

# Image Search Seznam.cz

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# Image Search Page

[Internet](#) [Obrázky](#) [Videa](#) [Články](#) [Firmy](#) [Mapy](#) [Zboží](#) [Slovník](#)

[Seznam.cz](#)

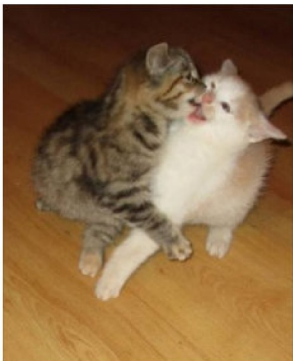
**SEZNAM.CZ**  
Obrázky

koťátka



Vyhledat

Všechny velikosti  Barevné  Skrýt hanbaté



# History



**2007 Launch, third-party solution**



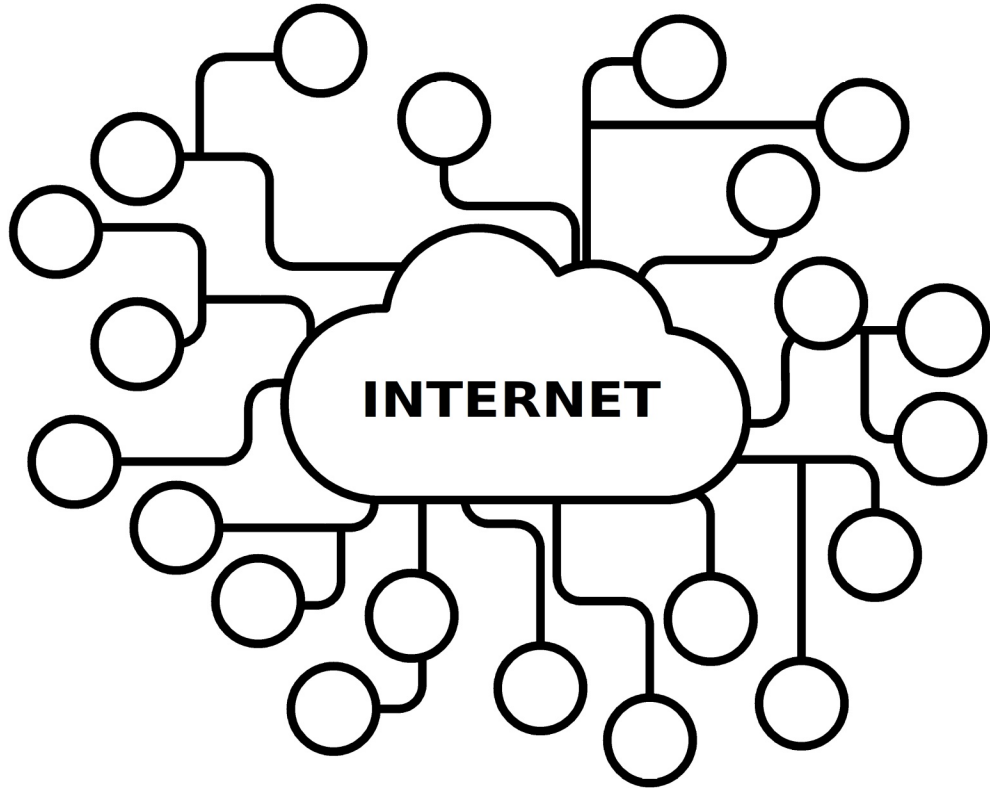
**2015 Our own solution - text search**

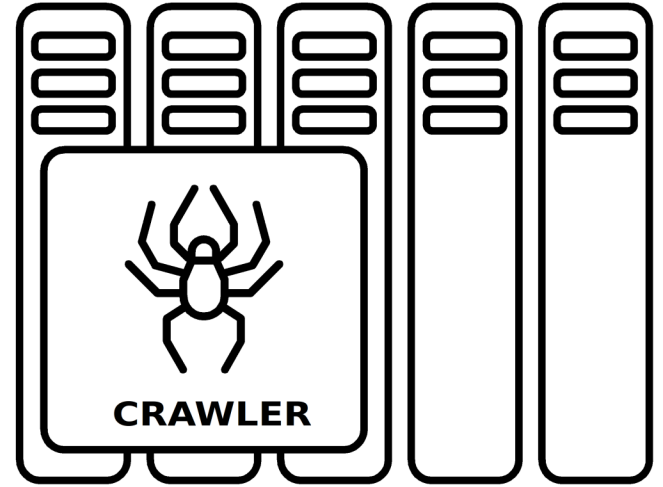
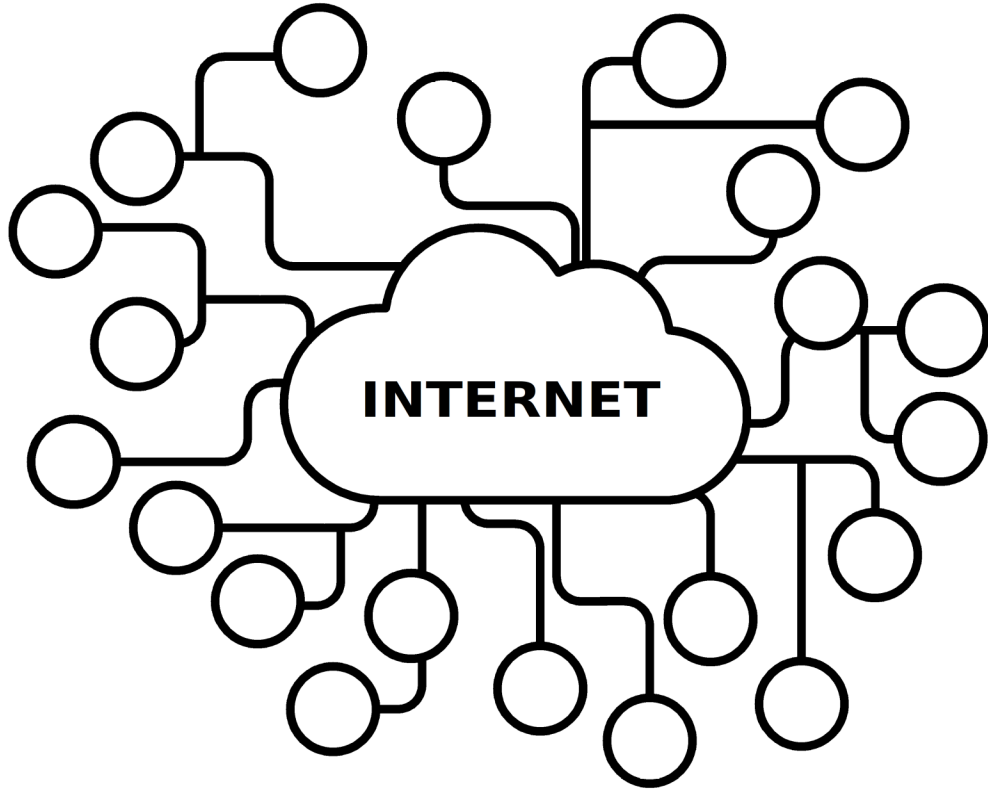


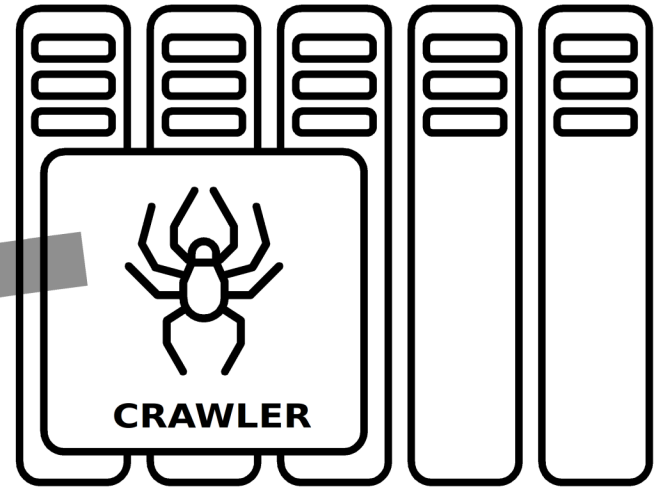
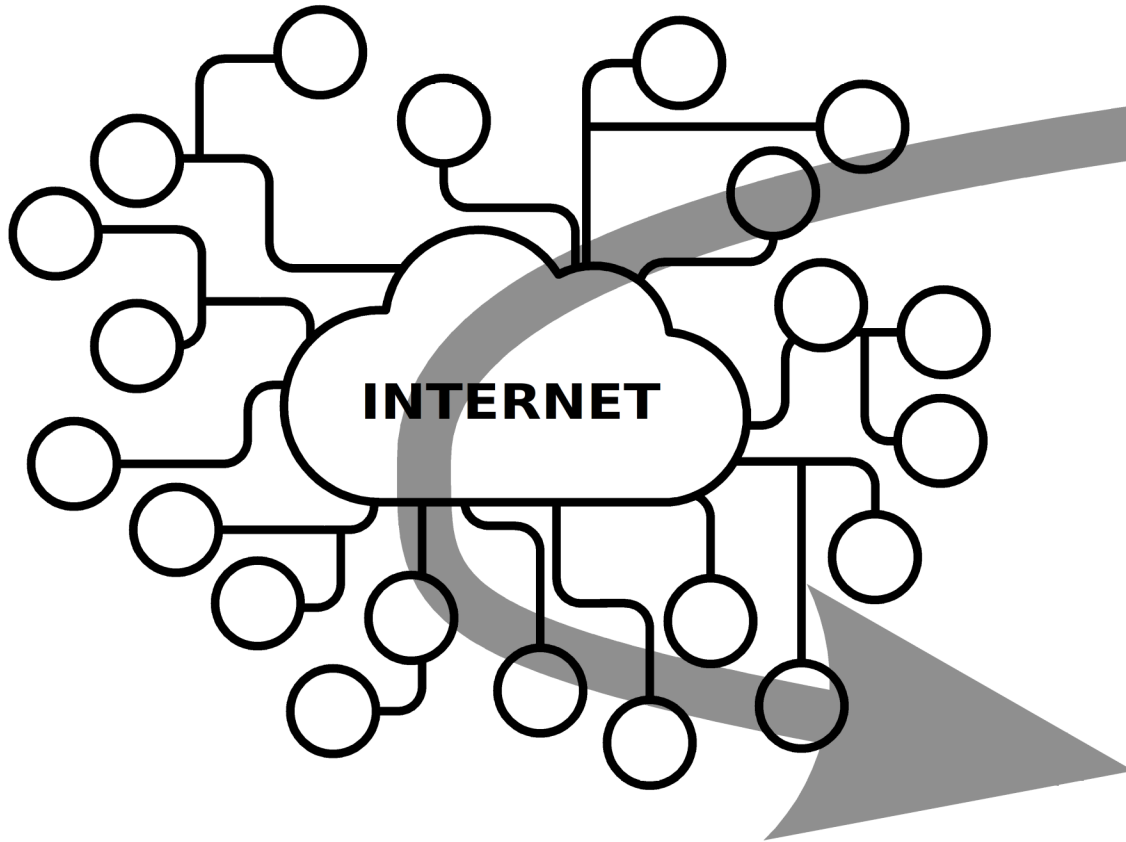
**2017 Neural Networks**

# Basic Text Search







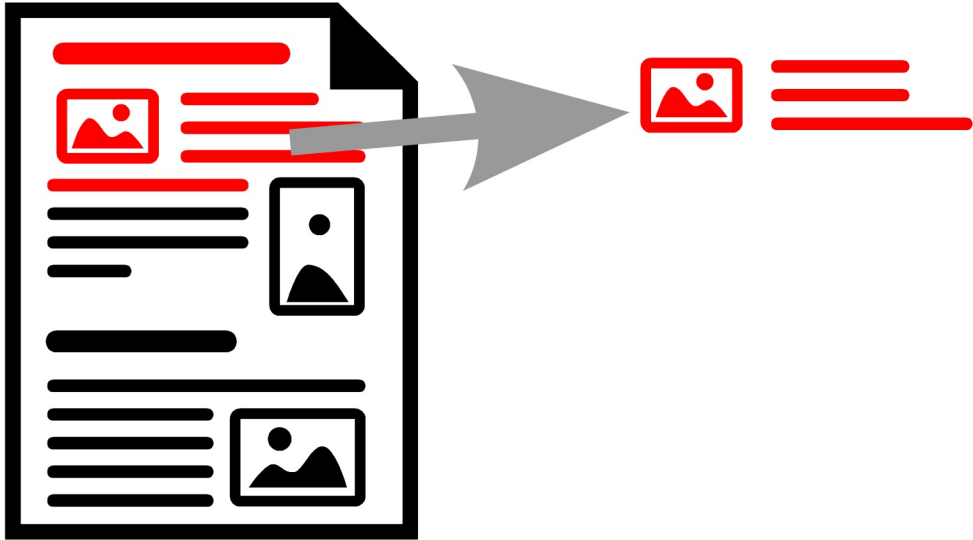


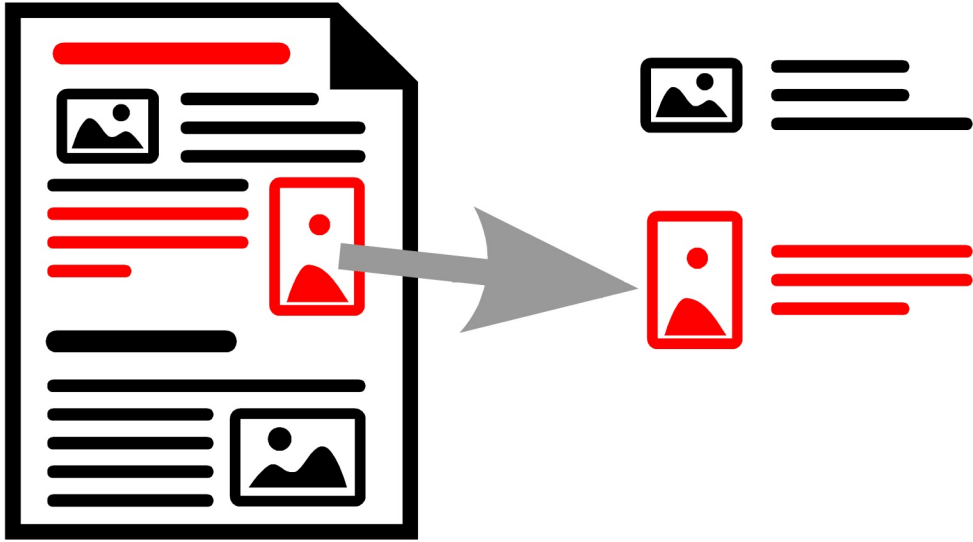
# ML in Crawler

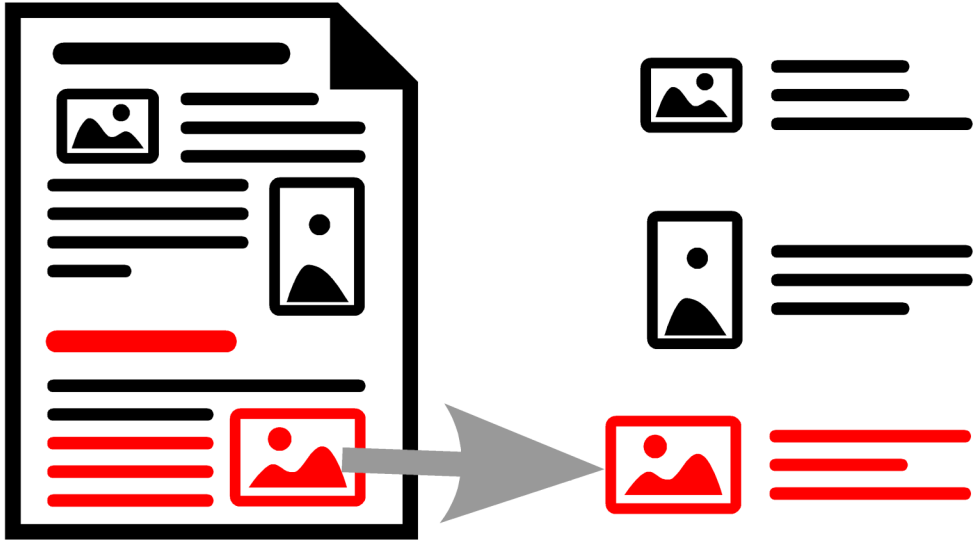
- Predict which links are interesting
- How often to revisit document
- Detect significant change after revisit

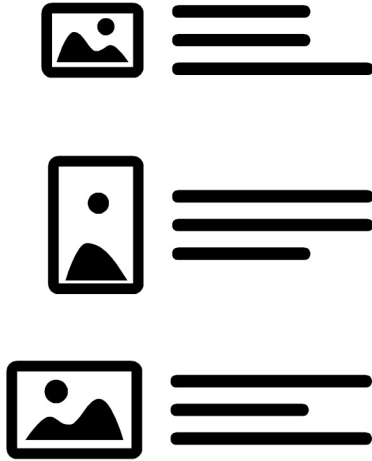


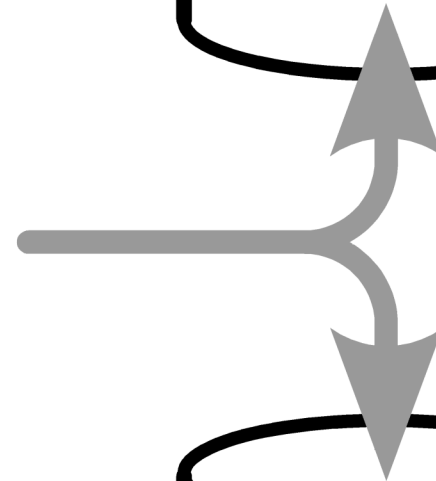
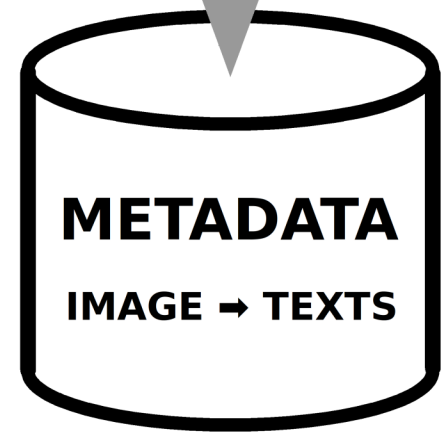
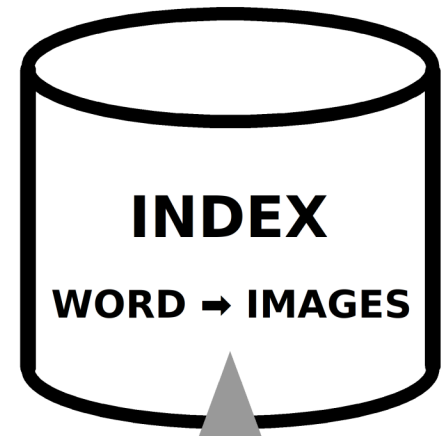
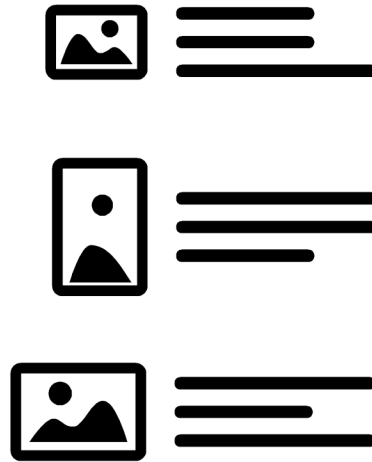












## Zloděj se zasekl na plotě ve značně nezáviděníhodné pozici

Velmi snadnou práci se zpacifikováním zloděje měli policisté v arizonském Tucsonu. Zadržený muž si totiž při útěku počínal tak nešikovně, že zůstal viset z plotu za kalhoty, a navíc ještě hlavou dolů.



