

InnSpect

Analyzing sentiments and topics from hotel reviews

**Chang Zhang
Insight 2019 C**



Groupon is ambitious in travel market

PARTNERSHIPS / ACQUISITIONS

Groupon Teams With DerbySoft To Boost Its Travel Business

Groupon Acquires HotelTonight Competitor Blink To Get In On The Last Minute Hotel Booking App Action

Steve O'Hear @sohear 7:45 am EDT • September 9, 2013

 Comment



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Groupon Acquires Presence AI to Enhance Booking Experience

AI-powered messaging tool enables merchants to drive bookings, engage with customers, cut calls and save time

Important Feature Missing from Groupon Hotel

G Park West Hotel: 4-Star Hotel | X +
groupon.com/deals/ga-bk-park-west-hotel-1

Park West Hotel - New York, NY

2.8 ★★★★☆ 121 ratings



A large aerial photograph showing a dense green area of Central Park in New York City, with a red brick building featuring several prominent blue-tiled, conical-roofed towers visible on the right side. The sky is bright blue with scattered white clouds.

<        >

[Getaways Report](#) [Fine Print & Details](#)

Highlights

What You Get

Important Feature Missing from Groupon Hotel

Room?
Location?
Service?
Food?

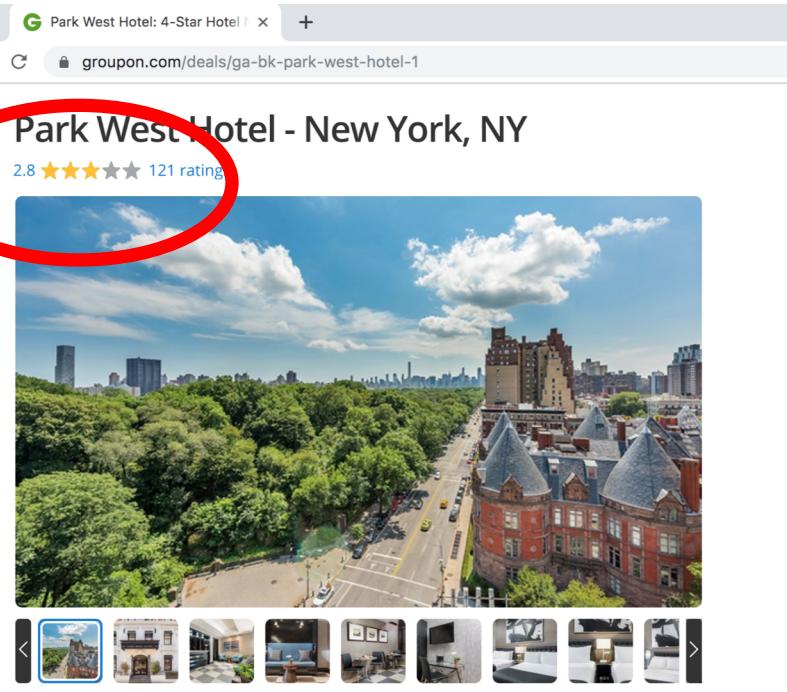
...

