

Yelp's image classifier: A case study about how to select model from a higher level

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Supervised VS. Unsupervised

Machine Learning

Constructing and/or learning the parameters of a specified model given existing data

- Supervised

Known: Input instances, corresponding labels
Predict: labels using unseen instances

- Unsupervised

Known: Input instances
Recognize input structure, Generate data

- Reinforcement Learning

But in industry...



Is *identifying critical information in system log* a supervised learning problem?

Is *detecting rumours on twitter* a supervised learning problem?

But in industry...



Is *identifying critical information in system log* a supervised learning problem?

Is *detecting rumours on twitter* a supervised learning problem?

Some problems can be solved in supervised/unsupervised/semi-supervised way.

The problem is *how to weight the cost of creating labels and the performance improvement*
And *how to reduce the cost of creating labels*



A choice made in early phase



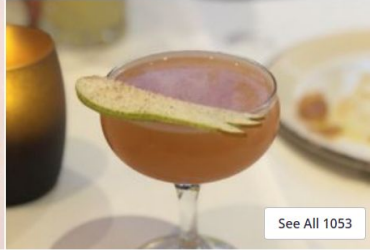



Yelp's image classifier:
A case study about how to select model from a higher level

Yelp: introduction

Yelp: a company that publishes crowd-sourced reviews about business

[Restaurants](#) [Home Services](#) [Auto Services](#) [More](#)



[See All 1053](#)

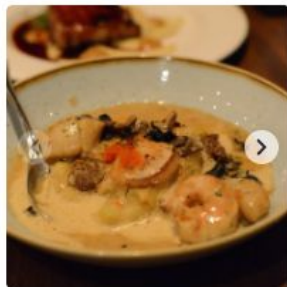
★★★★★ 7/18/2020

 2 photos

Family owned super cute restaurant! Went here before covid started. Loved the atmosphere and all the dishes were really good. My favorite was the burrata pizza and the mac and cheese.



Tasks: how to select the type of “cover photos”?



1. Le Robin Square

★★★★★ 775

\$\$ • Canadian (New), French

✓ Delivery ✓ Takeout ✓ Dine-in

“Family owned super cute restaurant! Went here before covid started. Loved the atmosphere and all the dishes were really good. My favorite was the burrata pizza and the mac and cheese.” [more](#)

(514) 508-5770

300 Rue Notre-Dame E

Ville-Marie



2. Daldongnae

★★★★★ 12

Korean, Barbeque

🕒 Current wait time: 0 mins

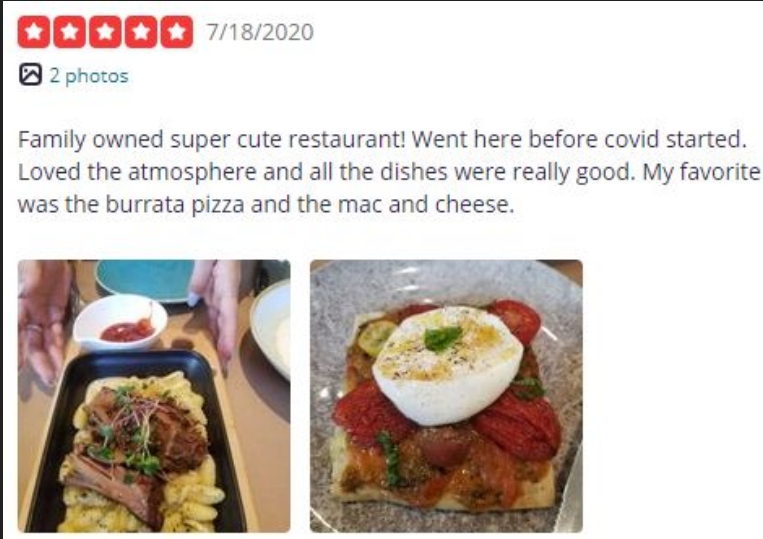
🔥 Opened 3 months ago

(514) 878-1111

1216 Rue Bishop

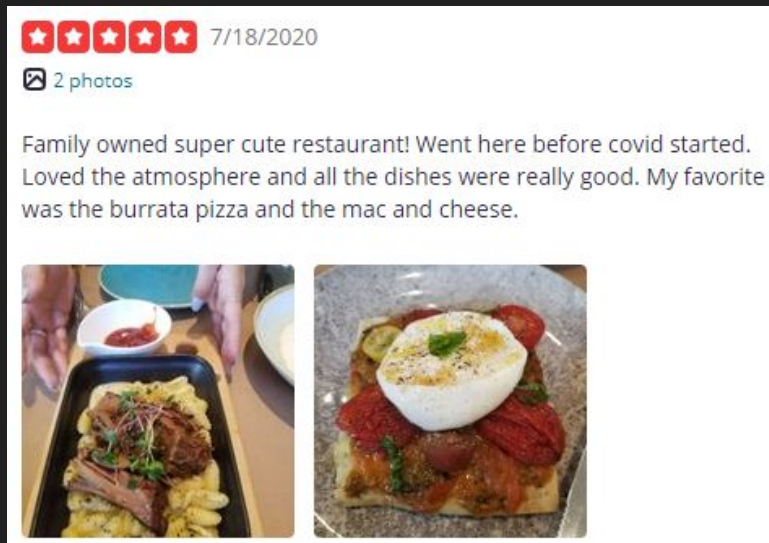
Ville-Marie

What is currently available?



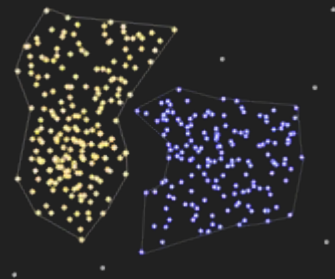
A bunch of reviews (caption+photos)
for each store

Seems like a clustering problem to me



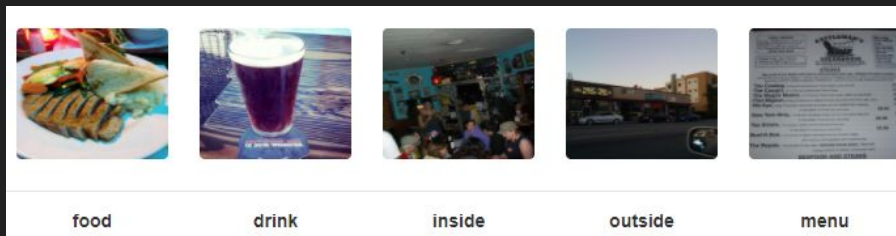
A bunch of reviews (caption+photos)
for each store

Transform into
high-dim space



Unsupervised/semi-supervised
clustering problem

Yelp's solution: transform into supervised classification



Creating labels semi-auto

From photo captions

From the uploader

Crowd-sourcing

“Sushi”/“burger” -> “food”

“Margarita” -> “drink”

“Menu” -> “menu”

“Is this the storefront?”

Correct and balance the dataset

Yelp's solution: from photo caption

"This is best in their *menu*"



More related to food than menu



Some cleanup is needed

How to find the terms like "sushi"?



Manually define them is hard



Such terms can be found in the
virtual menu

Conclusion

1. In industry, the boundary between a supervised, unsupervised or semi-supervised problem is not as clear as in academia
2. Choosing between supervised, unsupervised or semi-supervised model is a decision made in early phase
3. Automatically generate/extract labels given other contain is helpful to reduce the cost(time and money) of creating labels
4. (Debatable) Industry people prefer supervised than unsupervised

Reference

1. [How We Use Deep Learning to Classify Business Photos at Yelp](#)
2. [10 Companies Using Machine Learning in Cool Ways](#)