úterý 28. března 2017, 3:00

Muže visícího bezmocně z plotu vyfotil v pátek Jesse Sensibar, který jel v tu chvíli zrovna okolo. Chtěl mu pomoci, ale na místě se o pár okamžiků později objevila dvě policejní auta.

„Když jsem se o čtvrt hodiny později vracel stejnou cestou, seděl spoutaný na zadním sedadle,“ vysvětlil Sensibar v příspěvku na Facebooku. Jeho fotka od té doby obletěla

▲ Zloděj zůstal bezmocně viset hlavou dolů z plotu.

FOTO: Jesse Sensibar, Kristin Woodall

REKLAMA

Columbia Sportswear Company  
TESTED TOUGH  
-30%  
MIKINY ZJISTI VÍCE

REKLAMA

Top se špagetovými ramínky  
balení  
129.-  
LIDL

Komerční sdělení

Levnější elektřina až o 22%! Spočítejte si, kolik s E.ON ušetříte.



Investujte do ING Podílových fondů od 100 Kč měsíčně v základní nabídce.



Předsezónní ceny TOMKET pneu. nakupte



## Zloděj se zasekl na plotě ve značně nezáviděníhodné pozici

Velmi snadnou práci se zpacifikováním zloděje měli policisté v arizonském Tucsonu. Zadržený muž si totiž při útěku počínal tak nešikovně, že zůstal viset z plotu za kalhoty, a navíc ještě hlavou dolů.



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„Když jsem se o čtvrt hodiny později vracel stejnou cestou, seděl spoutaný na zadním sedadle,“ vysvětlil Sensibar v příspěvku na Facebooku. Jeho fotka od té doby obletěla

▲ Zloděj zůstal bezmocně viset hlavou dolů z plotu.

FOTO: Jesse Sensibar, Kristin Woodall

REKLAMA

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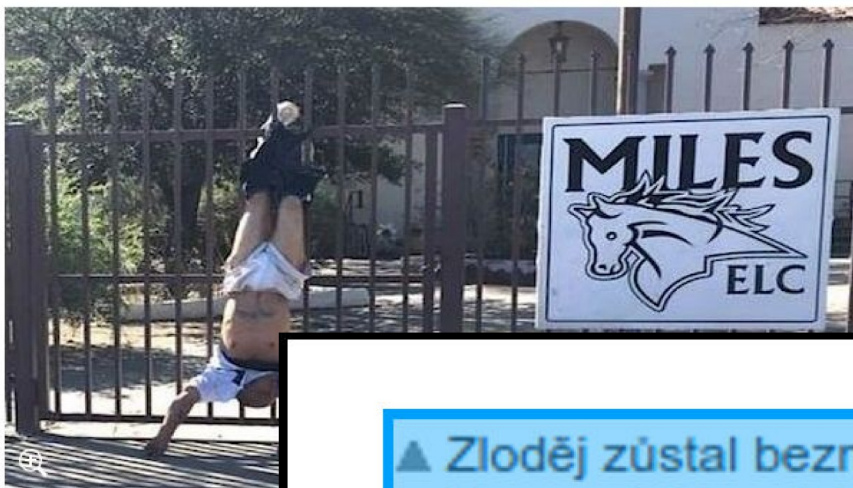
Předsezónní ceny TOMKET pneu. nakupte





## Zloděj se zasekl na plotě ve značně nezáviděníhodné pozici

Velmi snadnou práci se zpacifikováním zloděje měli policisté v arizonském Tucsonu. Zadržený muž si totiž při útěku počínal tak nešikovně, že zůstal viset z plotu za kalhoty, a navíc ještě hlavou dolů.



úterý 28. března 2017, 3:00

Muže visícího bezmocně z plotu zachránil policista Jesse Sensibar, který jel v tu chvíli v služebním autě. Pomohl mu, ale na místě se o pár minut později dostal do policejního auta.

„Když jsem se o čtvrt hodiny později vracel z práce, seděl spoutaný na zadním sedadle,“ vysvětlil Sensibar v příspěvku na Facebooku. Jeho fotka od té doby obletěla

▲ Zloděj zůstal bezmocně viset hlavou dolů z plotu.

FOTO: Jesse Sensibar, Kristin Woodall

REKLAMA



JISTI VÍCE



e si.

e-on



Kč měsíčně v základní nabídce.

Předsezónní ceny TOMKET pneu, nakupte



**Popisok: Zloděj zůstal bezmocně viset hlavou dolů z plotu.**

**Nadpis: Zloděj se zasekl na plotě ve značně nezáviděníhodné pozici**

**Text: Muže visícího bezmocně z plotu vyfotil v pátek Jesse Sensibar...**

**Abstrakt: Velmi snadnou práci se zpacifikováním zloděje měli ...**

# ML in Document Analysis

- Discard headers, templates, ads
- Find caption and nearby text
- Extract significant words from text

 **Fotbal**



🔍 **Fotbal**

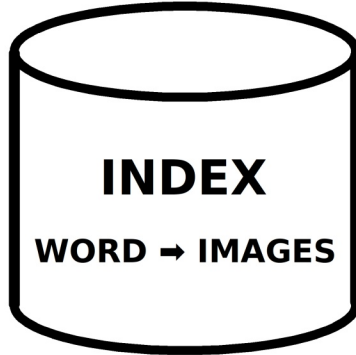


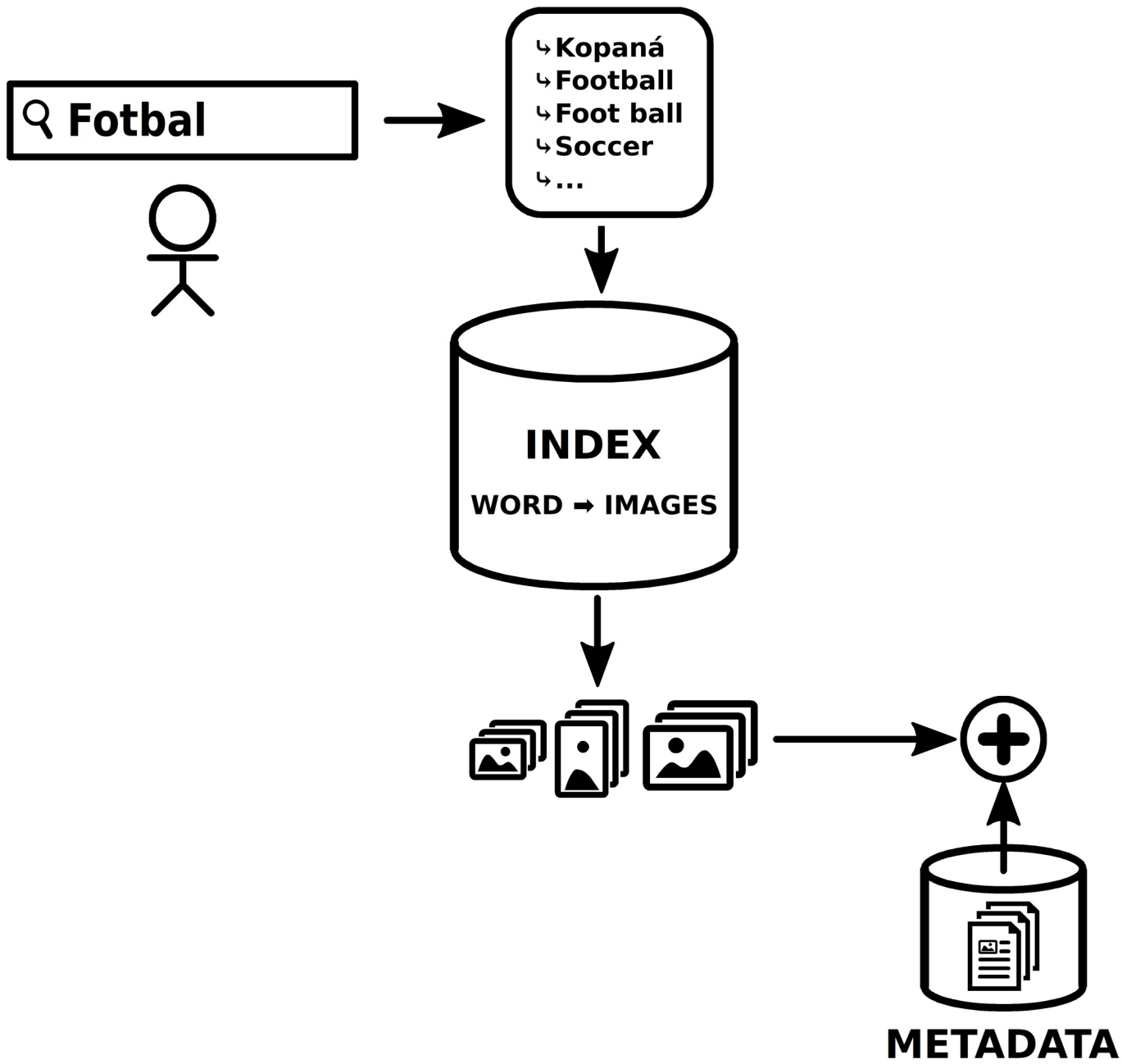
- ↳ **Kopaná**
- ↳ **Football**
- ↳ **Foot ball**
- ↳ **Soccer**
- ↳ ...

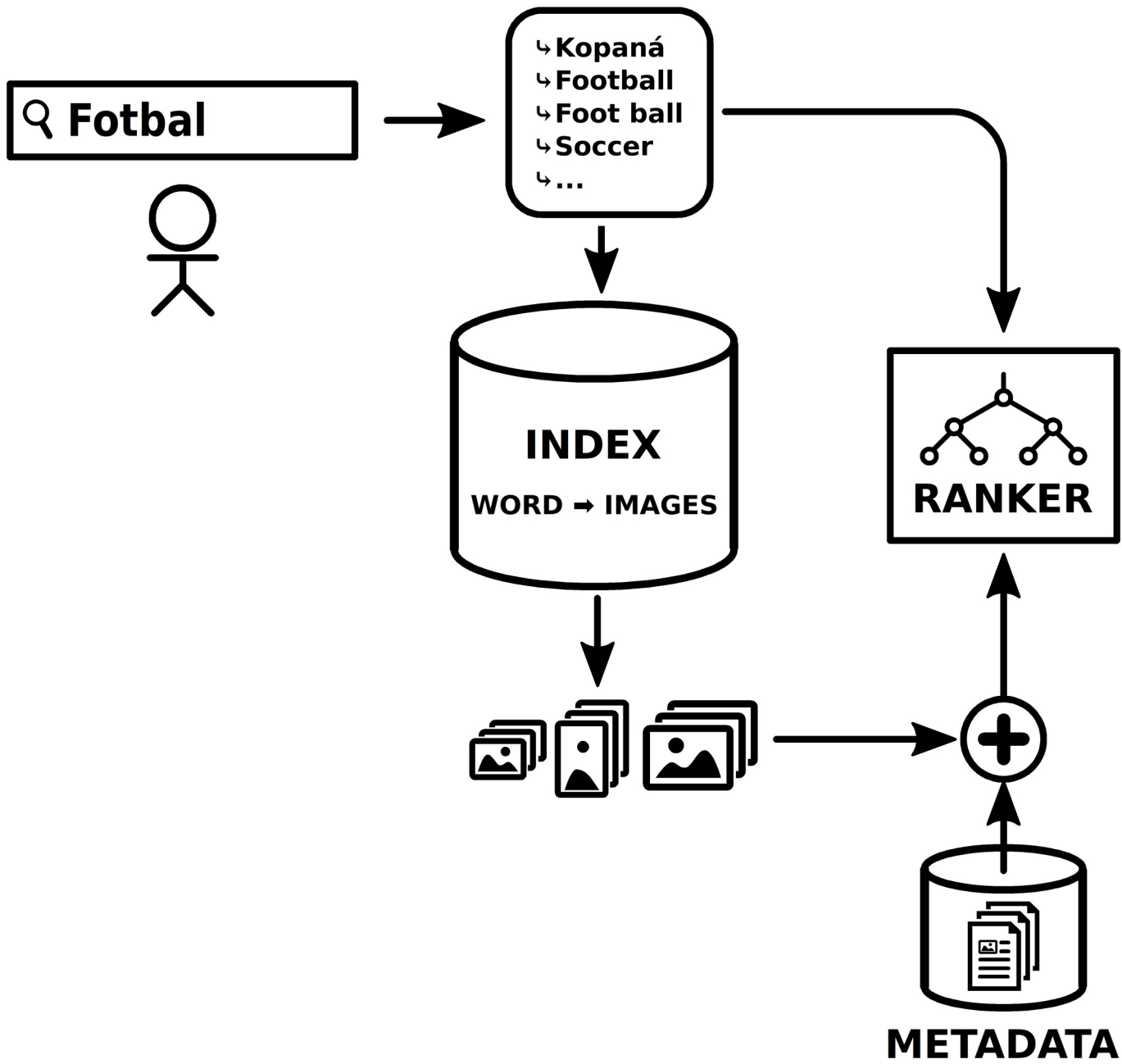
🔍 Fotbal



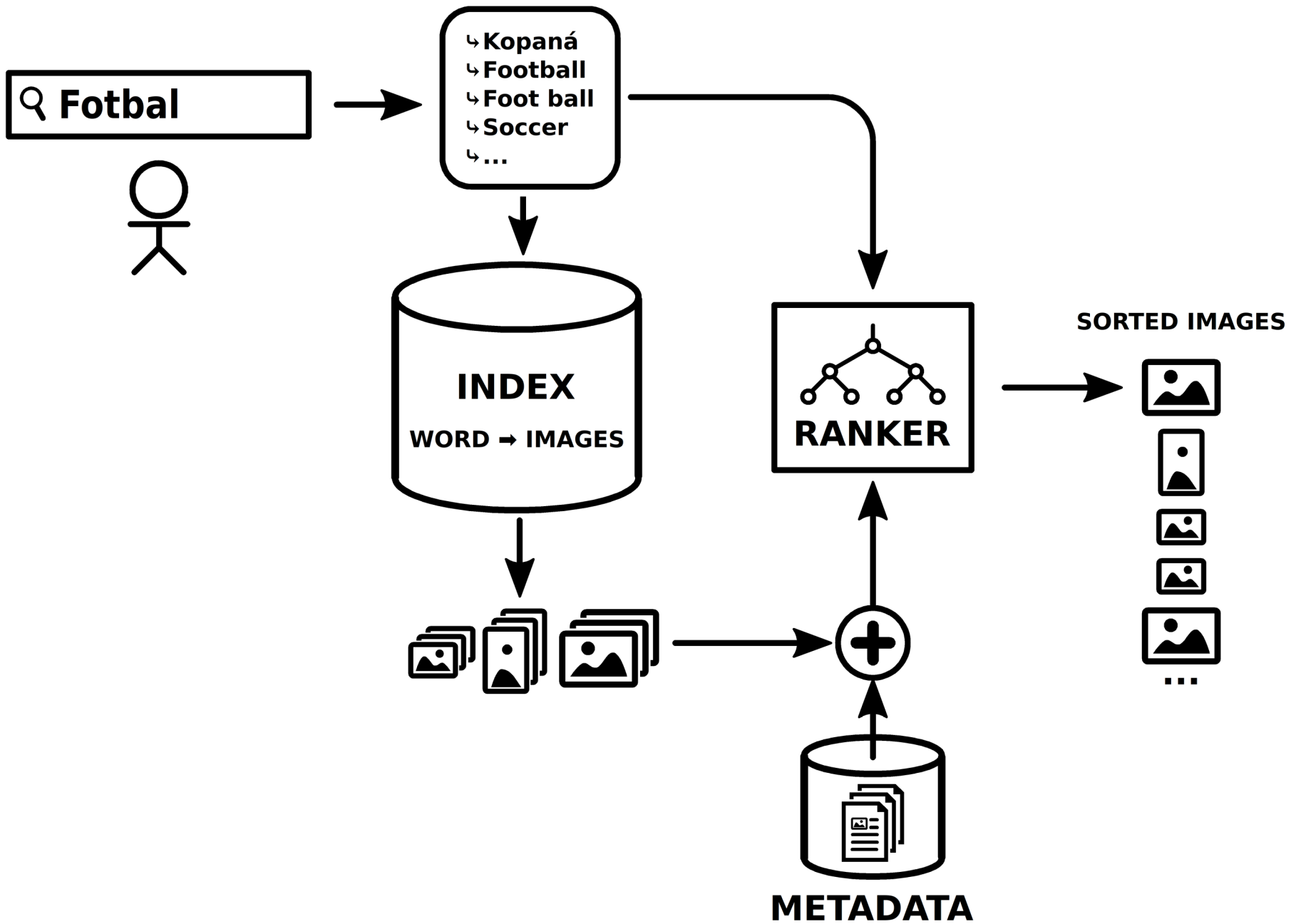
- ↳ Kopaná
- ↳ Football
- ↳ Foot ball
- ↳ Soccer
- ↳ ...











# Summary

- Crawling
- Indexing
- Searching
- Ranking

# Relevance Ranking

relevance

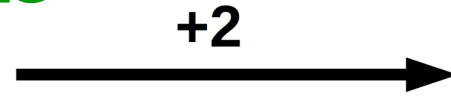
***/ˈrɛləv(ə)ns/***

*noun*

- the quality or state of being closely connected or appropriate.  
*"this film has contemporary relevance"*

# Image relevant to query?

Words from query in caption? **YES**  
Words from query in title? **YES**  
Words from query in url? **YES**  
⇒ **RELEVANT**



final relevance:

**2.5**

Query contains location? **YES**  
GPS coords in image EXIF? **YES**  
GPS close to query location? **YES**  
⇒ **RELEVANT**

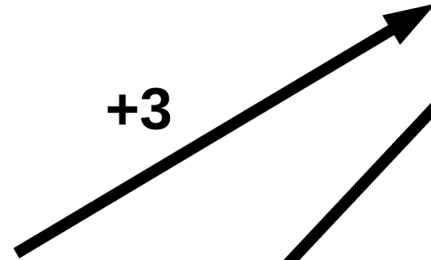
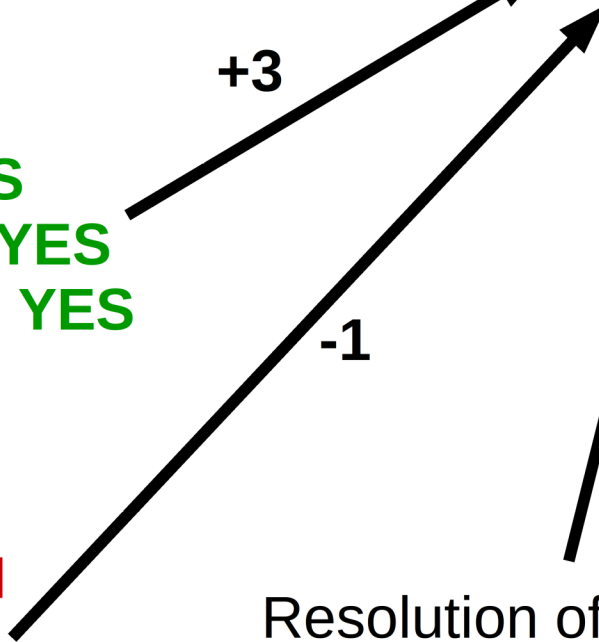
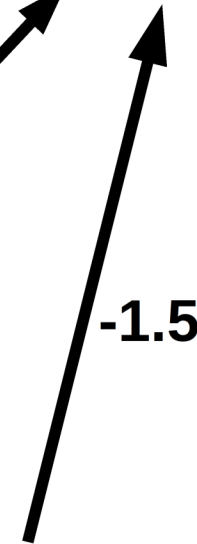


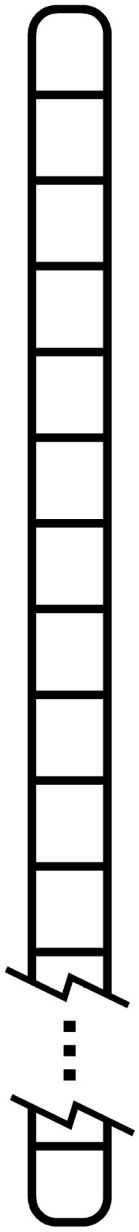
image count on page? **HIGH**  
links count on page? **HIGH**  
spam level of page? **MEDIUM**  
⇒ **NOT RELEVANT**



Resolution of image? **LOW**  
Number of colors? **LOW**  
⇒ **NOT RELEVANT**



**FEATURE VECTOR**



- ↳ Kopaná
- ↳ Football
- ↳ Foot ball
- ↳ Soccer
- ↳ ...