G Park West Hotel: 4-Star Hotel | x +

C groupon.com/deals/ga-bk-park-west-hotel-1

Park West Hotel - New York, NY

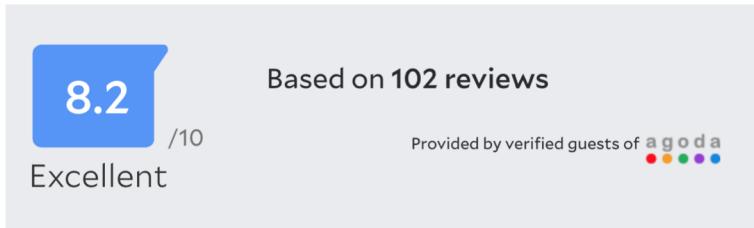
2.8 ★★★★☆ 121 rating



Getaways Report Fine Print & Details

Highlights What You Get

Aspect-based hotel ratings



✓ 87 customers had great experiences at this property

Cleanliness 8.7

✓ Excellent rating for location and cleanliness

Facilities 7.9

✓ Highly rated by solo and family travelers

Location 8.9

Room comfort and quality 8.3

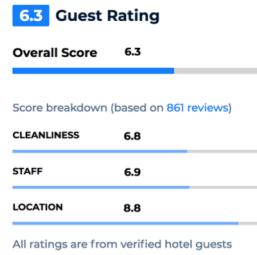
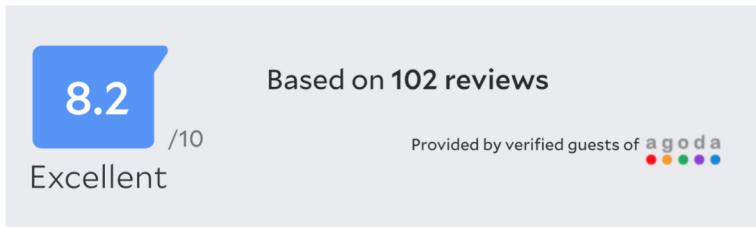
Service 7.6

Value for money 7.6

[Read all verified reviews](#)

Agoda

Aspect-based hotel ratings



Details	Map	Reviews
Excellent budget hotel. Close to Navy Pier. Good for sights and located near shopping areas.		
Location	9.2	Pool
Service	8.2	Fitness center
Value	5.4	Restaurant
Comfort	5.3	Bar/Lounge

