Machine Learning from a Computer Vision and Natural Language Processing perspective

A Talk by,
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Machine Learning

Machine learning is a scientific discipline that is concerned with the design and development of algorithms that allow computers to evolve behaviours based on empirical data, such as from sensor data or databases.

Want more?

A computer program is said to learn to perform a **task T** from **experience E**, if its performance at task T, as measured by a **performance metric P**, improves with experience E over time.

Enough of it!

What is understanding or Intelligence ?

Query - “car parts for sale”

Document 1

… car parking available for a small fee.

… parts of our floor model inventory for sale.

Document 2

Selling all kinds of automobile and pickup truck parts, engines, and transmissions.

Have you used any ML System ?

- Amazon, Youtube, Netflix, Ebay, etc - Recommender system
- Cheques and Cash deposit machines
- Credit card, bank transactions - Fraudulent transactions
- Sophisticated cars
- US postal service

Other stuff related to ML

- Google Allo, Google Now, Siri - personal AI assistants
- Google Translate
- Skype live translate
- Facebook auto tag
- Google glass
- Self driving cars
- Google Brain
- FBLearner Flow
- Tensor Flow

Simple example - Spam Filter

- What is spam?
- How do traditional spam filters work?
- Make computers learn to classify between spam and non spam mails!

Some common ML problems

- Optical Character Recognition
- Face detection
- Spam filtering
- Topic spotting
- Spoken language understanding
- Medical diagnosis
- Customer segmentation
- Fraud detection
- Weather prediction
- Social network analysis

Alpha GO !

The housing price prediction example

Malignant Tumor Problem

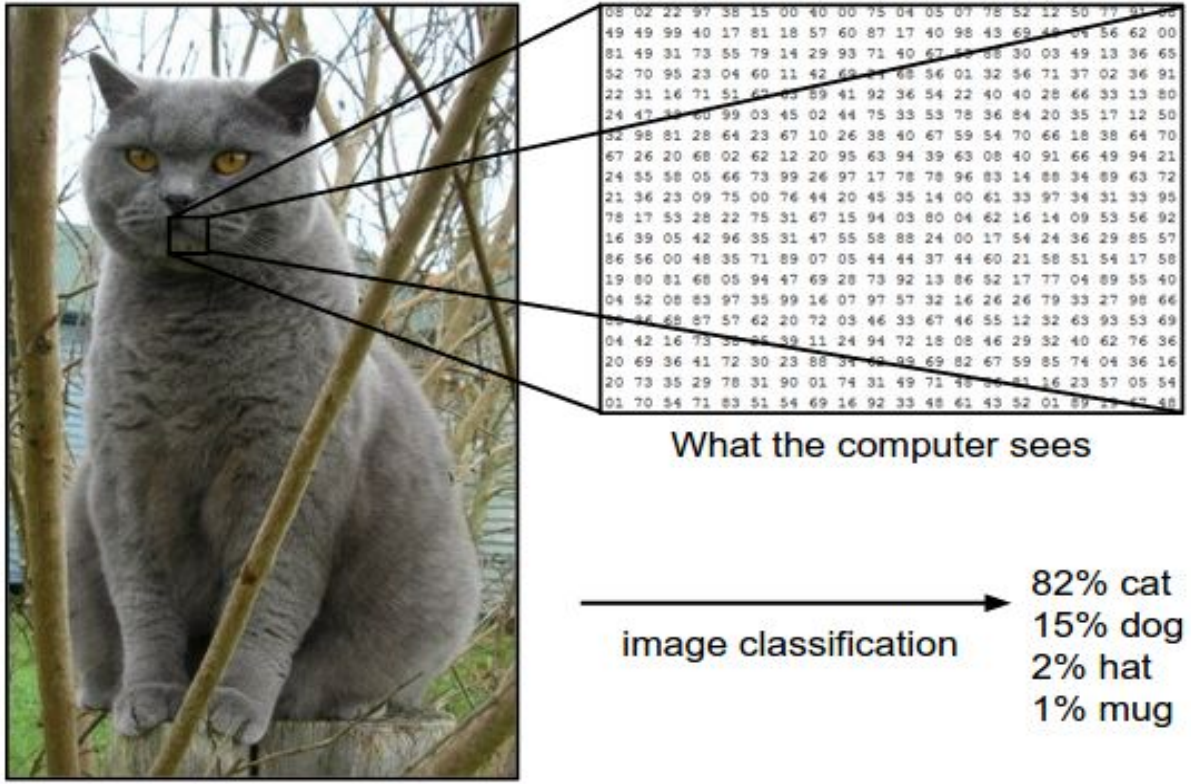
The ML Pipeline

- Feature engineering / Extraction - An art
- Feature selection / Reduction
- Learning Algorithm
- Post processing
- Prediction

Computer Vision

What is?

