

Semantic Image-Based Profiling of Users' Interests with Neural Networks

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Motivation (1)

- the popularity of online social networks,
- the importance of visual media in communication,
- advances in computer vision.



Motivation (2)

- images are difficult to understand,
- computer vision systems can be difficult to create.

Questions

- it is possible to obtain valuable information about social networks' users based solely on visual data?
- can existing solutions, created for other purposes, be used as effectively as dedicated ones?

Data (1)

Source

- public profiles on Flickr

Users

- randomly selected authors of recent posts

Volume

- 200 users
- 300 photos per user (from *faves*)

Data (2)

- pictures come from Faves, which means pictures marked as a favourite by the user,
- for each image tags that image was described with are also collected,
- users were chosen randomly from recently active accounts (methods like snowballing could cause a lower variety of interests as there is a possibility that users which follow each other may have similar interests).

Data (3)

flickr Explore Create

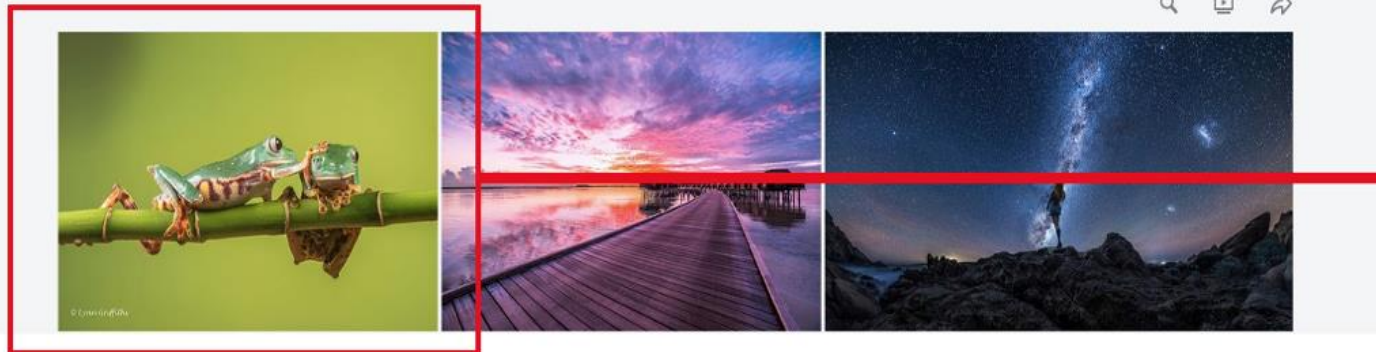
Photos, people, or groups Log In Sign Up

Danny VB + Follow

PRO 9.9K Followers • 336 Following

11,943 Photos Joined 2007

About Photostream Albums Faves Galleries Groups



Tags ?

- Amphibian Frog
- Super Tiger Legged Waxy...
- Nature Captive Fauna
- Wildlife Bournemouth
- England United Kingdom
- GB Coth SpecAnimal
- Coth5 NGC Sunrays+5
- NPC

Method (1)

Object recognition

- classify the main object in the image using convolutional neural networks

Object generalisation

- match object predictions with more general categories

User's profile creation

- based on a set of classifications create a profile of potential user's interests

Method (2)

Main object is recognised in picture with convolutional neural network.



Key meaning for the class name is selected from BabelNet.

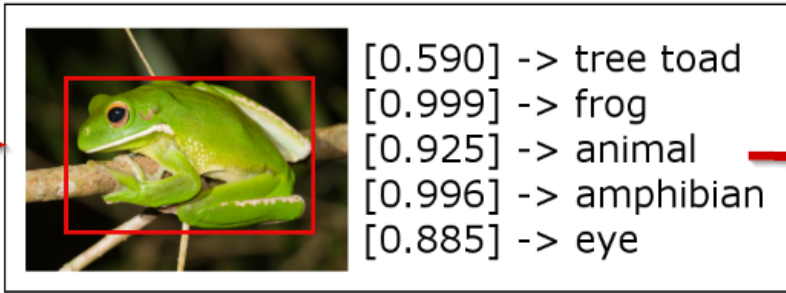


General category for the key meaning is extracted.



5 most frequent categories are used as user's interests profile.

Method (3)



frog

a person of French descent
various tailless stout-bodied amphibians [KEY]
a decorative loop of braid or cord
informal grouping o amphibians

ANIMALS

1. input image

2. Recognise main object in the image with CNN

3. Pick key meaning to object name and it's domain from BabelNet synset

Evaluation (1)

Issue: absence of dataset linking *liked* images with user's interests.

Evaluation (2)



Animals (9)
Transport and travel (6)
Sport and recreation (5)
Biology (5)
Food and drinks (3)

Results (1)

- five different neural network architectures were evaluated:
 - Alexnet, VGG16, VGG19, GoogleNet, ResNet50
- predictions are evaluated by comparing the similarity between the samples of predicted and ground-truth interests for given user.