Expedia

Priceline

Kayak



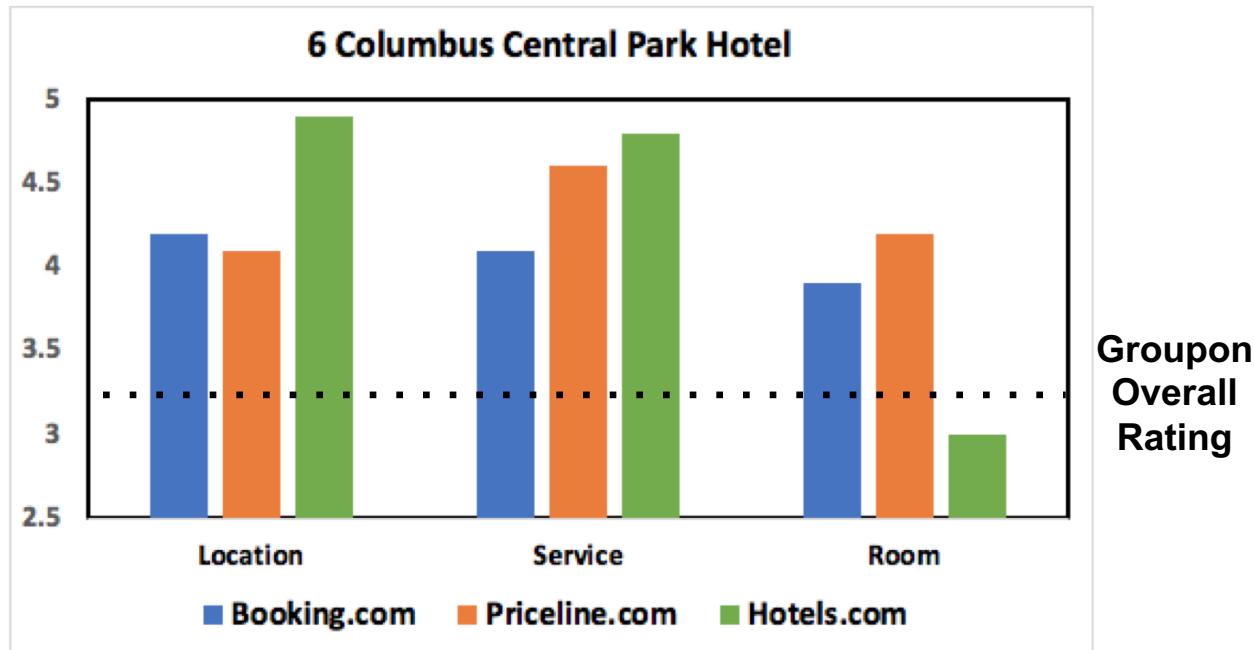
98% Recommended

Ctrip

Agoda

- Can Groupon “copy” ratings from other sites?

- Can Groupon “copy” ratings from other sites?
- Users’ opinions vary!



InnSpect generates aspect-based hotel ratings from reviews

"Stay here!"

Reviewed September 24, 2019

After reading a few bad reviews I chose to take a chance on the Wellington. I was so glad I didn't! Queen Suite. I was blown away by the size. The bathroom was spacious and looked to be newly renovated. This is the best bathroom I've ever experienced at a hotel. The ... [more](#)



"Very Pleased"

Reviewed September 23, 2019

Being the 1st time in NYC , I felt a huge responsibility to make sure our family was close to everything we needed for Mon Tues NYFW yet not in the middle of complete hustle bustle on our 3 leisure days. We were greeted promptly and even though we were 3 hours early the front desk staff ... [more](#)

Groupon Hotel Reviews

"Wonderful experience"

Reviewed September 23, 2019

Everything about this hotel was great, from staff to finish. Staff was professional, check-in, check-out, cleanliness, friendliness, room standards, location. I couldn't say a bad word about the Wellington. I have stayed in many 4 and 5 star hotels in my time. Even though this is a 3 Star ... [more](#)

"Great place to stay"

Reviewed September 22, 2019

Great location to explore New York. Room was very comfortable and the staff were all helpful and pleasant. Air con was efficient. Room was well services with option not to have bed linen / towels changed showing environmental awareness and we would stay again.

"Overnight trip"

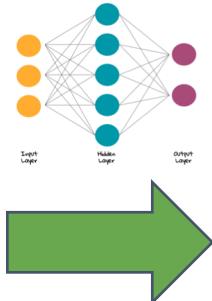
Reviewed September 22, 2019

Park Café could be a little less pricey (2 pieces of French toast and 4 pcs of bacon- shouldn't come to close to \$15 BEFORE TIP!!). Room was AWESOME (we were told, as we were checking in, that we got upgraded from a standard dbl bed to a suite- FOR FREE!!!) THAT was a surprise!! We had to... [more](#)

Passport160170

Liz B

poohnpurple1976



Ratings

Location



Service



Room



Demo:
www.innspect.xyz

Results

Days Inn by Wyndham Hotel N...

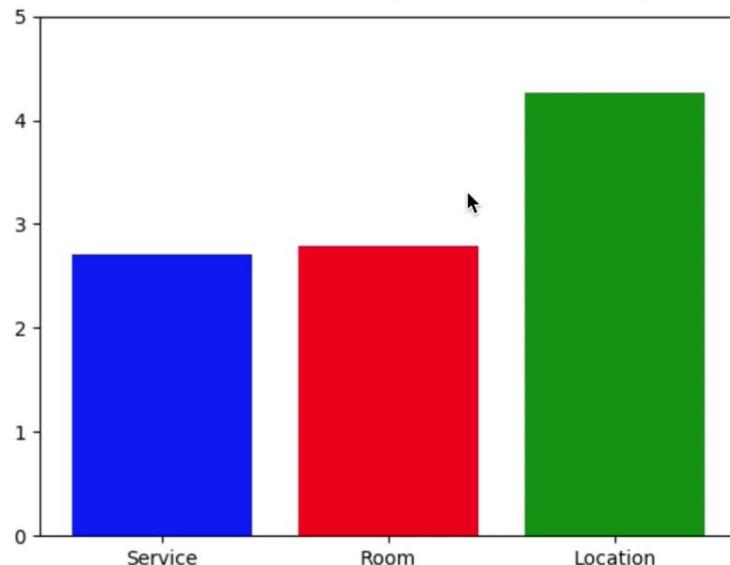
[Not Secure | innspect.xyz/model_output?birth_month=https%3A%2F%2Fwww.groupon.com%2Fdeals%2Fga-bk-days-hotel-by-wyndham](https://www.groupon.com/deals/ga-bk-days-hotel-by-wyndham)