**QUERY**

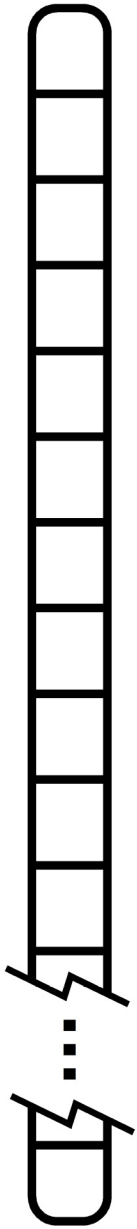


**METADATA**



**IMAGE**

**FEATURE VECTOR**



**Words from query in caption?  
Words from query in title?  
Words from query in url?**



**QUERY**

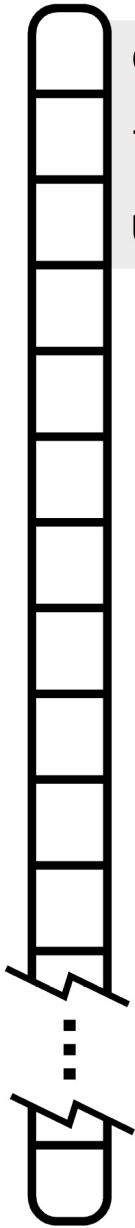


**METADATA**



**IMAGE**

FEATURE VECTOR



caption\_coverage **1.0**  
title\_coverage **0.8**  
url\_coverage **0.2**



**QUERY**



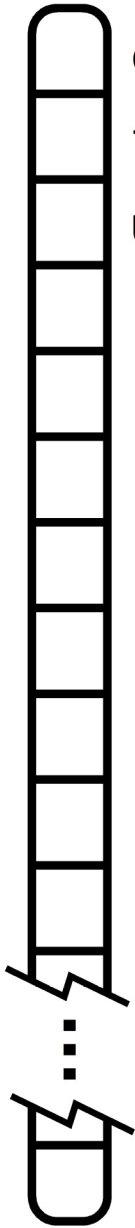
**METADATA**

**Words from query in caption?**  
**Words from query in title?**  
**Words from query in url?**



**IMAGE**

FEATURE VECTOR



caption\_coverage **1.0**  
title\_coverage **0.8**  
url\_coverage **0.2**

**Query contains location?**  
**GPS coords in image EXIF?**  
**GPS close to query location?**



**QUERY**



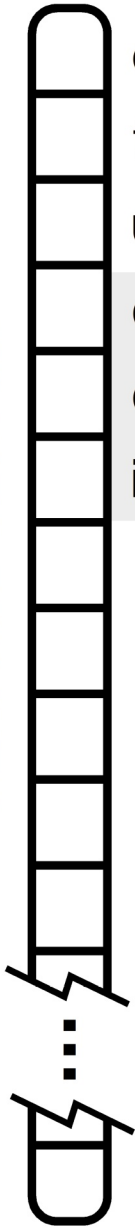
**METADATA**



**IMAGE**



FEATURE VECTOR



caption\_coverage **1.0**

title\_coverage **0.8**

url\_coverage **0.2**

query\_location **1**

query\_img\_gps\_dist **128**

img\_exif\_gps **1**



QUERY



METADATA



IMAGE

**Query contains location?  
GPS coords in image EXIF?  
GPS close to query location?**

FEATURE VECTOR



caption\_coverage **1.0**  
title\_coverage **0.8**  
url\_coverage **0.2**  
query\_location **1**  
query\_img\_gps\_dist **128**  
img\_exif\_gps **1**  
img\_size **131072**  
img\_bw **0**

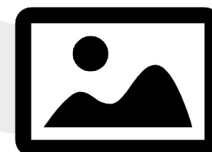
**Resolution of image?  
Number of colors?**



**QUERY**



**METADATA**



**IMAGE**

**FEATURE VECTOR**

caption\_coverage **1.0**  
title\_coverage **0.8**  
url\_coverage **0.2**  
query\_location **1**  
query\_img\_gps\_dist **128**  
img\_exif\_gps **1**  
img\_size **131072**  
img\_bw **0**  
page\_img\_count **24377**  
page\_link\_count **349**  
page\_spam\_level **0.5**



**QUERY**



**METADATA**

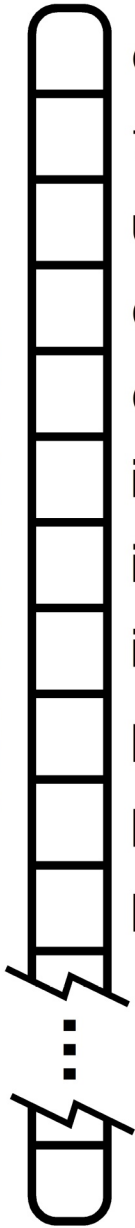


**IMAGE**

**image count on page?  
links count on page?  
spam level of page?**



**FEATURE VECTOR**



caption\_coverage **1.0**  
title\_coverage **0.8**  
url\_coverage **0.2**  
query\_location **1**  
query\_img\_gps\_dist **128**  
img\_exif\_gps **1**  
img\_size **131072**  
img\_bw **0**  
page\_img\_count **24377**  
page\_link\_count **349**  
page\_spam\_level **0.5**



↳ Kopaná  
↳ Football  
↳ Foot ball  
↳ Soccer  
↳ ...

**QUERY**



**METADATA**



**IMAGE**

## Image

- camera/lense type
- ISO, f-ratio, ...
- compression level
- filetype

## Img-query match

- word occurences
- word „closeness“
- word position
- page relevance
- coverages

## Query

- language
- name
- porn
- special chars
- numbers
- robot?

## Text fields

- link texts
- alt texts
- urls
- filenames

## Page/domain

- link network
- spam/porn
- popularity
- source code

- image count on page? **HIGH**
- links count on page? **HIGH**
- spam level of page? **MEDIUM**
  - ⇒ **NOT RELEVANT**

- image count on page? **HIGH**
- links count on page? **HIGH**
- spam level of page? **MEDIUM**  
⇒ **NOT RELEVANT**



- page\_img\_count > 12? **YES**
- page\_link\_count > 43? **YES**
- page\_spam\_level > 0.2? **YES**  
⇒ **-0.5**

- image count on page? **HIGH**
- links count on page? **HIGH**
- spam level of page? **MEDIUM**  
⇒ **NOT RELEVANT**



- page\_img\_count > 12? **YES**
- page\_link\_count > 43? **YES**
- page\_spam\_level > 0.2? **YES**  
⇒ **-0.5**

### Answer variants

<b>YES</b>	<b>NO</b>
<b>YES</b>	<b>NO</b>
<b>NO</b>	<b>NO</b>
⇒ <b>+0.7</b>	⇒ <b>+1.0</b>



- image count on page? **HIGH**
- links count on page? **HIGH**
- spam level of page? **MEDIUM**  
⇒ **NOT RELEVANT**



- page\_img\_count > 12? **YES**
- page\_link\_count > 43? **YES**
- page\_spam\_level > 0.2? **YES**  
⇒ **-0.5**

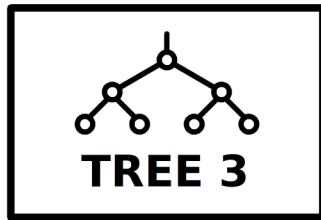
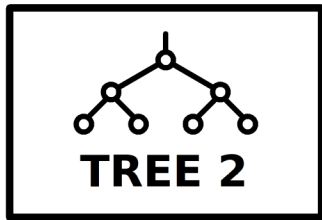
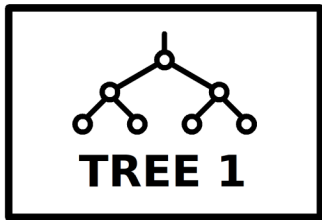
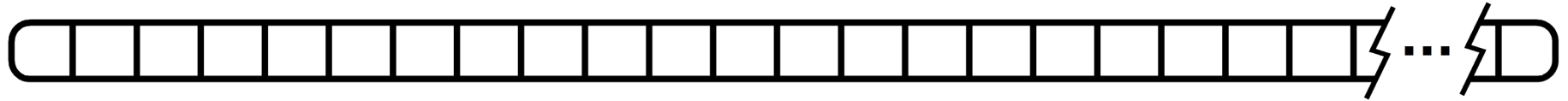


- features[7] > 12? **YES**
- features[9] > 43? **YES**
- features[2] > 0.2? **YES**  
⇒ **-0.5**

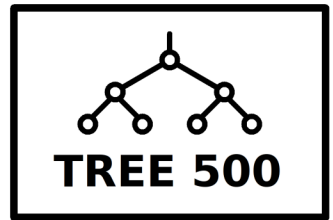
## Answer variants

<b>YES</b>	<b>NO</b>
<b>YES</b>	<b>NO</b>
<b>NO</b>	<b>NO</b>
⇒ <b>+0.7</b>	⇒ <b>+1.0</b>

# FEATURE VECTOR



■ ■ ■



**2.33**

**1.02**

**-0.71**

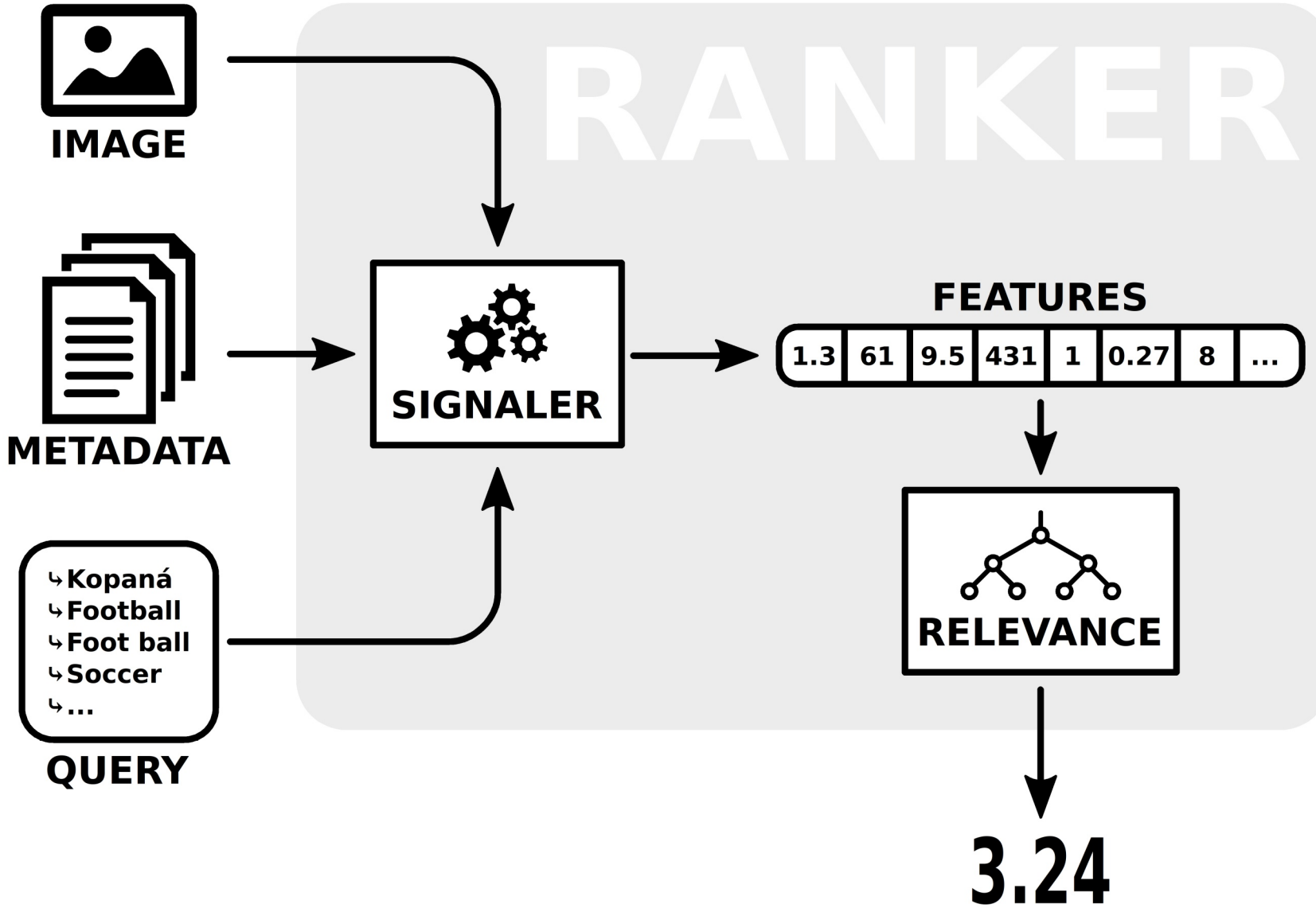
■ ■ ■

**0.02**



$$\Sigma = 4.11$$

# RANKER



# Summary

- Compute features
- Evaluate questions/trees
- Sum to get relevance value

# Training



# Annotations



# Annotations

Kot'átko



5



5



1



3

Auto



5







2



4

# FEATURES

# LABEL

QUERY#1		1.3	61	9.5	431	1	0.27	8	...	5
QUERY#9		2.3	46	9.5	232	0	0.33	1	...	4
QUERY#5		1.7	39	8.5	88	1	0.17	1	...	1
QUERY#1		0.9	11	9.0	112	1	0.80	6	...	2

5 4

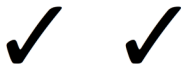


features[3] > 112

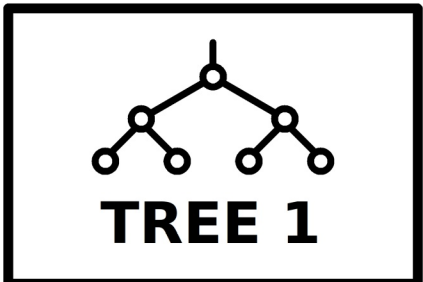
1 2



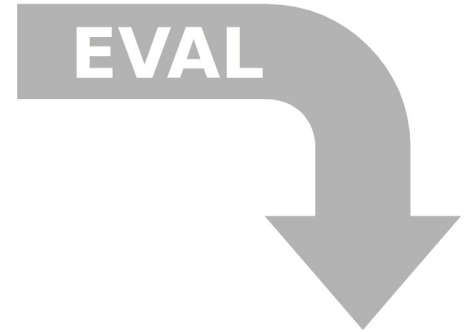
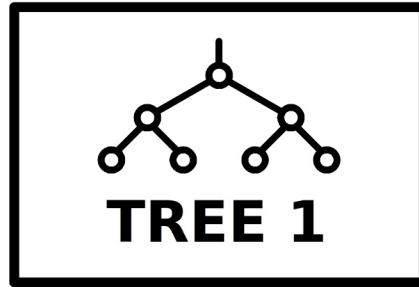
features[6] > 1

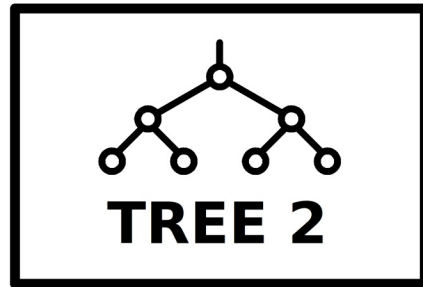
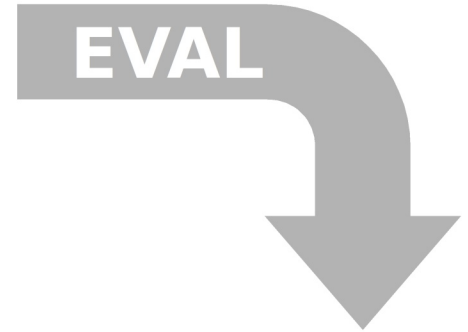
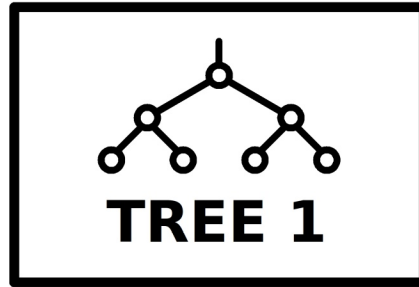


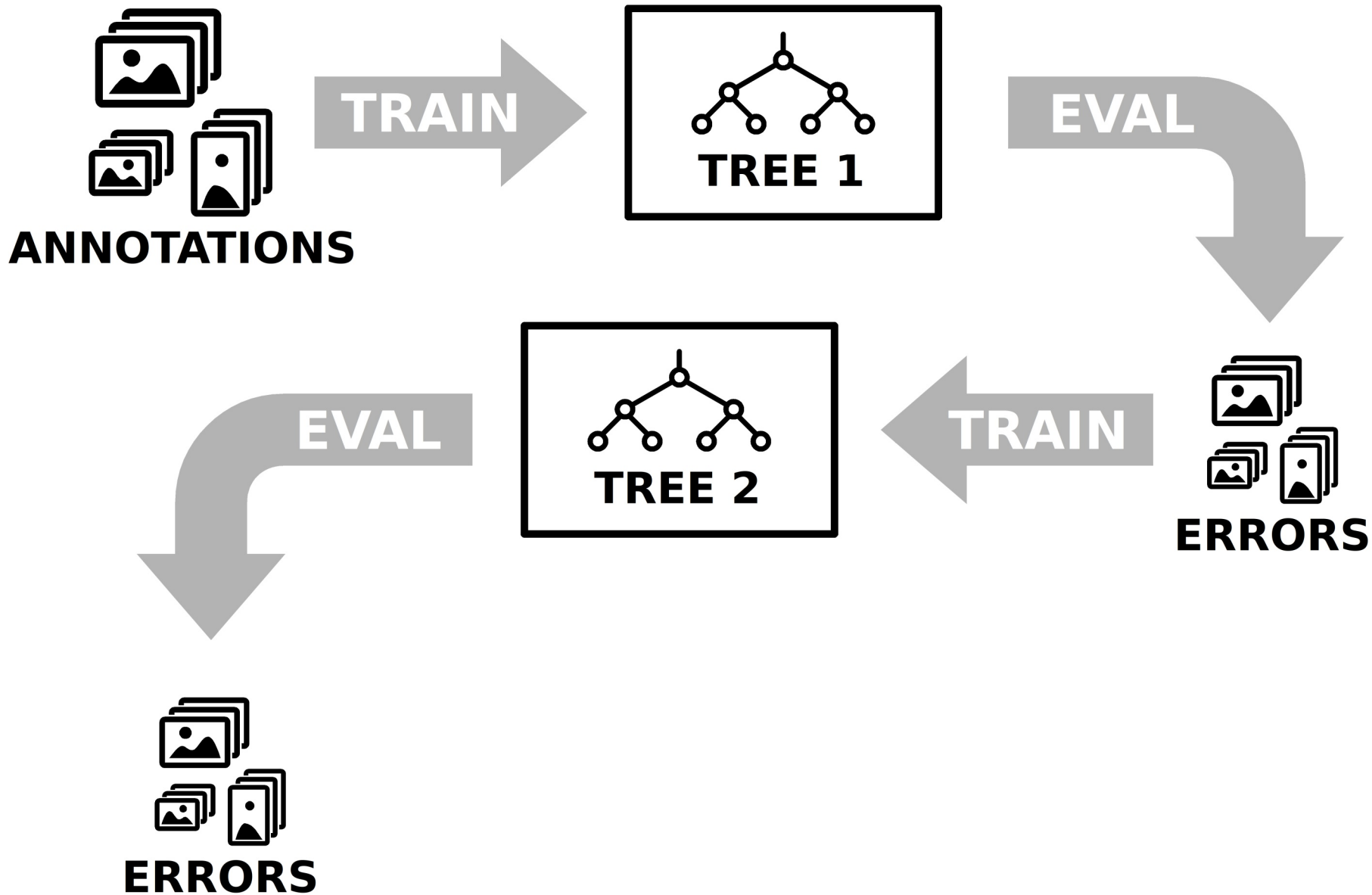


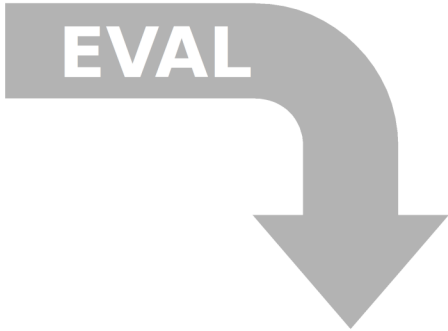
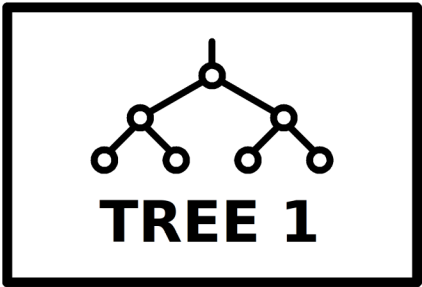