What the computer sees



The Challenges !

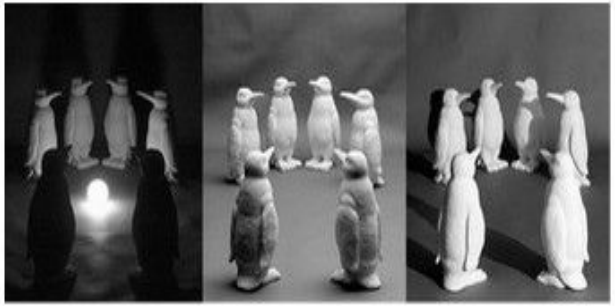
Viewpoint variation

Scale variation

Deformation

Occlusion

Illumination conditions



Background clutter

Intra-class variation

How intimidating is ML and CV ?

How powerful is it?

Image Classification

The pipeline,

- Input
  - Data - ImageNet, MS COCO, Flickr Datasets, PASCAL VOC or Kaggle Challenges
  - Crawl and Scrape it out!
- Learning
- Evaluation

The computing power needed,

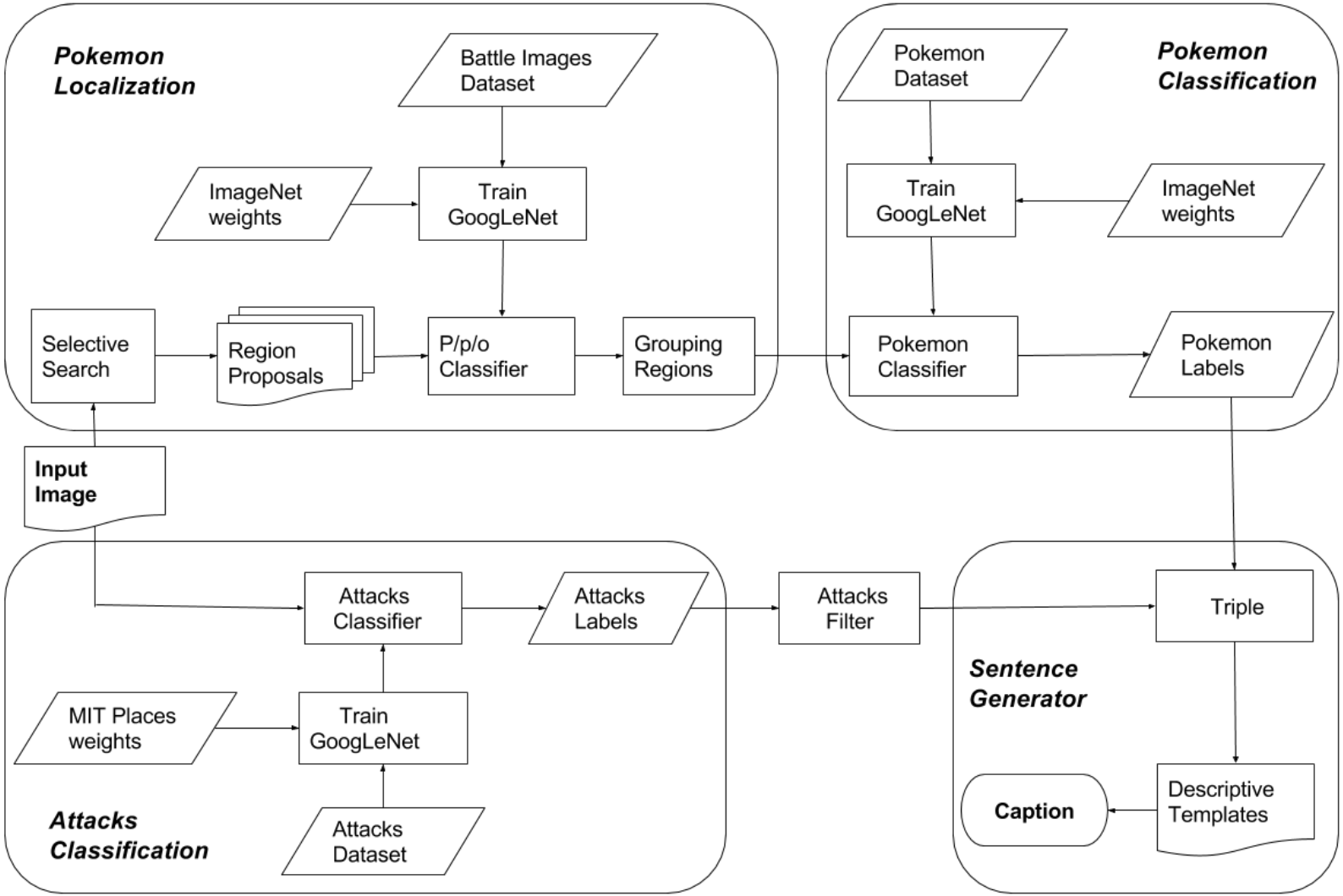
- GPUs - K40, K20, Titan, etc.