10.0% of the reviewers mentioned loc. 85.4% of them spoke highly of it.

the bed was comfortable, the room was relatively inexpensive, and the location was very convenient.

No relevant comments found.

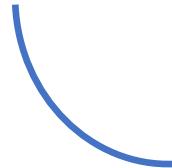
Predicted Aspect Rating



Model

Aspect based sentiment analysis

- Grand Hotel is close to everything! The lady at the front desk was very friendly and helpful. But my room was small and had unpleasant smell.



Step 1: Aspect identification

Location

Service

- Grand Hotel is close to everything! The lady at the front desk was very friendly and helpful. But my room was small and had unpleasant smell.

Room

Step 1: Aspect identification

Location

Service

- Grand Hotel is close to everything! The lady at the front desk was very friendly and helpful. But my room was small and had unpleasant smell.

Room

Dataset (240k hotel reviews)

Tokenize by sentence + text cleaning

LDA topic clustering

~ 80 % accuracy (sampling)

Step 2: Sentiment analysis

Location:



Service:



- Grand Hotel is close to everything! The lady at the front desk was very friendly and helpful. But my room was small and had unpleasant smell.

Room:



Step 2: Sentiment analysis

Location:



Service:



- Grand Hotel is close to everything! The lady at the front desk was very friendly and helpful. But my room was small and had unpleasant smell.

Room:



Dataset
(240k hotel reviews + aspect ratings)