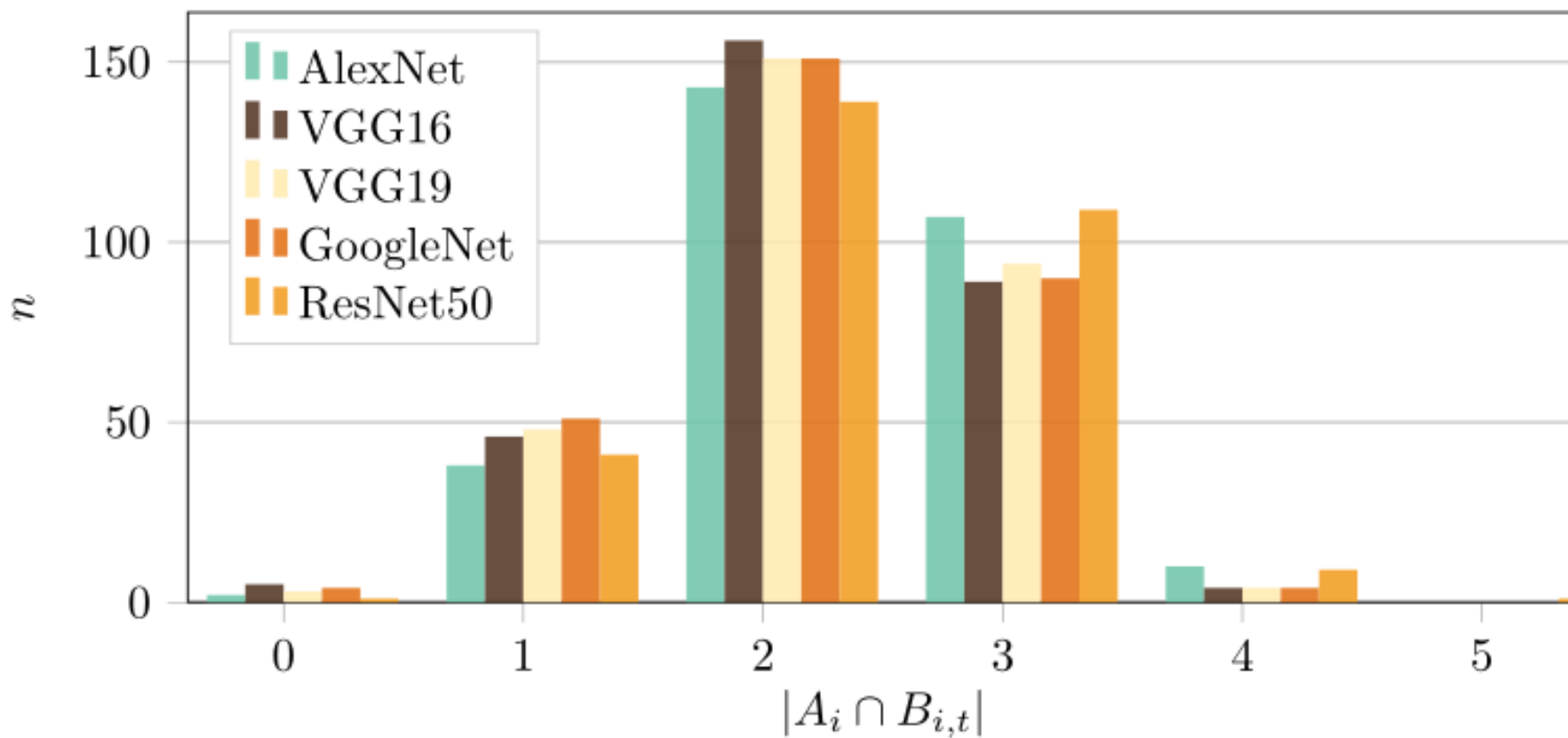
$$F_1(A_i, B_{i,t}) = \frac{2|A_i \cap B_{i,t}|}{|A_i| + |B_{i,t}|}$$

Results (2)

Table 1. Experiment results, $N = 300$. Source: own research

$ A_i \cap B_{i,t} $	AlexNet		VGG16		VGG19		GoogleNet		ResNet50	
	n	n/N	n	n/N	n	n/N	n	n/N	n	n/N
0	2	0.0067	5	0.0167	3	0.0100	4	0.0133	1	0.0033
1	38	0.1267	46	0.1533	48	0.1600	51	0.1700	41	0.1367
2	143	0.4767	156	0.5200	151	0.5033	151	0.5033	139	0.4633
3	107	0.3567	89	0.2967	94	0.3133	90	0.3000	109	0.3633
4	10	0.0333	4	0.0133	4	0.0133	4	0.0133	9	0.0300
5	0	0.0000	0	0.0000	0	0.0000	0	0.0000	1	0.0033
$\overline{ A_i \cap B_{i,t} }$	2.28		2.14		2.16		2.13		2.29	
$\overline{F_1}$	0.4567		0.4273		0.4320		0.4260		0.4580	

Results (3)



Conclusions

- visual content from online social networks can be used to reason about users' interests,
- computer vision tools can be multipurpose with the right approach,
- the main challenge is not the object recognition but assignment to the right, general category.

Future work

- improving the class generalisation method,
- comparing results to a dedicated neural network which assigns images with general categories.

Demo - <http://150.254.36.100:8080/>

User's Interests Profiling

Upload multiple images which will be used to predict user's interests. Due to hardware limitations, please do not use more than 10 images at the same time.

Please, be patient. Loading the model can take some time. Thank you!

Nie wybrano plików.

Convolutional Neural Network

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