The Image Captioning Problem

Pokemon!

To automatically identify creatures called Pokemon from cartoon images, the attacks which they execute, and generate natural language sentences from these realizations


ToonBarn


Pokemon Localization
Battle Images Dataset
ImageNet weights
Train GoogLeNet
Selective Search
Region Proposals
P/p/o Classifier
Grouping Regions
Pokemon Classification
Pokemon Dataset
Train GoogLeNet
ImageNet weights
Pokemon Classifier
Pokemon Labels
Input Image
Attacks Classifier
Attacks Labels
Attacks Filter
MIT Places weights
Train GoogLeNet
Attacks Classification
Attacks Dataset
Triple
Sentence Generator
Caption
Descriptive Templates

Natural Language Processing

What is?

One-Hot-Encoding

Vocabulary	
Word	***ID***
and	1
are	2
cat	3
dog	4
playing	5
the	6

the
cat
and
the
dog
are
playing

6
3
1
6
4
2
5

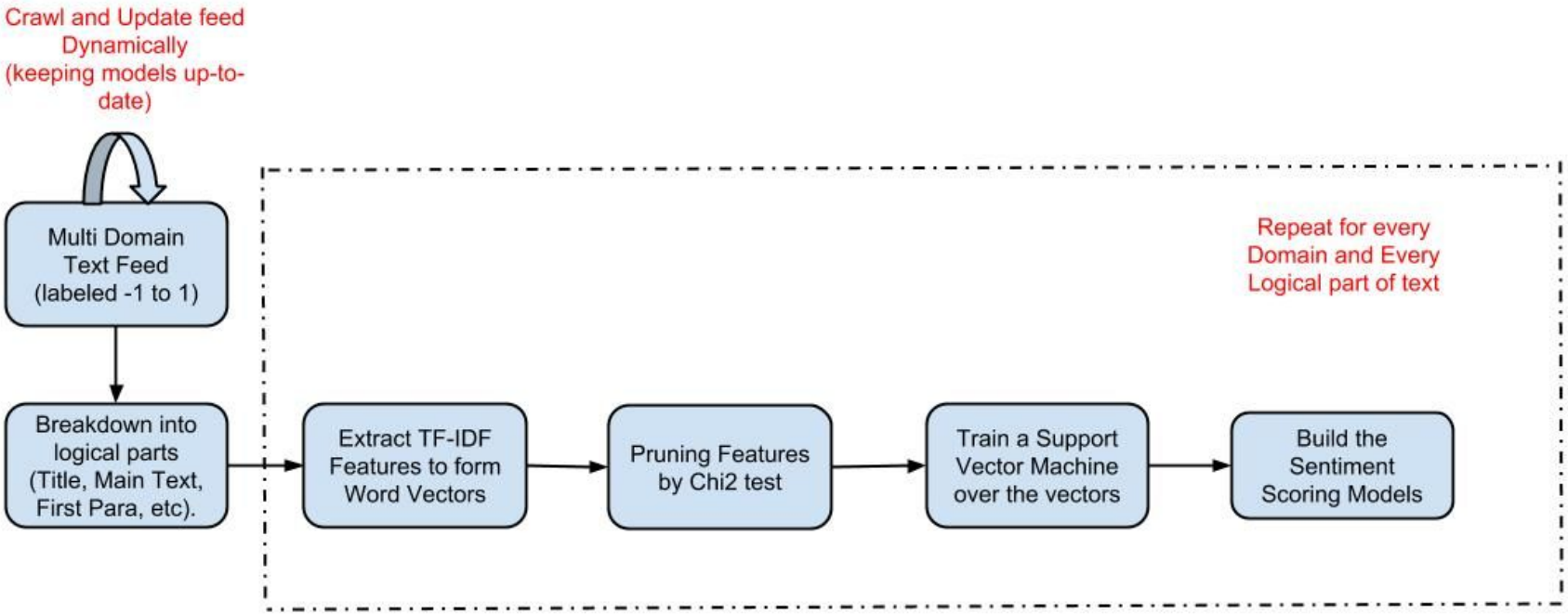
The social network text parser - SocialFilter