**ANNOTATIONS**

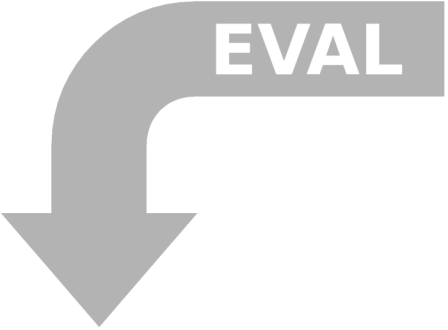
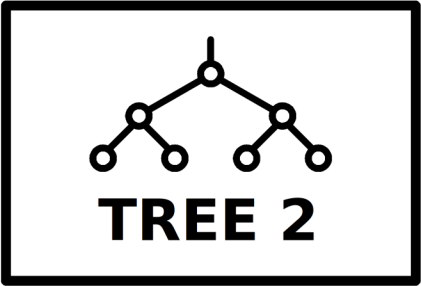




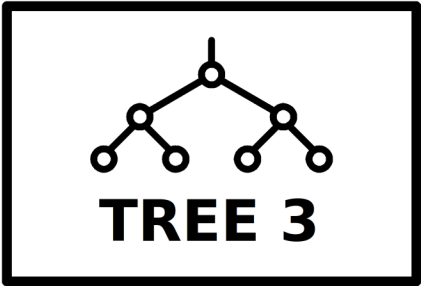




**ERRORS**



**ERRORS**



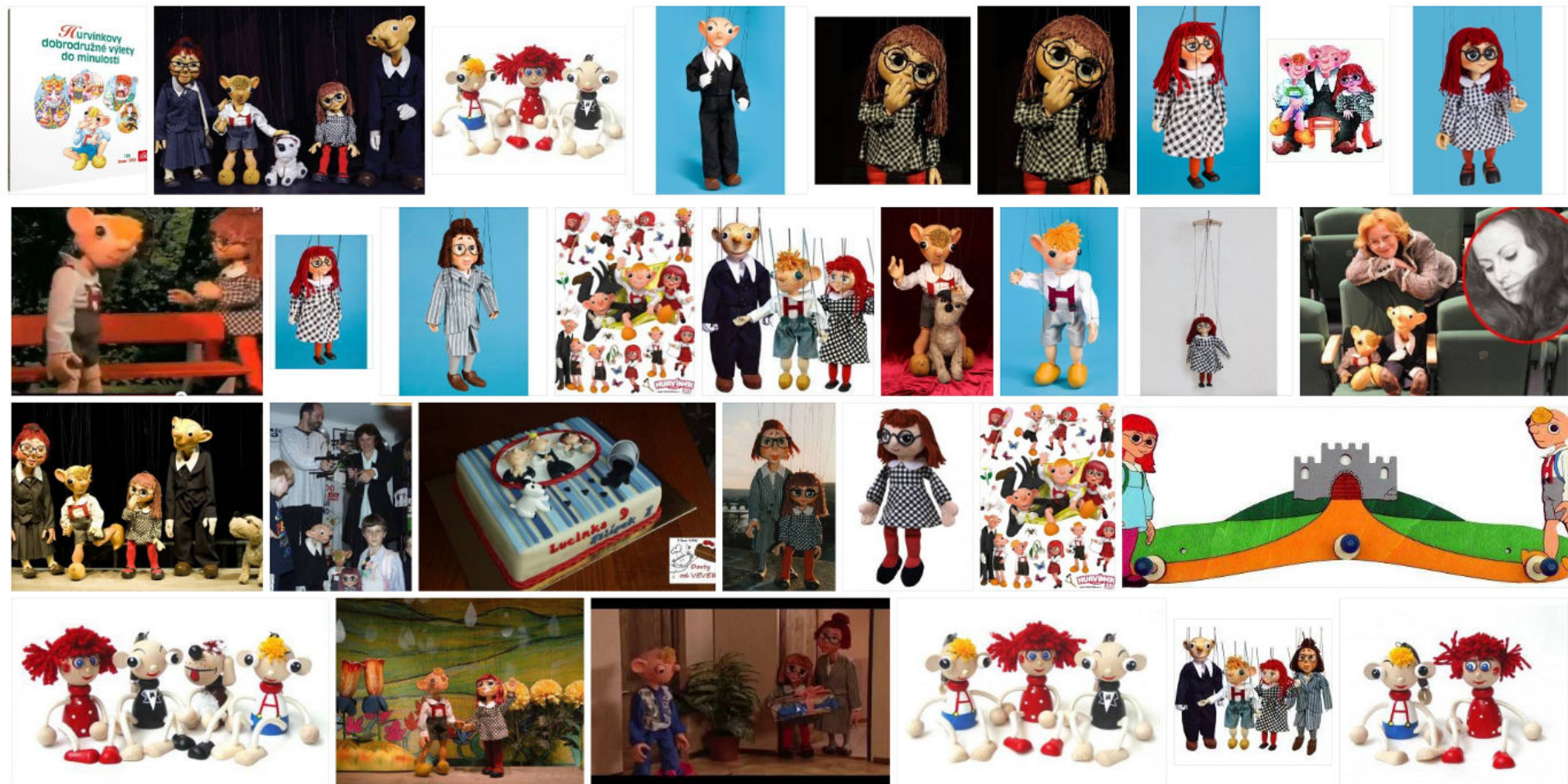
# Summary

- Annotations
- Select features and thresholds
- Fix errors of previous trees

# Results



# “Hurvínek a mánička”





# “Bobr evropský”

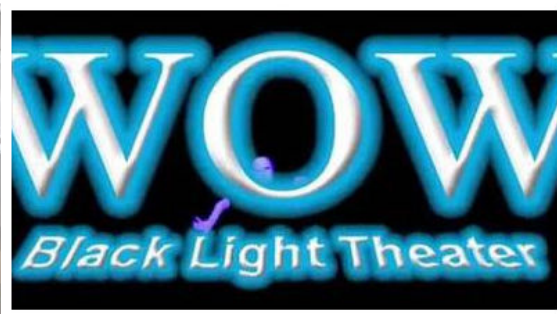
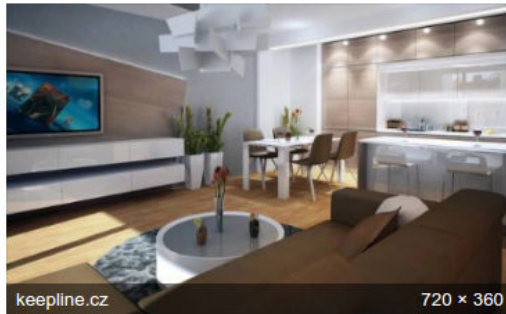




# “Praha”



**KAMENNÁ  
PRODEJNA V PRAZE**



# Challenges

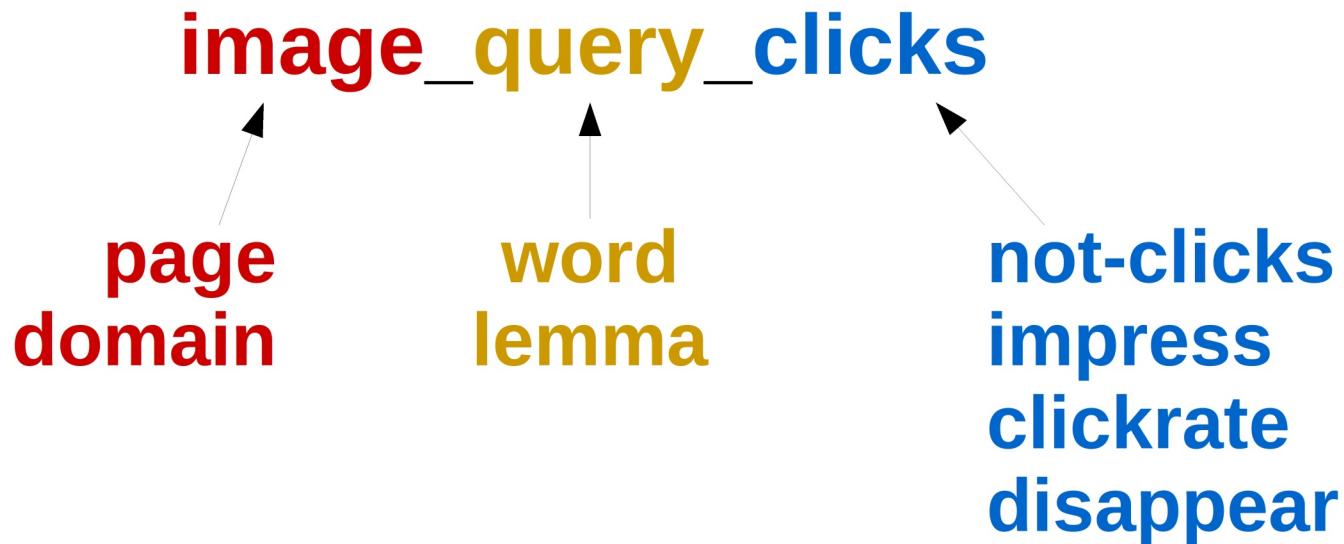
- Captions with no information:  
“obrazek”, “foto”, “img”
- Words with multiple usage:  
“Praha”, “obr”, “kozy”
- Photo gallery without text
- ...

# User Feedback



# Features

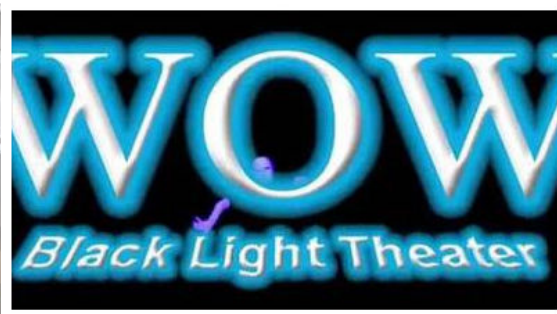
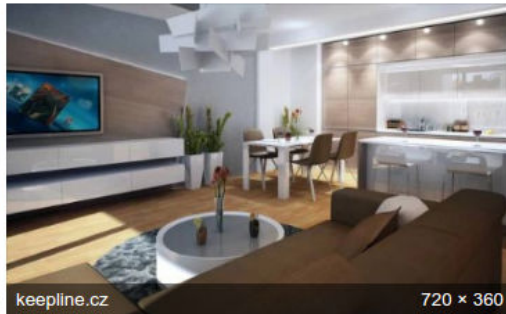
- User scrolls, clicks, reformulates query



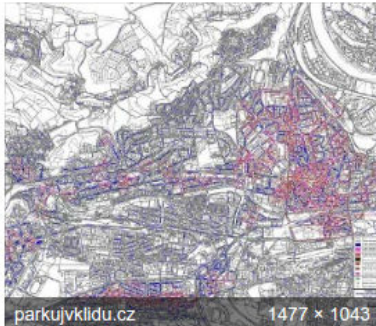
# “Praha”



**KAMENNÁ  
PRODEJNA V PRAZE**



# “Praha” after feedback





# “Praha” on Google



Web | Umělá inteligence | Vyhledávače

# Vyhledávač obrázků od Seznamu je hrozný. Pomůže mu umělá inteligence

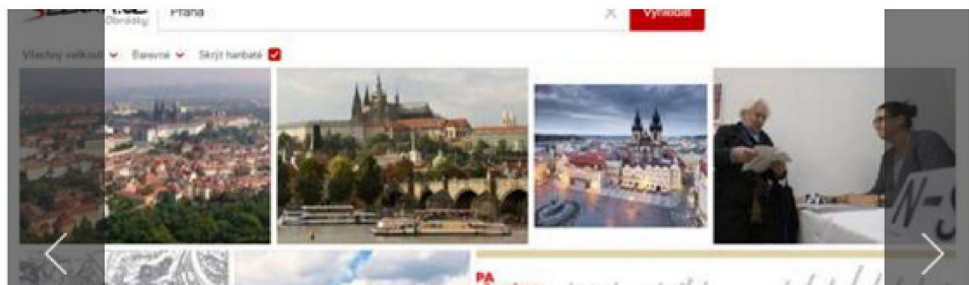


Jakub Čížek  
12. března 2017

SDÍLET NA FACEBOOKU

TWEETNOUT

- Vyhledávač obrázků je technologicky zastaralý
- Nemůže se srovnávat s Googlem a Bingem
- Brzy by se to ale mohlo změnit



## Nepřehlédněte



Chytré hodinky pro měšťáky, nebo masivní outdoorové s GPS a



Ubuntu čekají velké změny, mrtvé je Unity i systém pro telefony



Microsoft vypustil jarní upgrade Windows 10. Desítky to potřebují,



Atari Stacy: Takto vypadal sexy ultrabook před třiceti lety

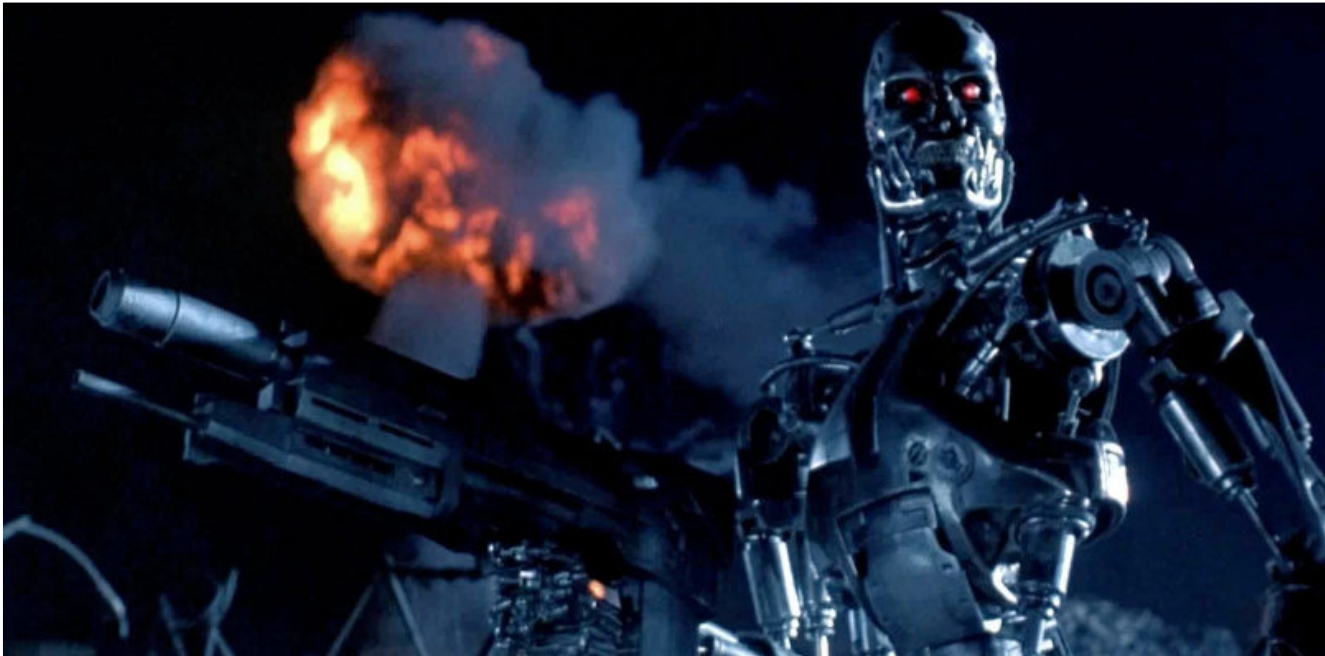
## Diskuzní fórum

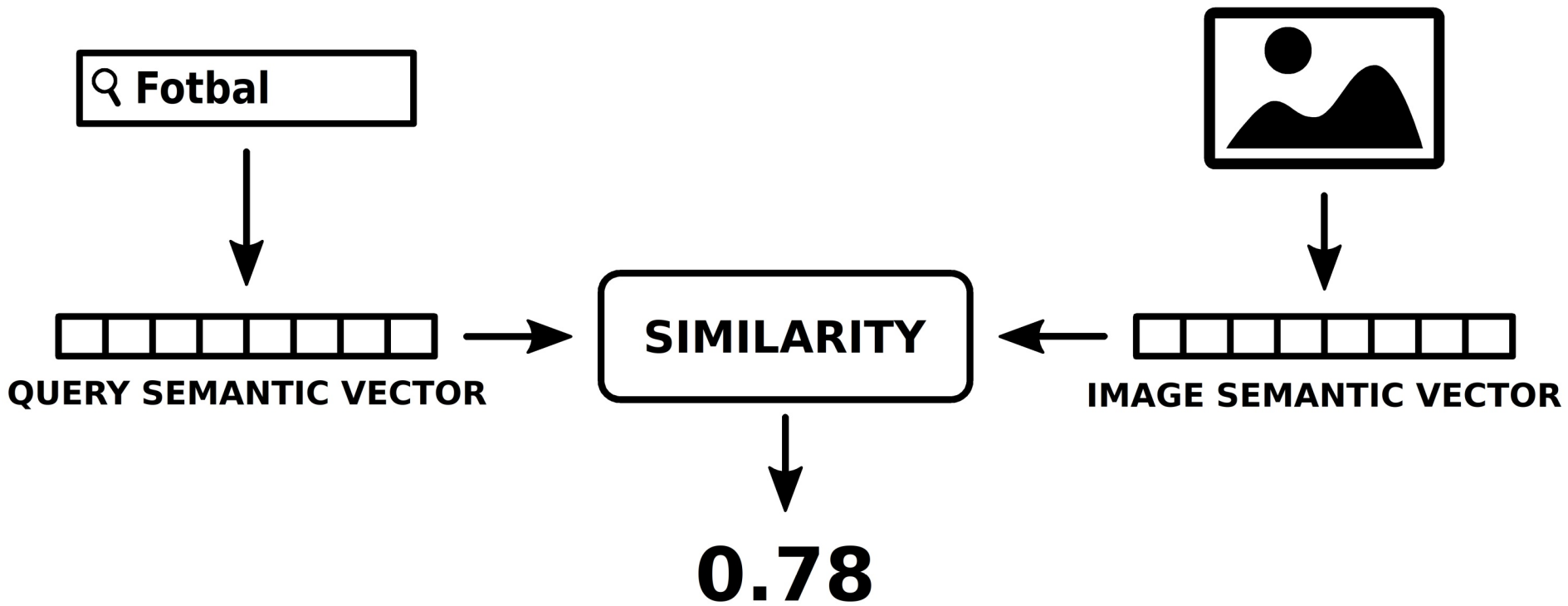
Nejlevnější/zdarma antivir pro komerční použití (27)

