.1735	0.2463
hybrid	0.1773	0.2504

Differences are statistically significant ( $p$ -value  $< 0.01$ ).

For users having more than 1 400 ratings, hybrid recommender ranking performance improved by more than 3%.