- Acronyms [LOL, OMG, etc.]
- Emoticons [:) , :(, etc.]
- Spell Check
- Contractions [doesn’t, wouldn’t, etc.]
- Hashtags [#greenplanet, #YOLO, etc.]
- Twokenize
- Stop words [and, or, a, an, the, etc.]

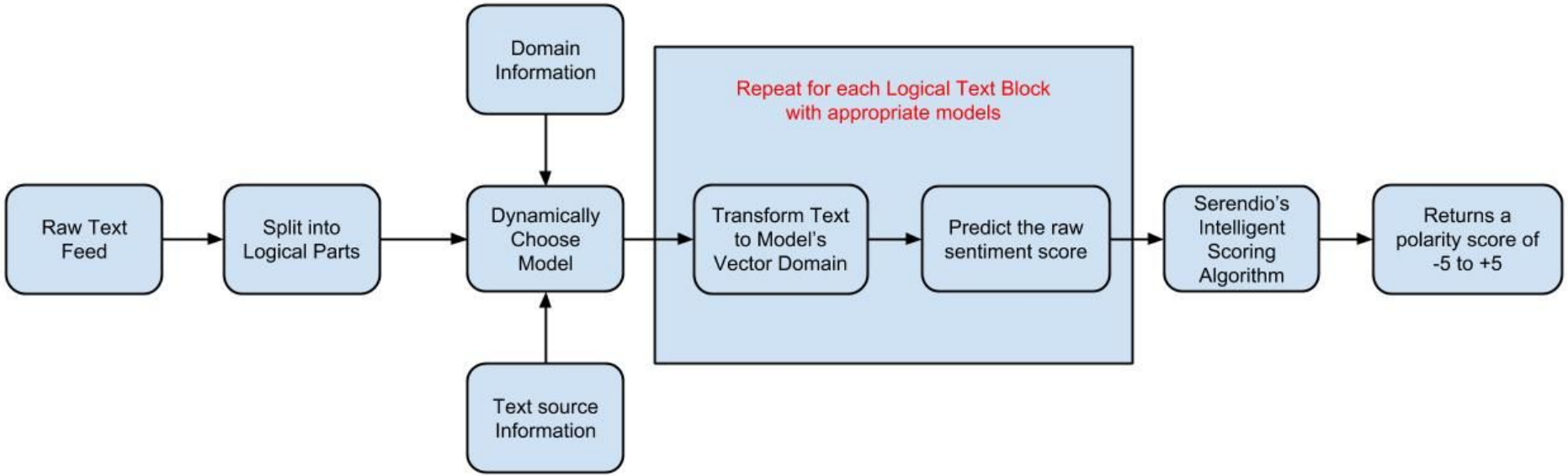
The spell checker - Peter Norvig

```
import re, collections

def words(text): return re.findall('[a-z]+', text.lower())

def train(features):
    model = collections.defaultdict(lambda: 1)
    for f in features:
        model[f] += 1
    return model

NWORDS = train(words(file('big.txt').read()))

alphabet = 'abcdefghijklmnopqrstuvwxyz'

def edits1(word):
   splits     = [(word[:i], word[i:]) for i in range(len(word) + 1)]
   deletes    = [a + b[1:] for a, b in splits if b]
   transposes = [a + b[1] + b[0] + b[2:] for a, b in splits if len(b)>1]
   replaces   = [a + c + b[1:] for a, b in splits for c in alphabet if b]
   inserts    = [a + c + b     for a, b in splits for c in alphabet]
   return set(deletes + transposes + replaces + inserts)

def known_edits2(word):
    return set(e2 for e1 in edits1(word) for e2 in edits1(e1) if e2 in NWORDS)

def known(words): return set(w for w in words if w in NWORDS)

def correct(word):
    candidates = known([word]) or known(edits1(word)) or known_edits2(word) or [word]
    return max(candidates, key=NWORDS.get)
```