Nové pasty Grizzly (20)

Tichý HDD (53)

# “Artificial Intelligence”





**The quick brown fox jumps over the lazy dog**

context

The quick brown fox jumps over the lazy dog



(300 dimensions)

# Closest Words

## **car:**

vehicle  
cars  
SUV  
minivan  
truck  
jeep

## **house:**

houses  
bungalow  
apartment  
bedroom  
townhouse  
residence

## **seven:**

eight  
five  
six  
four  
nine  
three

## **blue:**

red  
purple  
white  
maroon  
colored  
orange

# Semantic Properties

**[king] – [man] + [woman]  $\sim$  [queen]**

**[paris] – [france] + [germany]  $\sim$  [berlin]**



# Query → Vector

**Query:** „zajíc jezdí na kole“

**Vector:** *average*([zajíc], [jezdí], [kole])

🔍 Fotbal



QUERY SEMANTIC VECTOR



SIMILARITY



0.78



IMAGE SEMANTIC VECTOR



# Image Understanding



# Open Source

- Pretrained **models**
- ImageNet **competition**
- 1000 general categories

# Categories



- 1: wine bottle
- 2: candle
- 3: red wine
- 4: French loaf
- 5: wooden spoon



- 1: acoustic guitar
- 2: stage
- 3: microphone
- 4: electric guitar
- 5: banjo



- 1: plate
- 2: meat loaf
- 3: ice cream
- 4: chocolate sauce
- 5: potpie



$512 \times 512 \times 3$



$256 \times 256 \times 3$





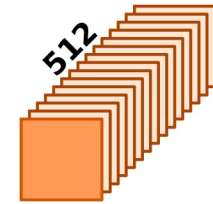
512x512



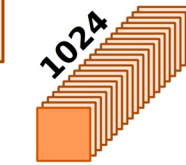
256x256



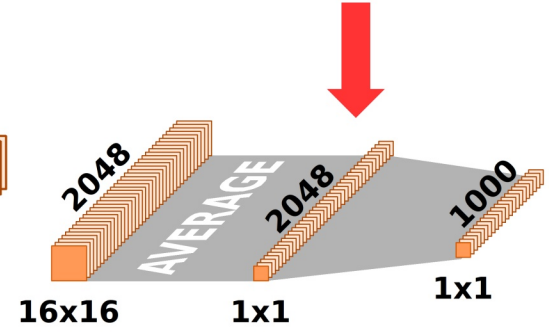
128x128



64x64



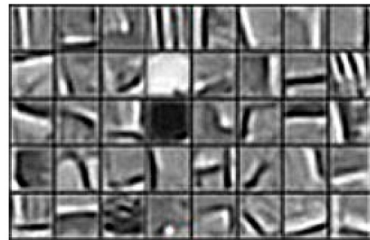
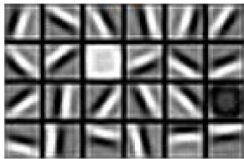
32x32



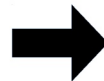
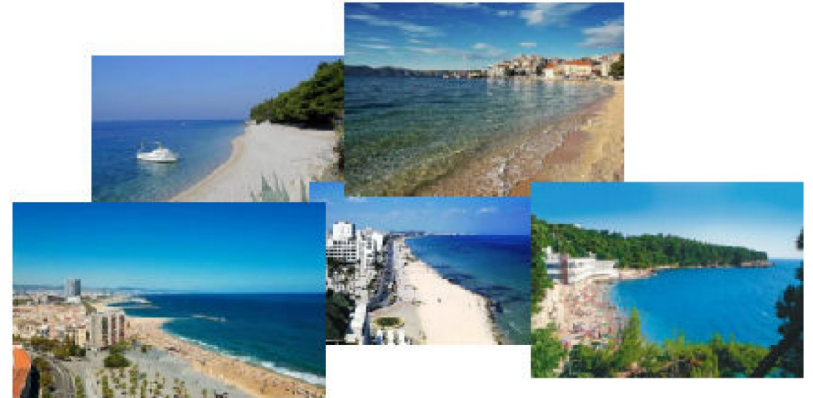
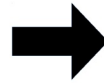
16x16

1x1

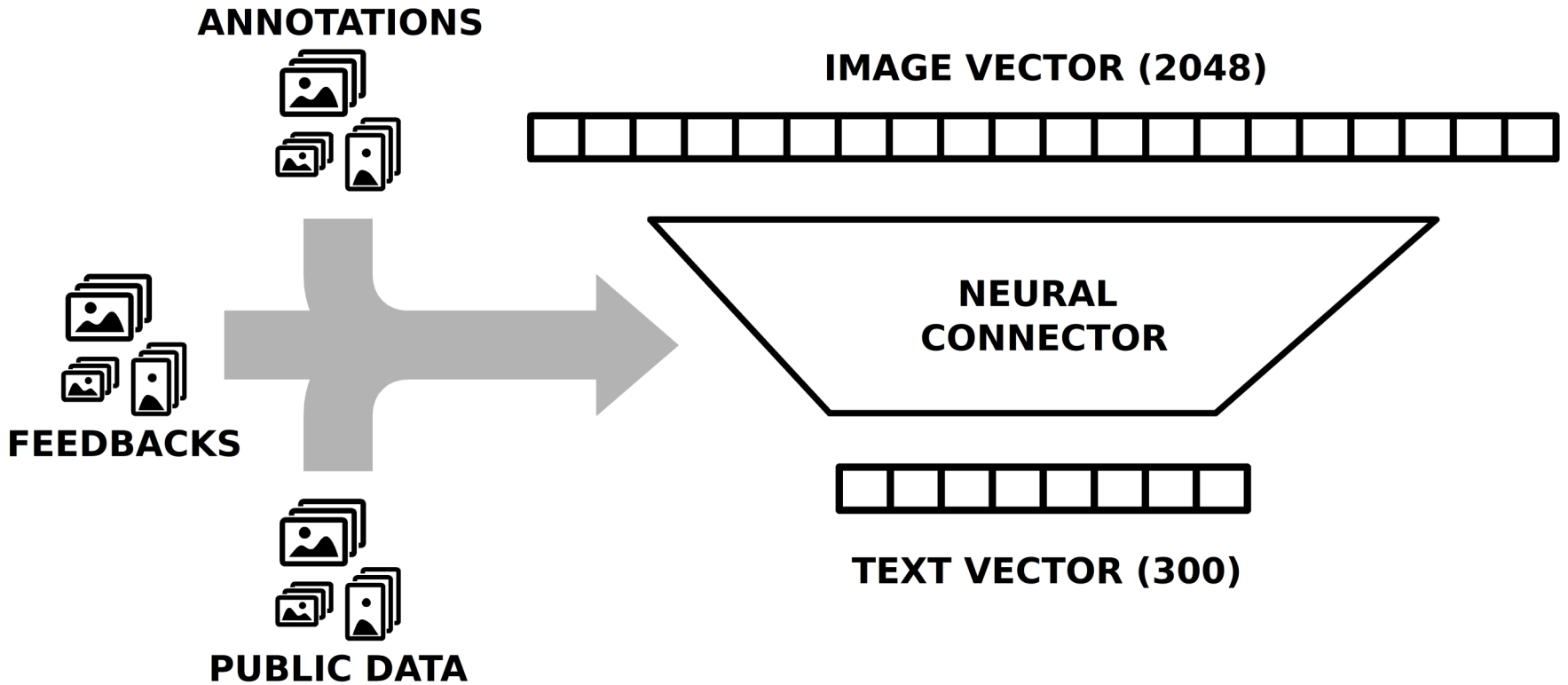
1x1



- Image clustering







🔍 Fotbal



QUERY SEMANTIC VECTOR



**SIMILARITY**



**0.78**



IMAGE SEMANTIC VECTOR

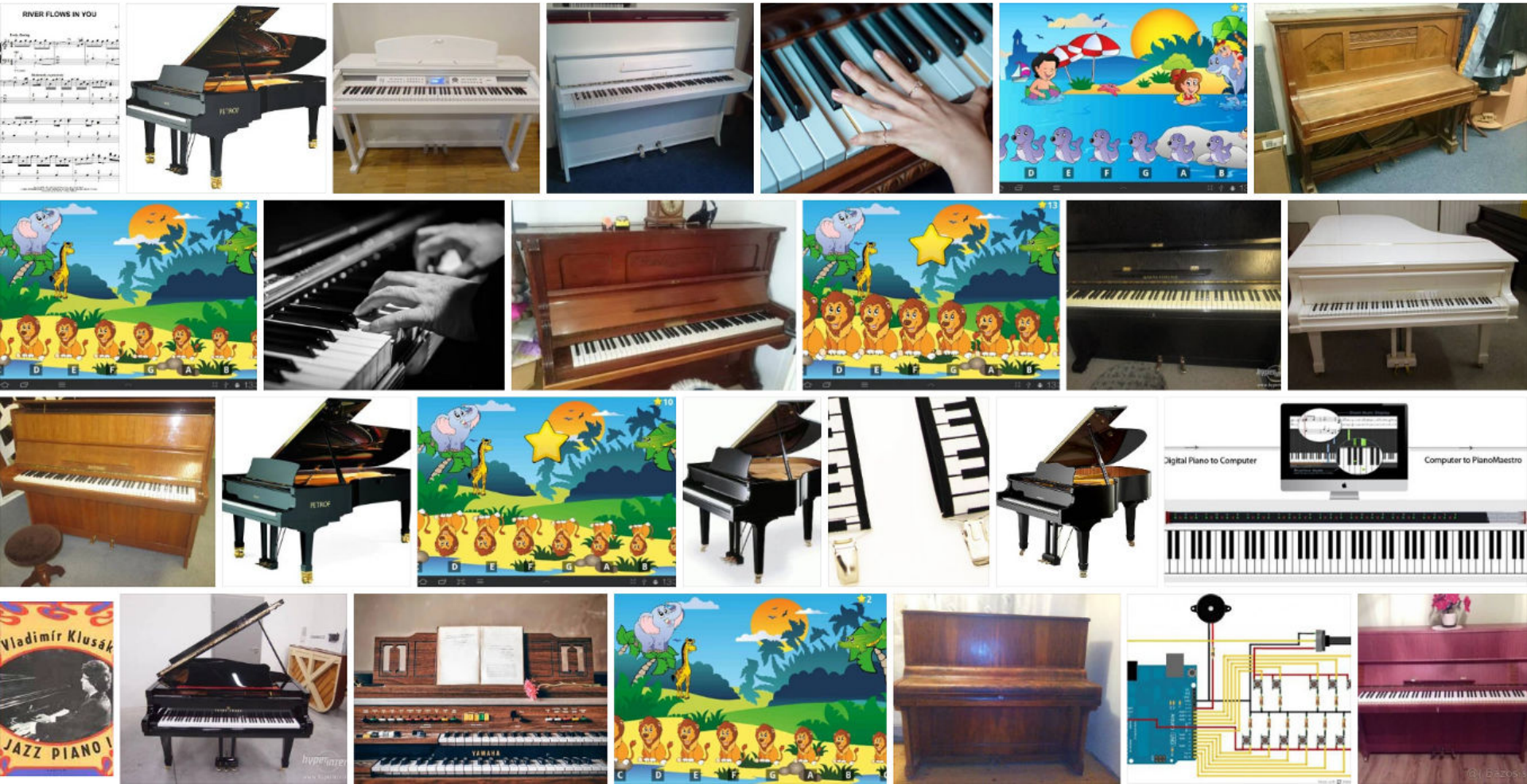


# Features for Ranking

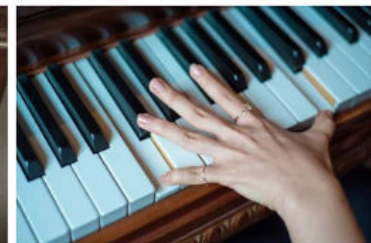
- Similarity
- Selected values of vector
- Porn detection
- New keywords
- Better near text detection

# Effect of Neural Networks

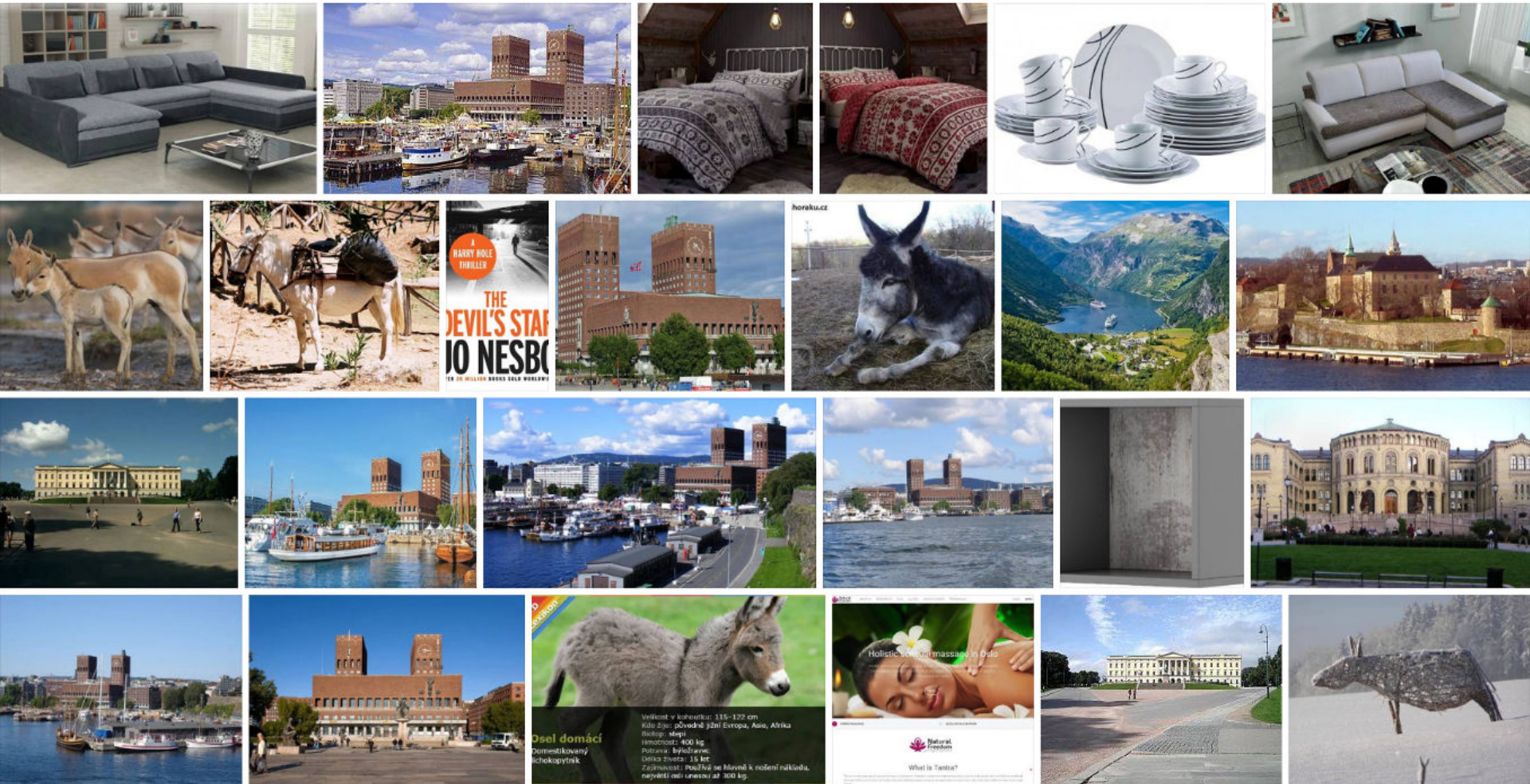
# “Klavír”



# “Klavír” new



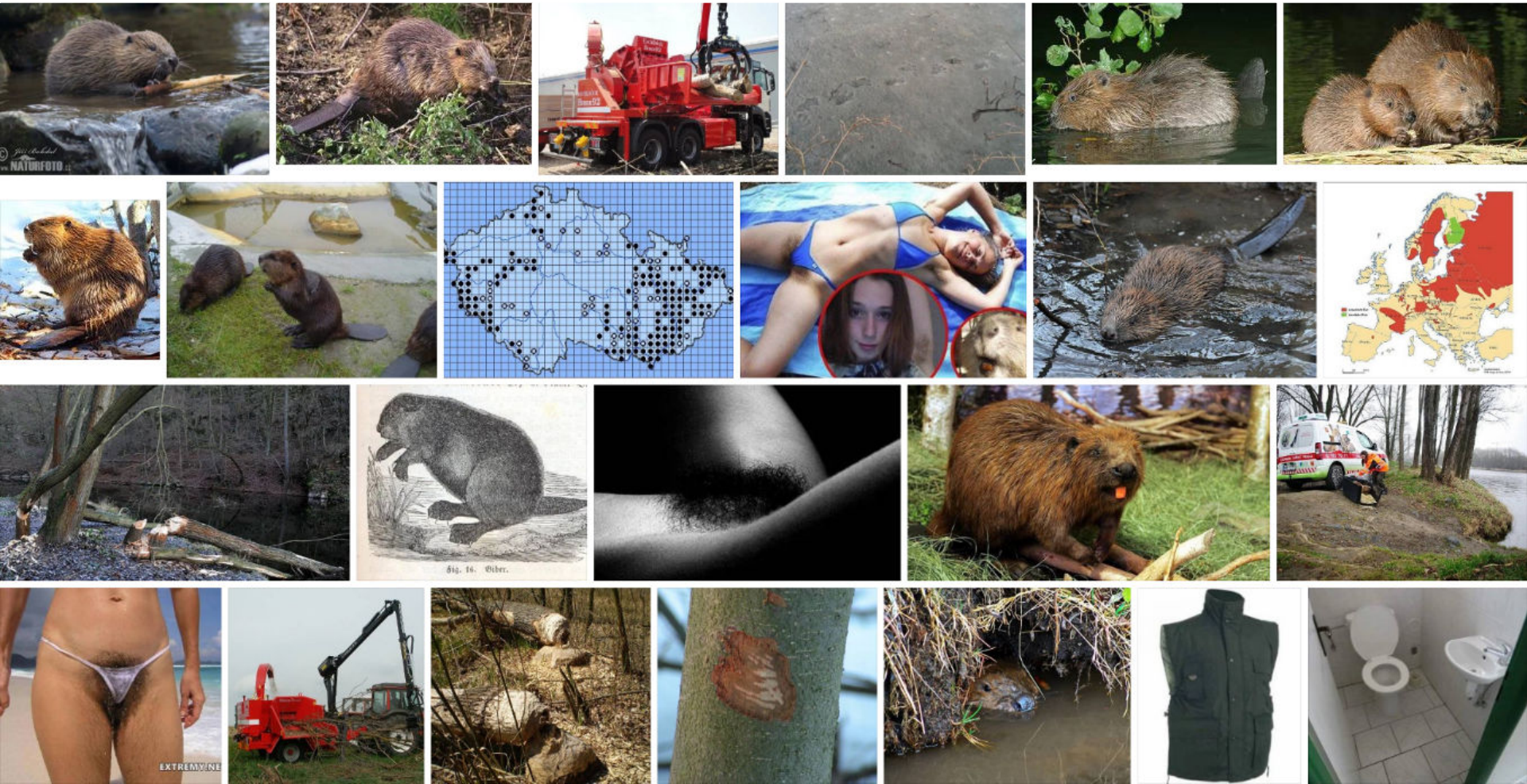
# “Oslo”







# “Bohr”



# “Bobr” new



# "Abeceda"

meno	Název	Výslovnost	Písmeno	Název	Výslov
A a	a	/af/	N n	en	/en/
B b	bee	/bi/	O o	o	/ou/
C c	cee	/si/	P p	pee	/pi/
D d	dee	/di/	Q q	cue	/ku/
E e	ee	/i/	R r	ar	/ar/
F f	ef	/di/	S s	ess	/es/
G g	gee	/dʒi/	T t	tee	/ti/
H h	atch	/etʃ/	U u	u	/ju/
I i	aye	/ai/	V v	vee	/vi/
J j	jay	/dʒeɪ/	W w	double-u	/dʌbəl/
K k	kay	/keɪ/	X x	ecks	/ɛks/
L l	el	/el/	Y y	wee	/wi/
M m	em	/em/	Z z	zed	/zɛd/

أبجدية عربية

حرف	اسم	الكتابة	اللفظ
أ	Alif	ا	/a/
ب	Ba	ب	/b/
ت	Ta	ت	/t/
ث	Tha	ث	/th/
ج	Jim	ج	/j/
ح	Ha	ح	/h/
خ	Kh	خ	/kh/
د	Dal	د	/d/
ذ	Dhal	ذ	/dh/
ر	Ra	ر	/r/
ز	Zay	ز	/z/
س	Sin	س	/s/
ش	Shin	ش	/sh/
ص	Sad	ص	/s/
ي	Ya	ي	/y/



ABECEDA

A a	G g
B b	H h
C c	Ch ch
D d	I i
E e	J j
F f	K k
L l	M m

Letter	Name	Phonetic	Name		
Aa	delta A	0e	Bb	delta B	0e
Cc	ce	0e	Dd	de	0e
Ee	ee	0e	Ff	ef	0e
Gg	ge	0e	Hh	he	0e
Ii	ie	0e	Jj	je	0e
Kk	ke	0e	Ll	le	0e
Mm	me	0e	Nn	ne	0e
Oo	oe	0e	Pp	pe	0e
Qq	qe	0e	Rr	re	0e
Ss	se	0e	Tt	te	0e
Vv	ve	0e	Ww	we	0e
Xx	xe	0e	Yy	ye	0e
Zz	ze	0e			



The English Alphabet

A	[eɪ]	J	[dʒeɪ]	S	[es]
B	[beɪ]	K	[keɪ]	T	[teɪ]
C	[seɪ]	L	[leɪ]	U	[ju]
D	[deɪ]	M	[meɪ]	V	[vi]
E	[i]	N	[en]	W	[dʌbjuː]
F	[ef]	O	[oʊ]	X	[ɛks]
G	[dʒi]	P	[pi]	Y	[waɪ]
H	[eɪ]	Q	[kjuː]	Z	[zɒd / ɛs ɪz]
I	[aɪ]	R	[reɪ]		



Wörterkärtchen

A	a	bee	B	b	bee
C	c	cee	D	d	dee
E	e	ee	F	f	ef
G	g	gee	H	h	atch
I	i	aye	J	j	jay
K	k	kay	L	l	el
M	m	em	N	n	en
O	o	o	P	p	pee
Q	q	cue	R	r	ar
S	s	ess	T	t	tee
U	u	u	V	v	vee
W	w	double-u	X	x	ecks
Y	y	wee	Z	z	zed

Písmeno	Výslovnost	Písmeno	Výslovnost
A a	ee	N n	en
B b	bee	O o	o
C c	cee	P p	pee
D d	dee	Q q	ku
E e	e	R r	er
F f	ef	S s	es
G g	gee	T t	tee
H h	ha	U u	u
I i	i	V v	vee
J j	jett	W w	wee
K k	ka	X x	eks
L l	el	Y y	ye
M m	em	Z z	zen

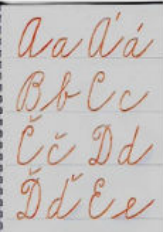
UČIME SE ABECEDU

a	b	c	d	e	f
g	h	ch	i	j	k
l	m	n	o	p	q
r	s	s	t	u	v
w	x	y	z		

Á á	B b	C c	Č č	D d	Ď ě	E e	É é	Ě ě
douhá	bé	cé	čé	dé	ě	é	douhá	ě s háčkem
[aː]	[b]	[s]	[ʃ]	[d]	[j]	[e]	[eː]	[ɛ, jɛ]
H h	Ch ch	I i	Í í	J j	K k	L l	M m	N n
há	chá	i	douhá	í	ké	lé	m	en
[ɛ]	[x]	[i]	[ɛ]	[j]	[k]	[l]	[m]	[n]
Ó ó	P p	Q q	R r	Ř ř	S s	Š š	T t	Ť ť
douhá	pé	ké	er	er	es	šé	té	ťé
[oː]	[p]	[kw]	[r]	[r]	[s]	[ʃ]	[t]	[tʃ]
Ú ú	Ú ú	V v	W w	X x	Y y	Z z	Ž ž	Ž ž
douhá	ú	vé	douhá	xé	yé	z	ž	ž
[uː]	[uː]	[v]	[w]	[ks]	[j]	[z]	[ʒ]	[ʒ]



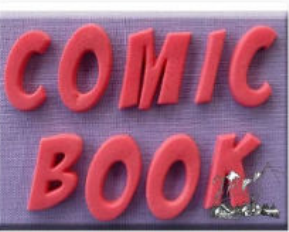
meno	Kód	Písmenná slova	Písmeno	Kód	Písmenná slo
A	...	abit	B	...	hábit
B	...	obkavice	C	...	o náá páin
C	...	slavici	P	...	papír
D	...	silva	Q	...	kvá onán
E	...	erb	R	...	radé
F	...	řápní	S	...	sohata
G	...	česník pán	T	...	tan
H	...	hrachovna	U	...	učení
Ch	...	cháb nám dáva	V	...	vývolání
I	...	im	W	...	dvéřá vé
J	...	jamh jít	X	...	Xřokratý
K	...	skřáta	Y	...	řhar máva
L	...	lyže	Z	...	žádá tena
M	...	má			



X x	X x
Y y	Y y
Z z	Z z



А а	Б б	В в	Г г	Д д	Е е
Ж ж	З з	И и	Й й	К к	Л л
М м	Н н	О о	П п	Р р	С с
Т т	У у	Ф ф	Х х	Ц ц	Ч ч
Ш ш	Щ щ	Ъ ъ	Ы ы	Ь ь	Э э
Ю ю	Я я				



The English Alphabet

A	[eɪ]	J	[dʒeɪ]	S	[es]
B	[beɪ]	K	[keɪ]	T	[teɪ]
C	[seɪ]	L	[leɪ]	U	[ju]
D	[deɪ]	M	[meɪ]	V	[vi]
E	[i]	N	[en]	W	[dʌbjuː]
F	[ef]	O	[oʊ]	X	[ɛks]
G	[dʒi]	P	[pi]	Y	[waɪ]
H	[eɪ]	Q	[kjuː]	Z	[zɒd / ɛs ɪz]
I	[aɪ]	R	[reɪ]		



ABECEDA

A a	G g
B b	H h
C c	Ch ch
D d	I i
E e	J j
F f	K k
L l	M m

А а	Б б	В в	Г г
Д д	Е е	Ё ё	Є є
Ж ж	З з	И и	Й й
К к	Л л	М м	Н н
О о	П п	Р р	С с
Т т	У у	Ф ф	Х х
Ц ц	Ч ч	Ш ш	Щ щ
Ъ ъ	Ы ы	Ь ь	Э э
Ю ю	Я я		

Handwritten numbers 0 through 9.



А а	Б б	В в	Г г	Д д	Е е	Ё ё	Є є	Ж ж	З з	И и	Й й	К к
Л л	М м	Н н	О о	П п	Р р	С с	Т т	У у	Ф ф	Х х	Ц ц	Ч ч
Ш ш	Щ щ	Ъ ъ	Ы ы	Ь ь	Э э	Ю ю	Я я					

# “Abeceda” new



Česká abeceda

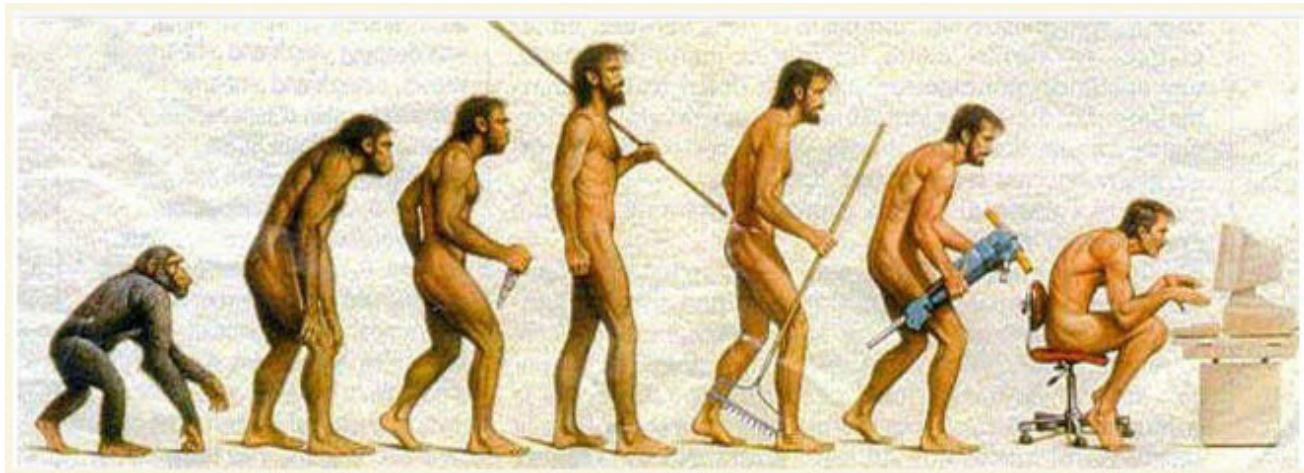
a	á	b	c	č	d	ď	e	é	ě
f	g	h	ch	i	í	j	k	l	m
n	ň	o	ó	p	q	r	ř	s	š
t	ť	u	ú	v	w	x	y	ý	z
ž									



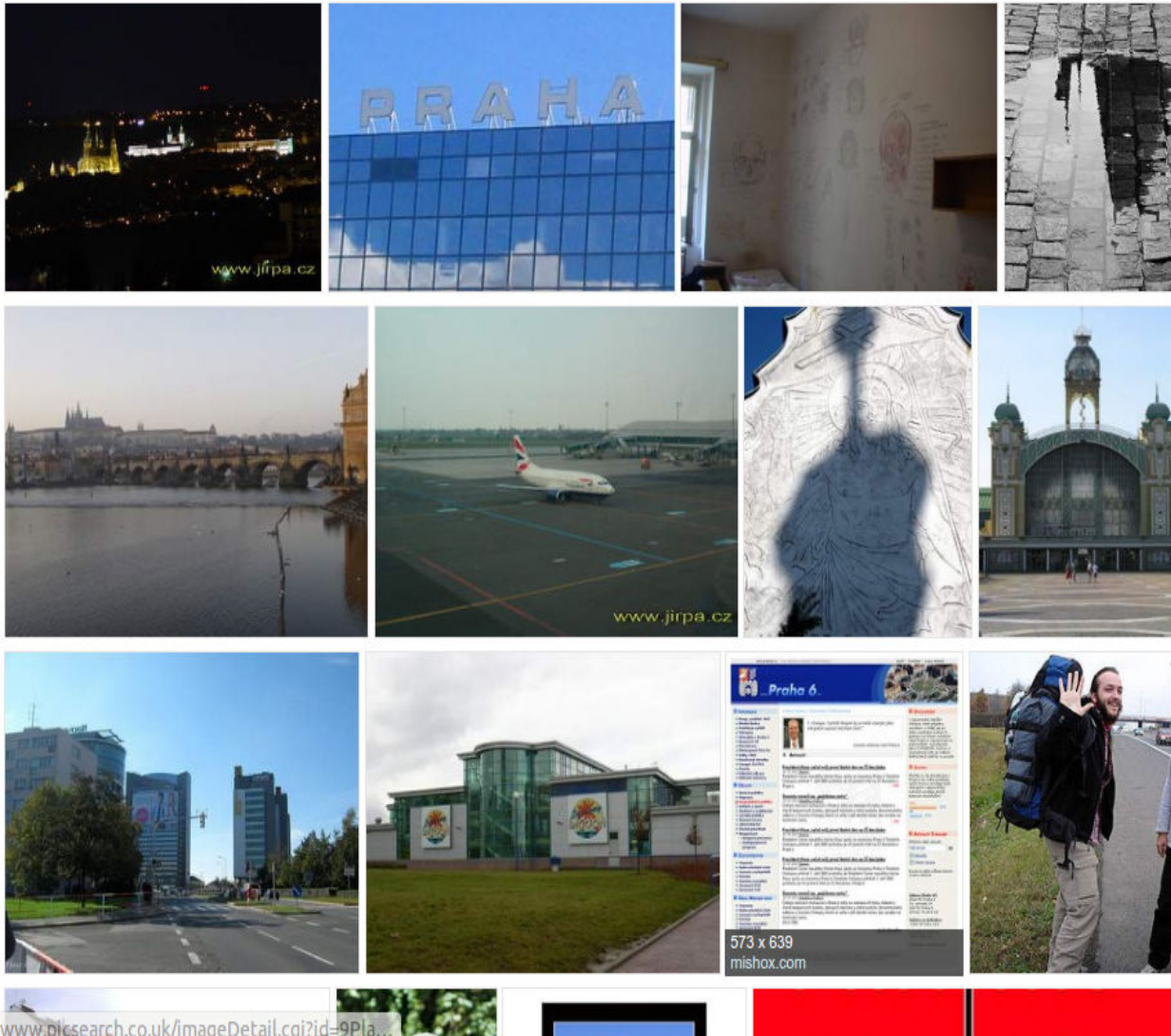
Vv	Vv	Vv	Vv	Vv	Vv
Ww	Ww	Ww	Ww	Ww	Ww
Xx	Xx	Xx	Xx	Xx	Xx
Yy	Yy	Yy	Yy	Yy	Yy
Zz	Zz	Zz	Zz	Zz	Zz
Ää	Ää	Ää	Ää	Ää	Ää
Öö	Öö	Öö	Öö	Öö	Öö
Úú	Úú	Úú	Úú	Úú	Úú