Sentiment Analysis



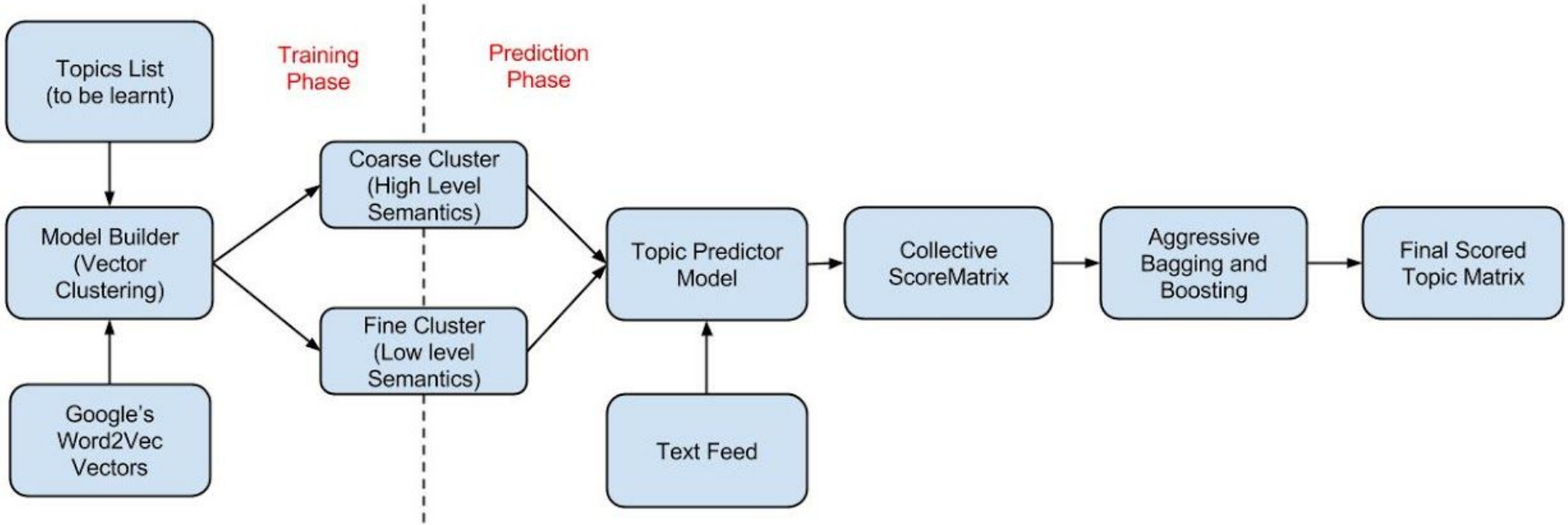
Sentiment Analysis



Results

Text and Source	Sentiment Score
News Article (Link) from "**The Hindu**"	-3
'This is the thinnest and sexiest phone on earth' from "**Amazon Product Reviews**"	5
'What's with the crappy weather?' from "**Twitter**"	-2
'#tropical #dreaming from last week #nightsky #palmtree #nightshot #stars #galaxy #etoiles #r\xeaver #hamocklife' from "**Tumblr**"	2
'I'm watching you... #ad http://bit.ly/19zaE6f' from "**Instagram**"	3

Topic Modelling



Results

Text	Topics/Categories
Heading to a garden cocktail party.	travel || food || general
so much cool stuff happening on mtv awards, so many awesome artists kings of leon performing BOOO, i hate cable.	media || pop
@Valkyrie_NYC Hi Philine, nice to meet you. I just looked at your bio and even your name suits the fact that you are a opera singer.	celebrity || music || pop
@FatimaControl @shotgunxsarah if i had a car I would so volunteer, I havent seen them since Reno 2007	culture || business || general
Sunday, lazy Sunday... after this long weekend, no more vacation time until August	news || travel

Behind the HOOD !?

The Real Image Perspective !

Thanks to My Gurus !

Andrew Ng

Andrej Karparthy

Peter Norvig

Thank You!

By,

@pikachu