# Evolution



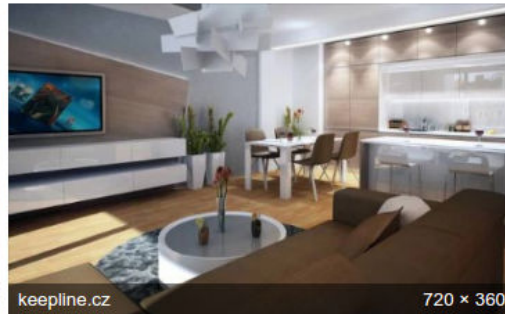
# “Praha” on



# “Praha”- Text Search



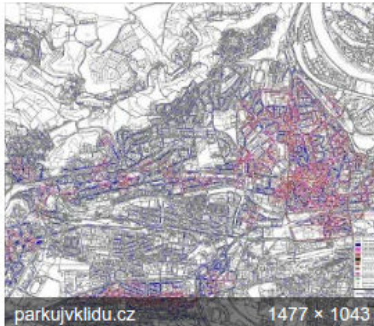
**KAMENNÁ  
PRODEJNA V PRAZE**



**WOW**  
*Black Light Theater*

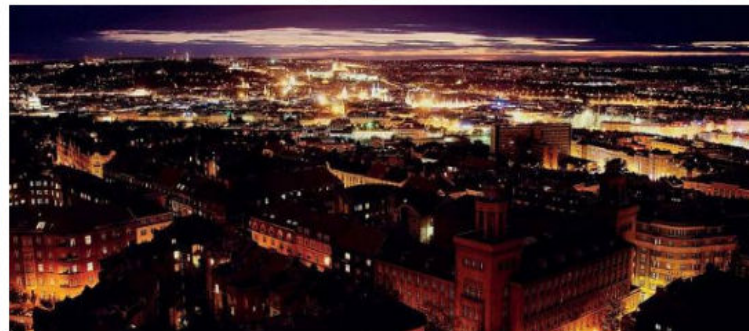


# “Praha” - User Feedback





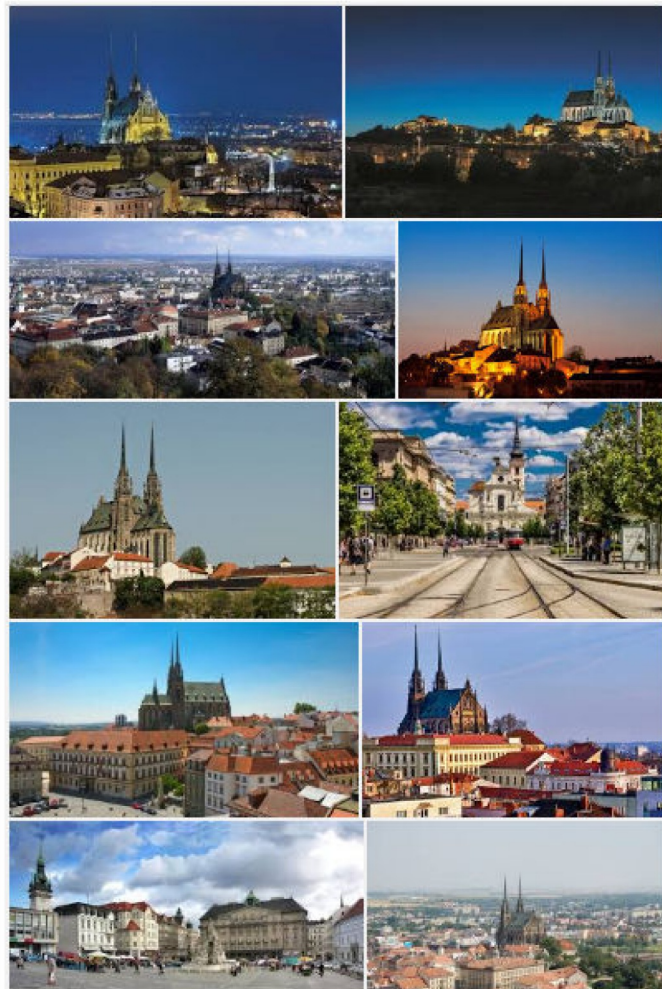
# “Praha” - Neural Nets



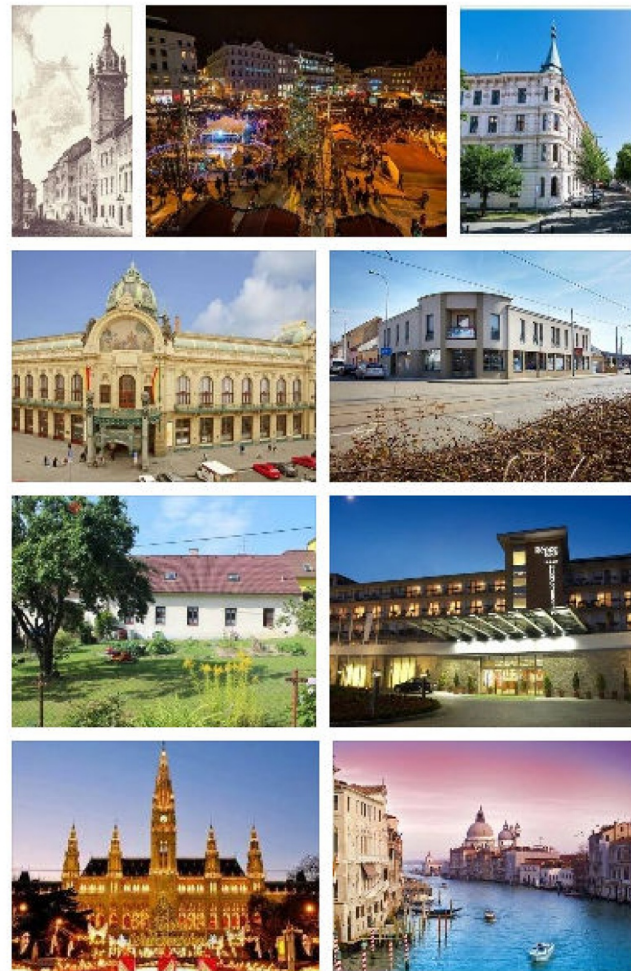


# “Brno”

Google



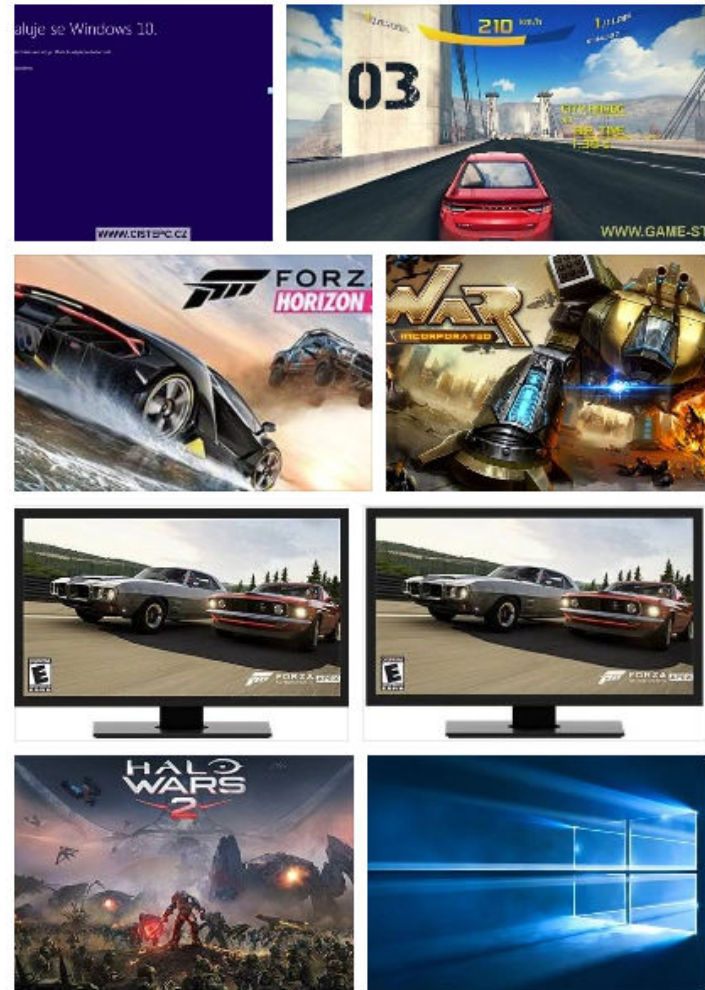
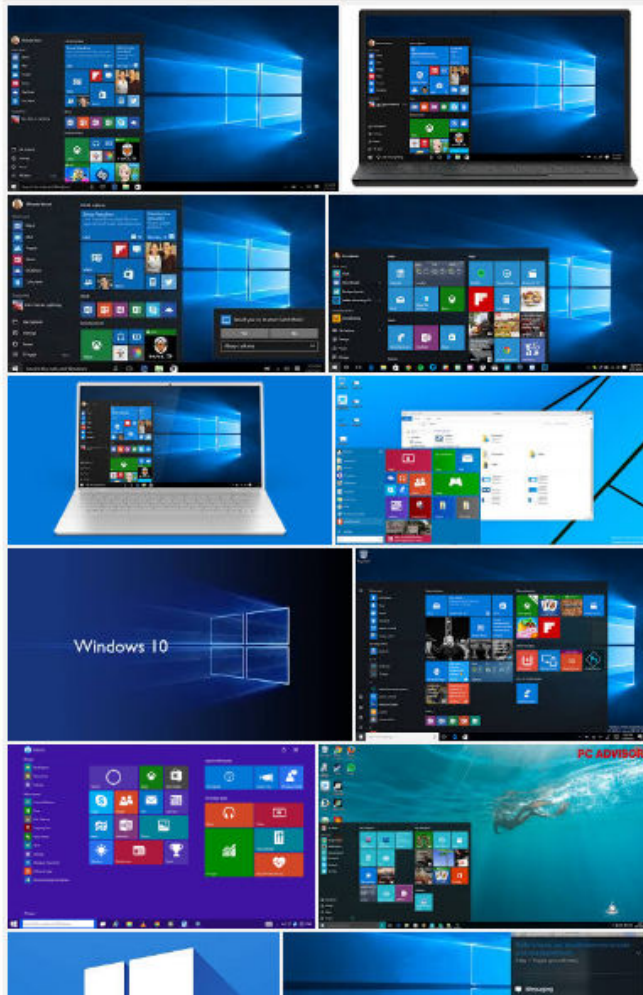
SEZNAM.CZ  
Obrázky



# “Windows 10”

Google

SEZNAM.CZ  
Obrázky



# Summary

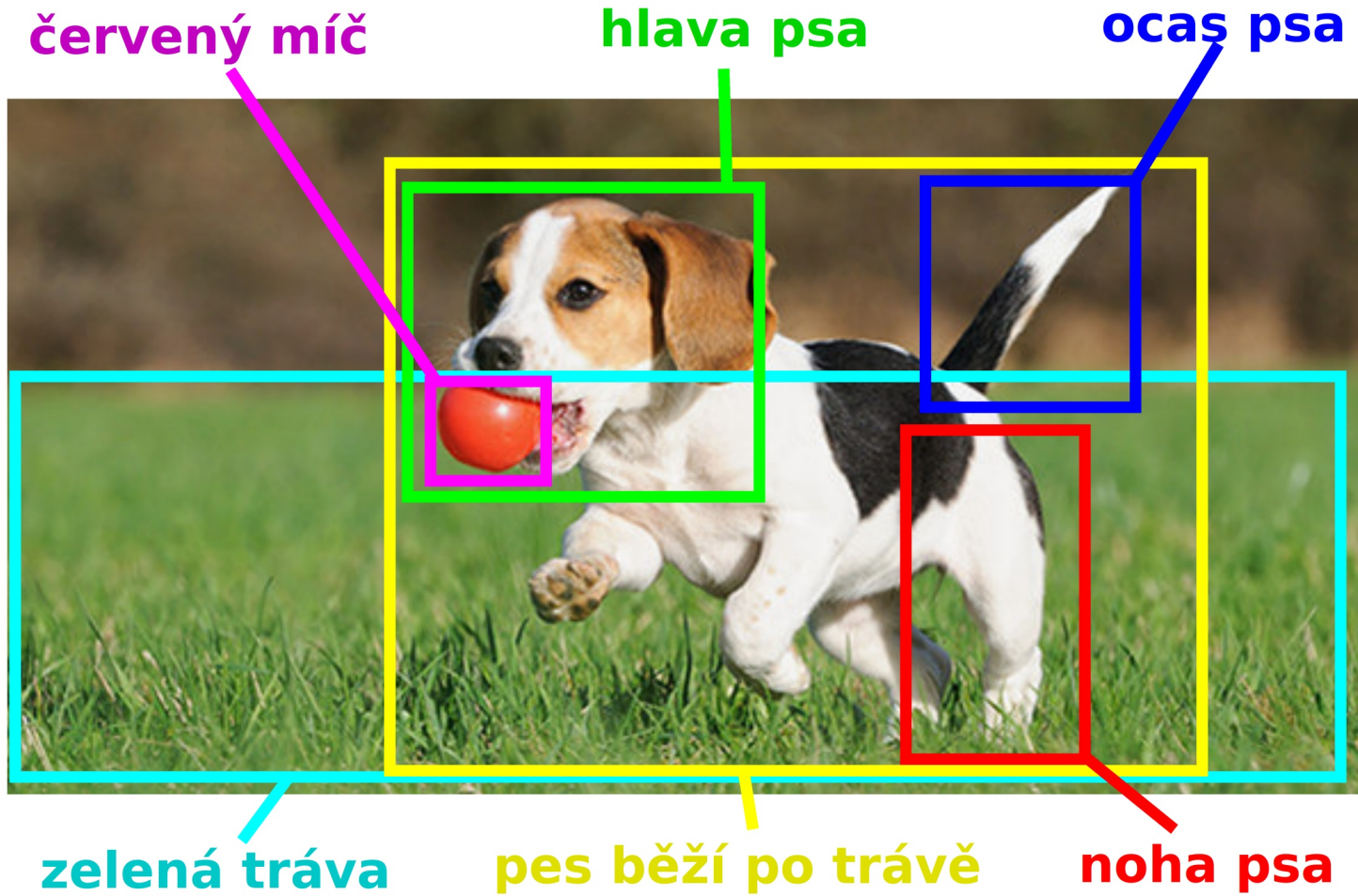
- User feedback
- Word vectors
- Image vectors
- New features
- Ref: [ResNet](#), [fastText](#), [DeViSE](#)

# Future



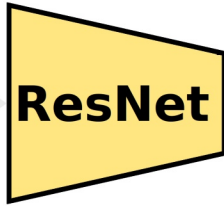
EVANS/THREE LIONS/GETTY IMAGES

# Object detection



# Overview

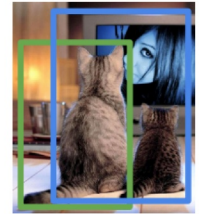
512 x 512 x 3



Conv features



Region features  
100 x 2048

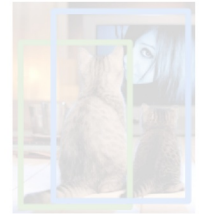
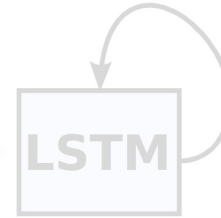
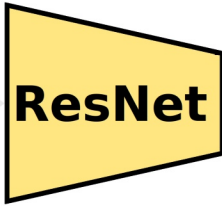


Two cats watching TV  
Brown cat sitting

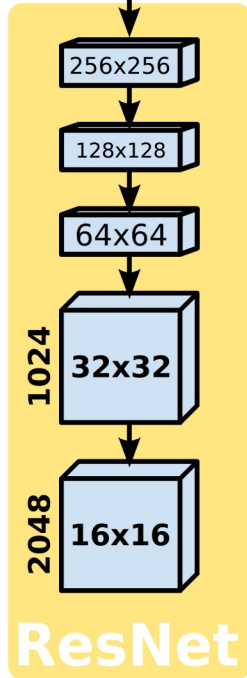


# Overview

512 x 512 x 3

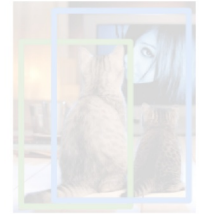
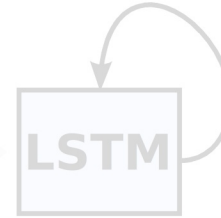
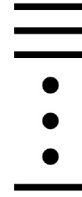
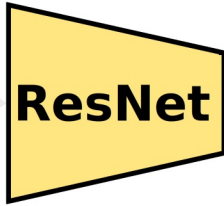


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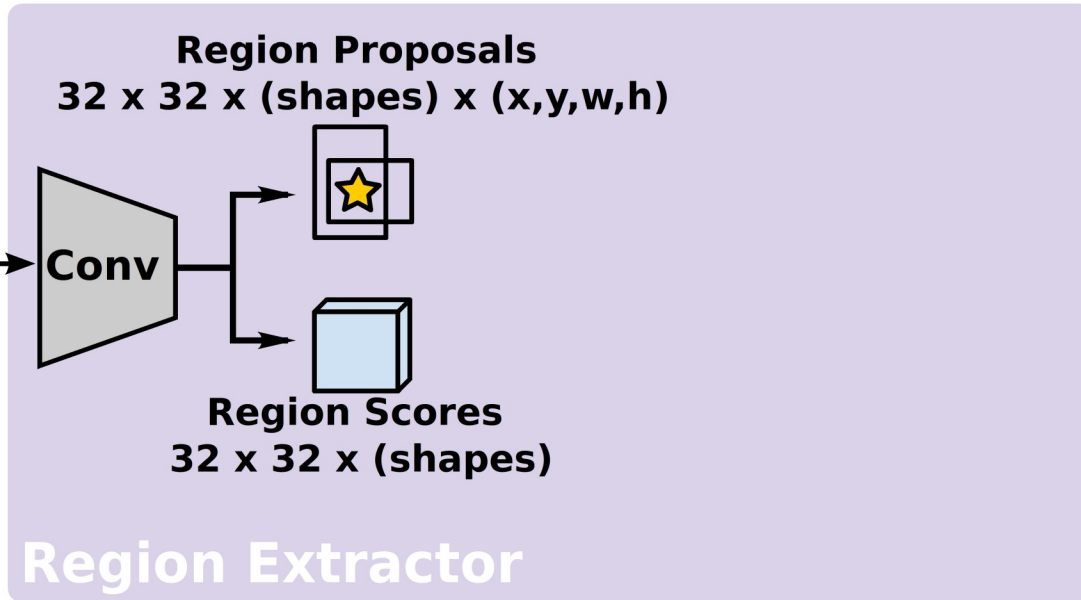
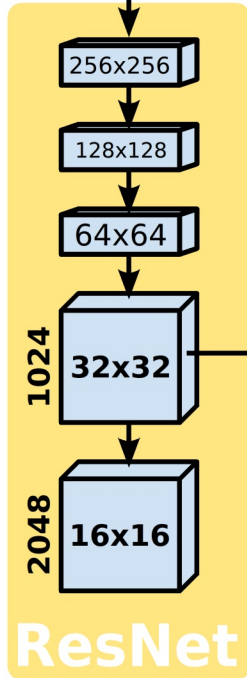


# Overview

512 x 512 x 3



Two cats watching TV  
Brown cat sitting



# Overview

512 x 512 x



## Region Proposals

32 x 32 x (shapes) x (x,y,w,h)

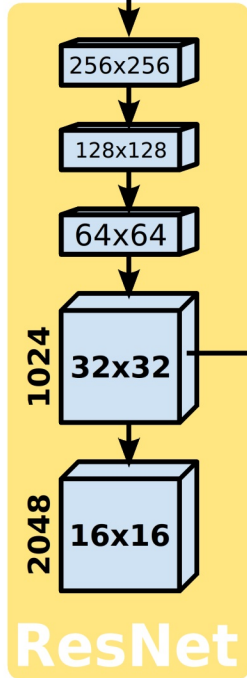
**Size:** small, medium, big, XXL

**Ratio:**

1:1

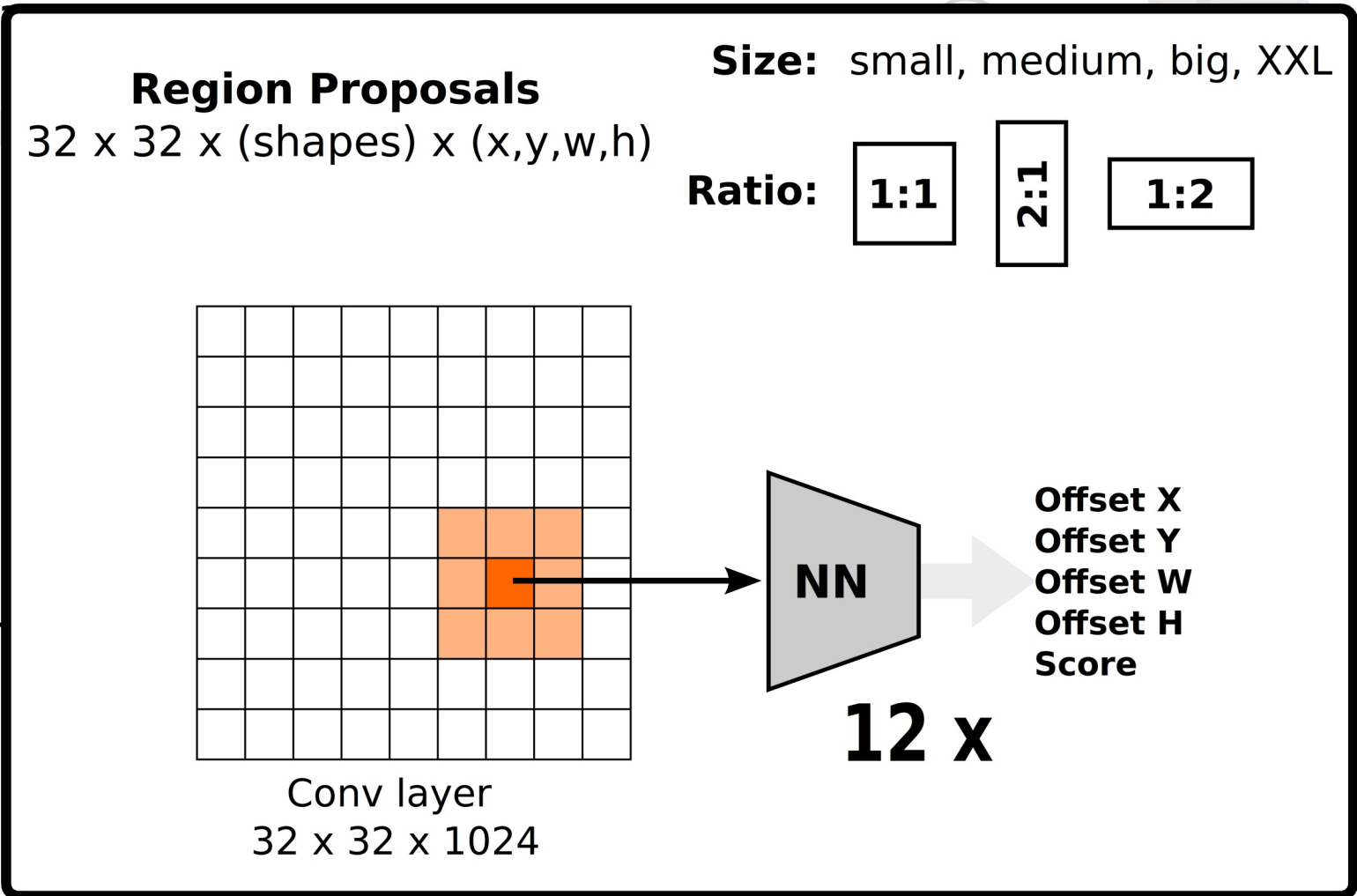
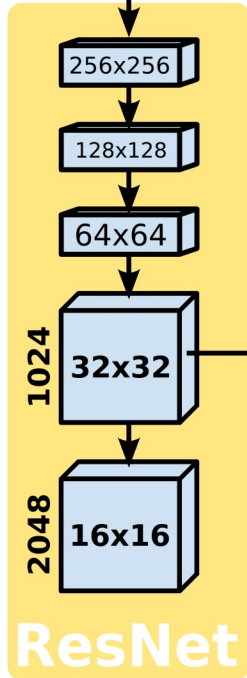
2:1

1:2



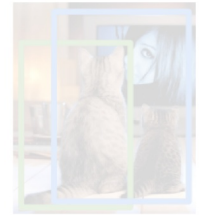
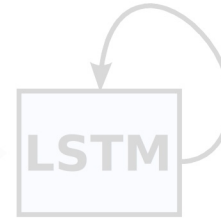
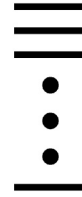
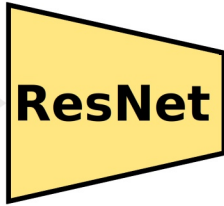
# Overview

512 x 512 x

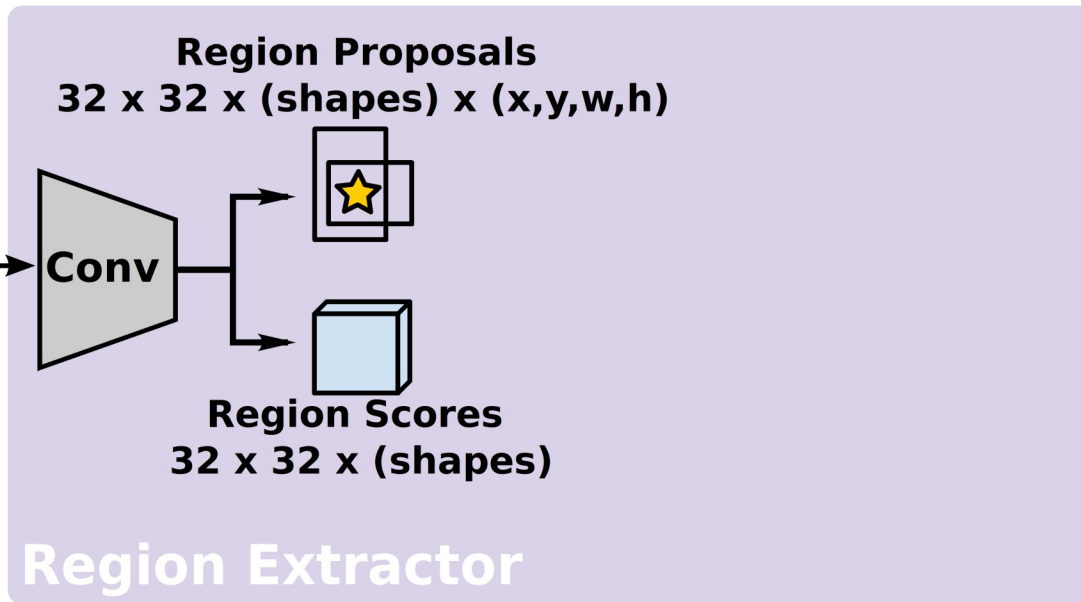
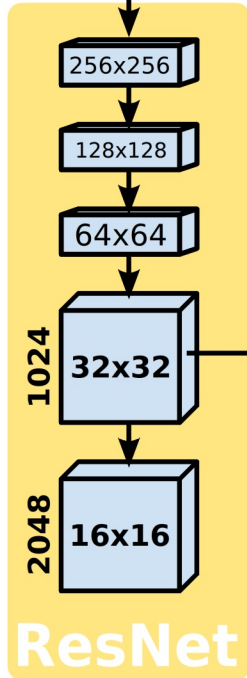


# Overview

512 x 512 x 3

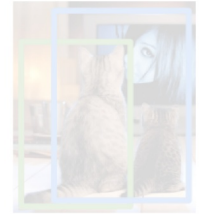
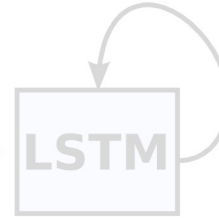
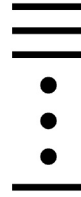
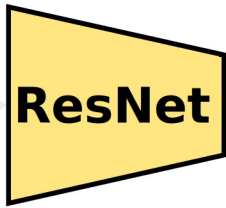


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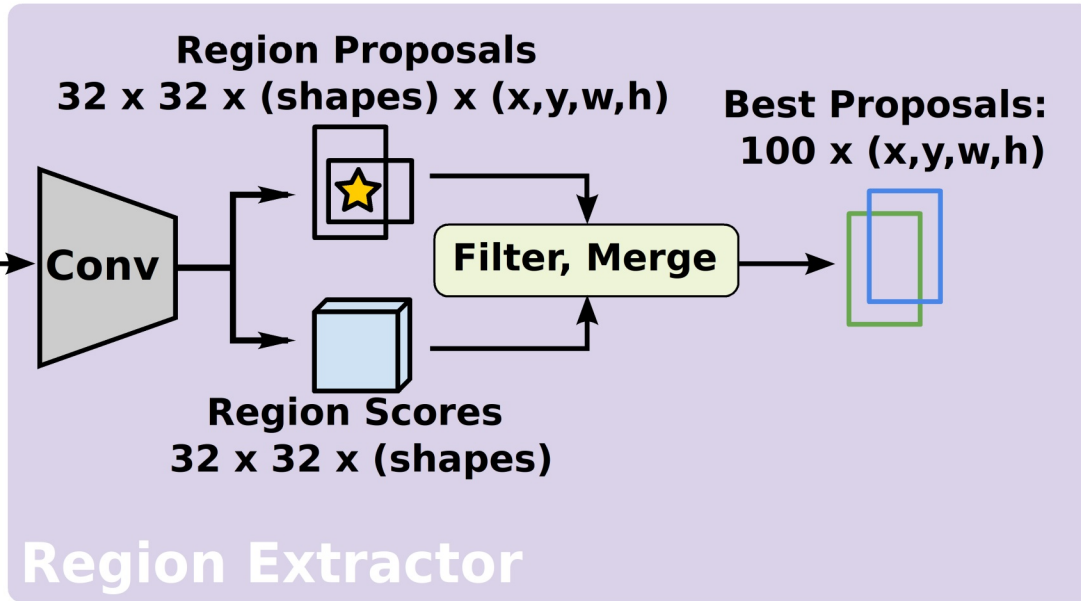
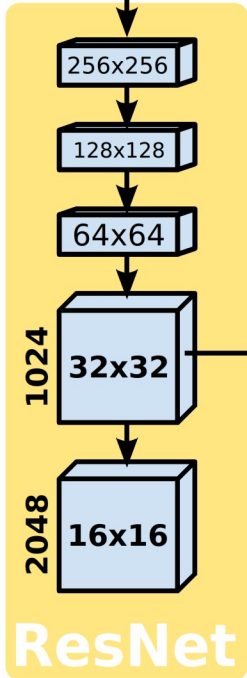


# Overview

512 x 512 x 3

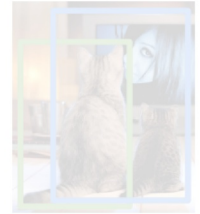
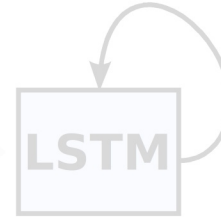
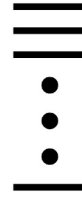
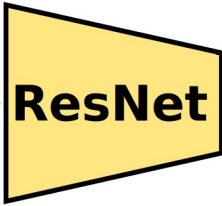


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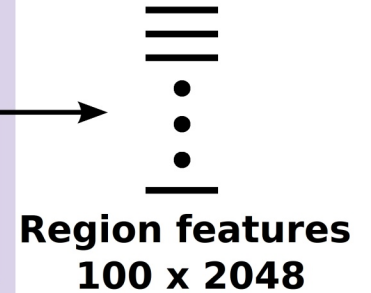
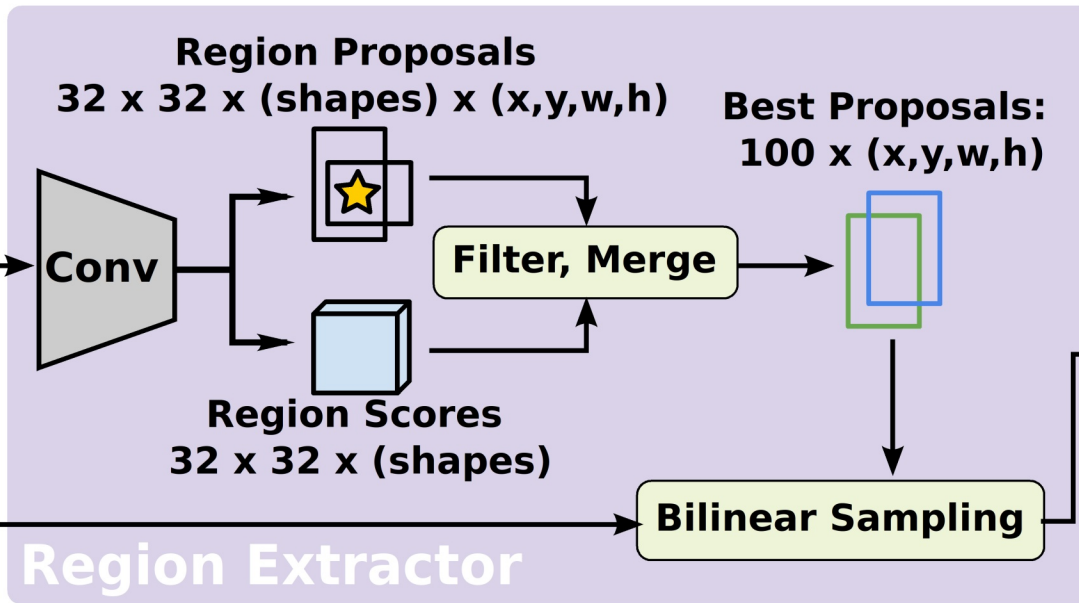
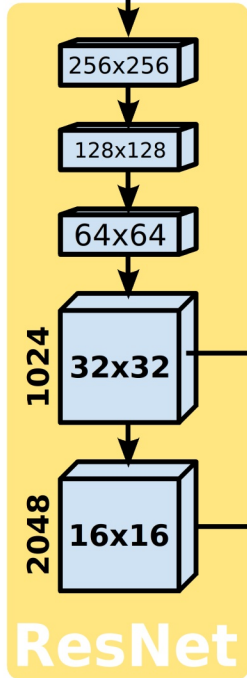


# Overview

512 x 512 x 3

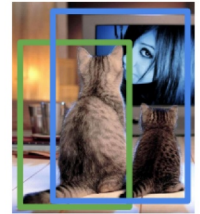
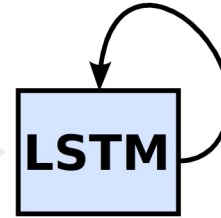
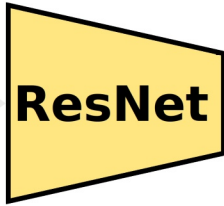


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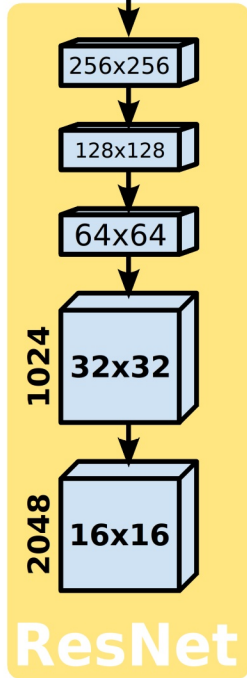


# Overview

512 x 512 x 3



Two cats watching TV  
Brown cat sitting



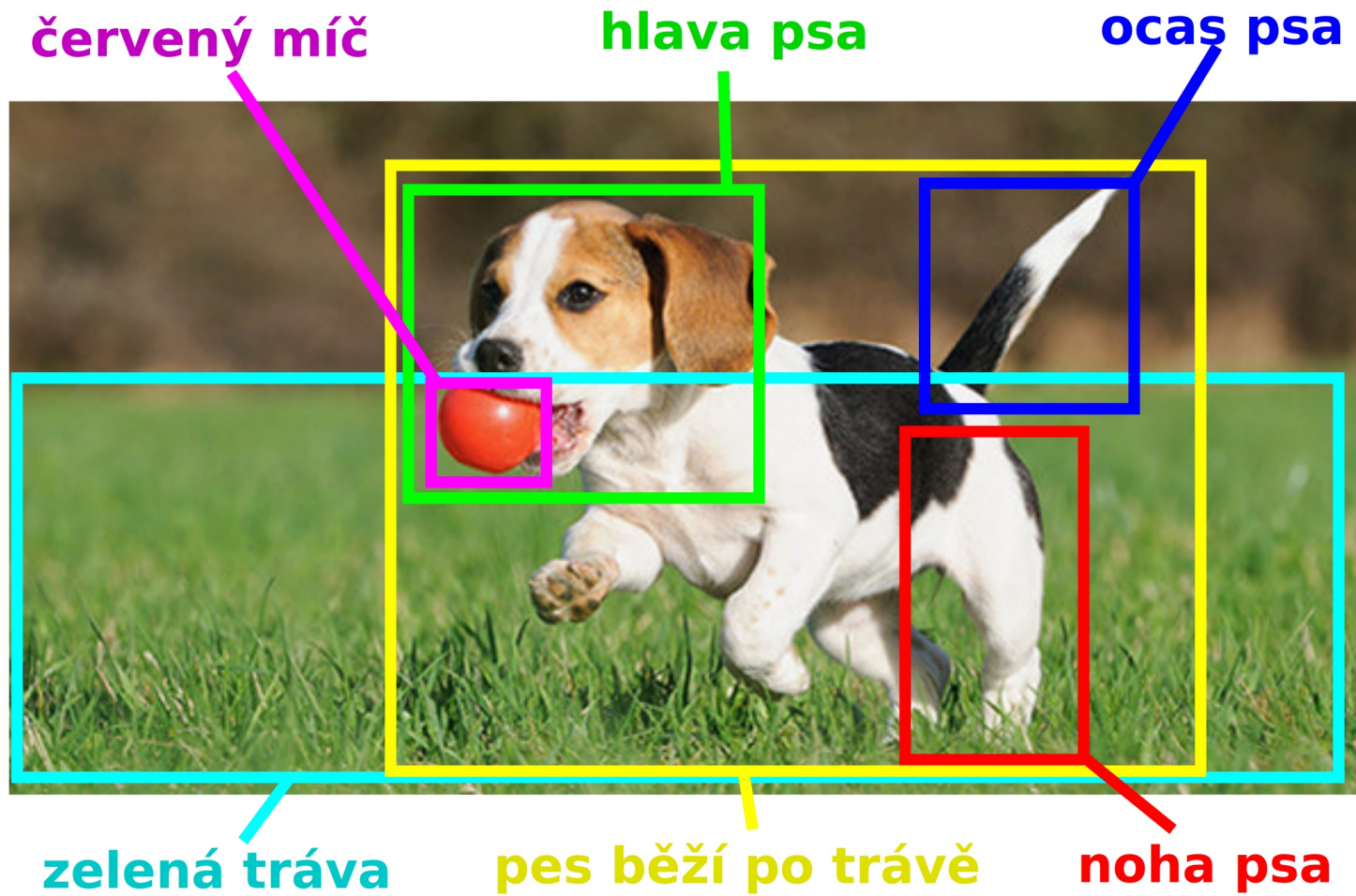
word

LSTM





# Goal



# Result

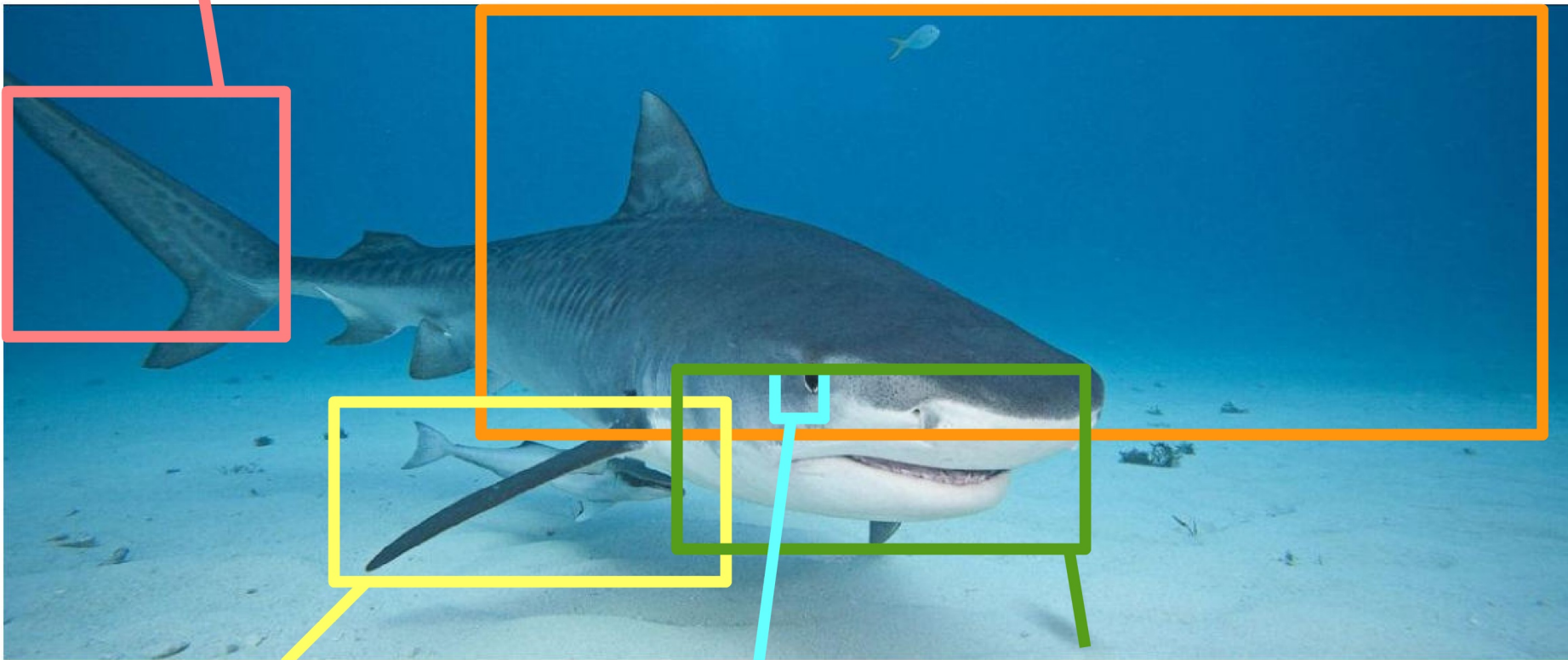
- č
- č



- to j
- zele

- bílé mraky na modré obloze
- to je ocas

- bílé mraky na modré obloze
- modrá obloha bez mraků



- noha osoby
- noha ptáka

- levé oko na ptáka
- oko na lední medvěď

- nos muže
- muž na sobě bílou košili

# Image Search usage

- Landmarks
- Celebrities
- Clothes
- Household items
- OCR for signs, texts

# References

- Lot of inspiration:
- DenseCap, Visual-Semantic Alignments
- ResNet, Identity Mappings
- RCNN, Fast RCNN, Faster RCNN
- DeepMask, SharpMask

# Thanks & Questions