Label reviews by aspect rating

Word2Vec for word embedding

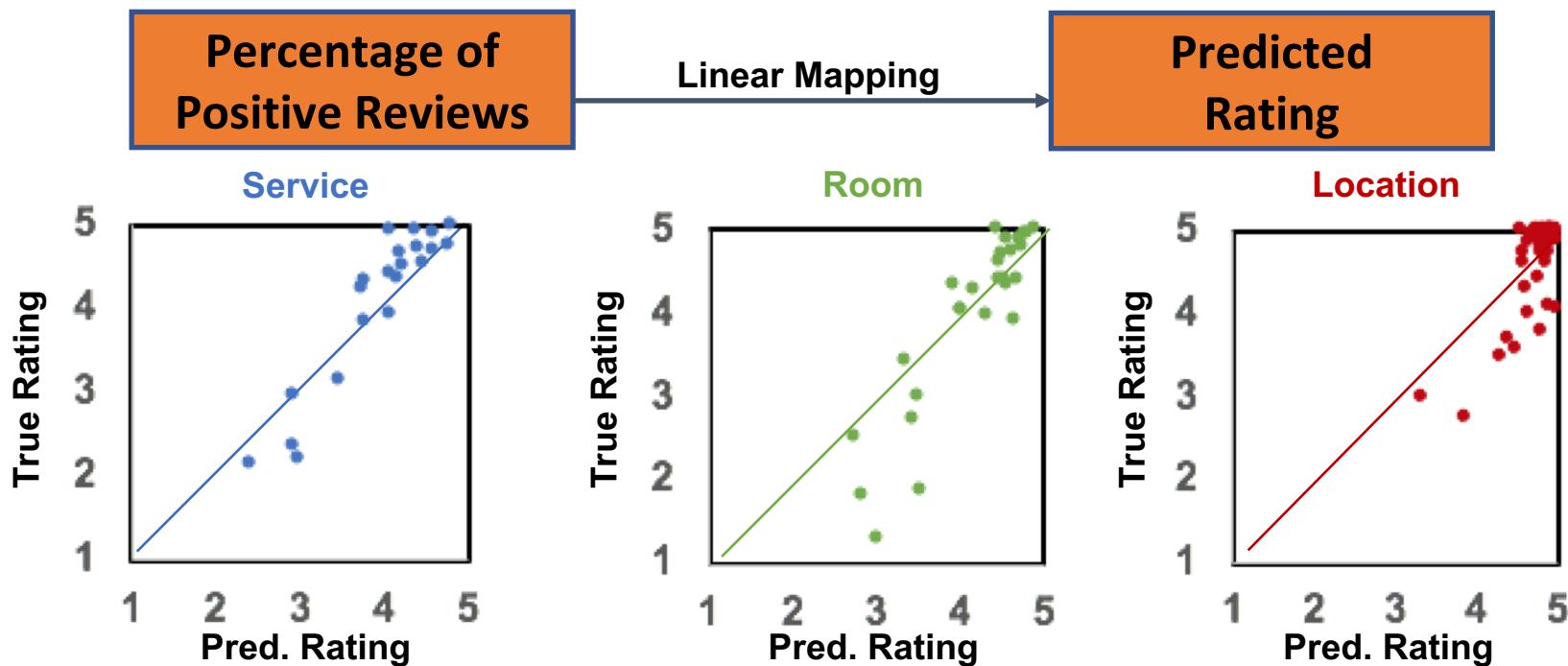
LSTM-RNN for each aspect

Accuracy: 90%
Weighted F1: 0.90
AUC-ROC: 0.91

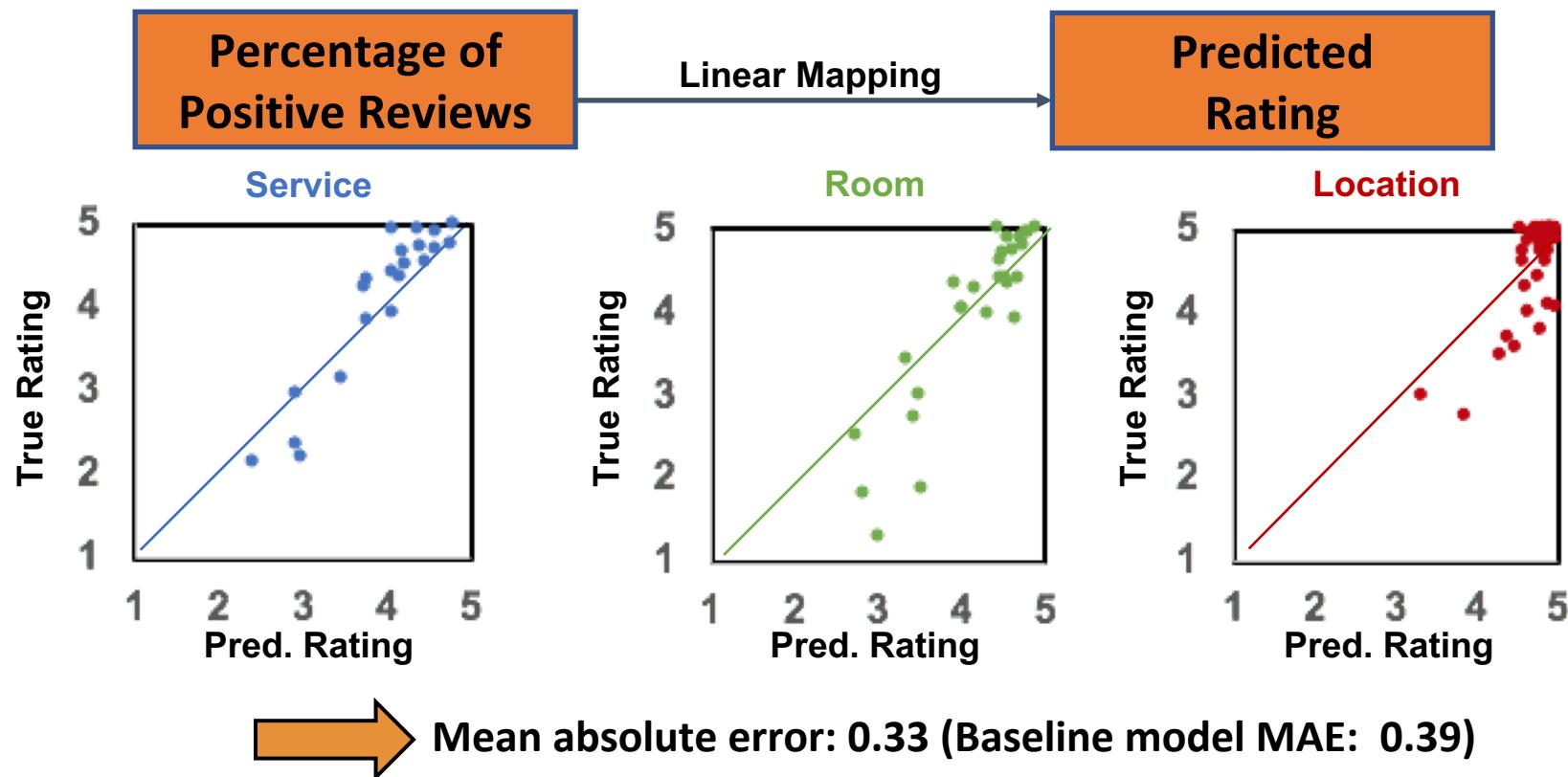
Step 3: Rating prediction



Step 3: Rating prediction



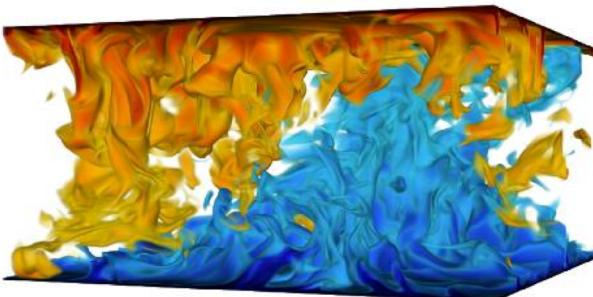
Step 3: Rating prediction



About Chang Zhang:



University of Minnesota
PhD, Computational Fluid Dynamics



Healthcare Data Mining



Machine Learning
Model Development



Market Data Analysis

LDA model

LDA topic	Top words
1 (Service)	Staff, desk, friendly, front, helpful, service, help
2 (Room)	Room, clean, bed, floor, view, small, nice, comfortable
3 (Location)	Walk, location, street, great, close, block, beach
4 (Facility)	Breakfast, service, good, food, bar, eat, restaurant
5 (Experience)	Hotel, stay, great, time, night, new, place, recommend
6 (Random)	Room, get, go, day, one, time, check, night

Word2Vec model

Most similar words to “service”:

Sevice (0.68), roomservice (0.59), server (0.46), satisfaction (0.45), housekeeping (0.45), job (0.44), professionalism (0.43), waitstaff (0.42), treatment (0.42), servive (0.40)

Most similar words to “room”:

Suite (0.63), bathroom (0.60), double (0.57), bed (0.54), twin (0.54), balcony (0.53), bedroom (0.53), rm (0.53), deluxe (0.53), unit (0.52)

Most similar words to “location”:

Position (0.75), locationwise (0.59), midtown (0.57), wellocate (0.51), proximity (0.50), kowloon (0.49), loaction (0.48), cbd (0.47), downtown (0.46), situate (0.46), hotel (0.45)

LSTM RNN:

Long Short-Term Memory

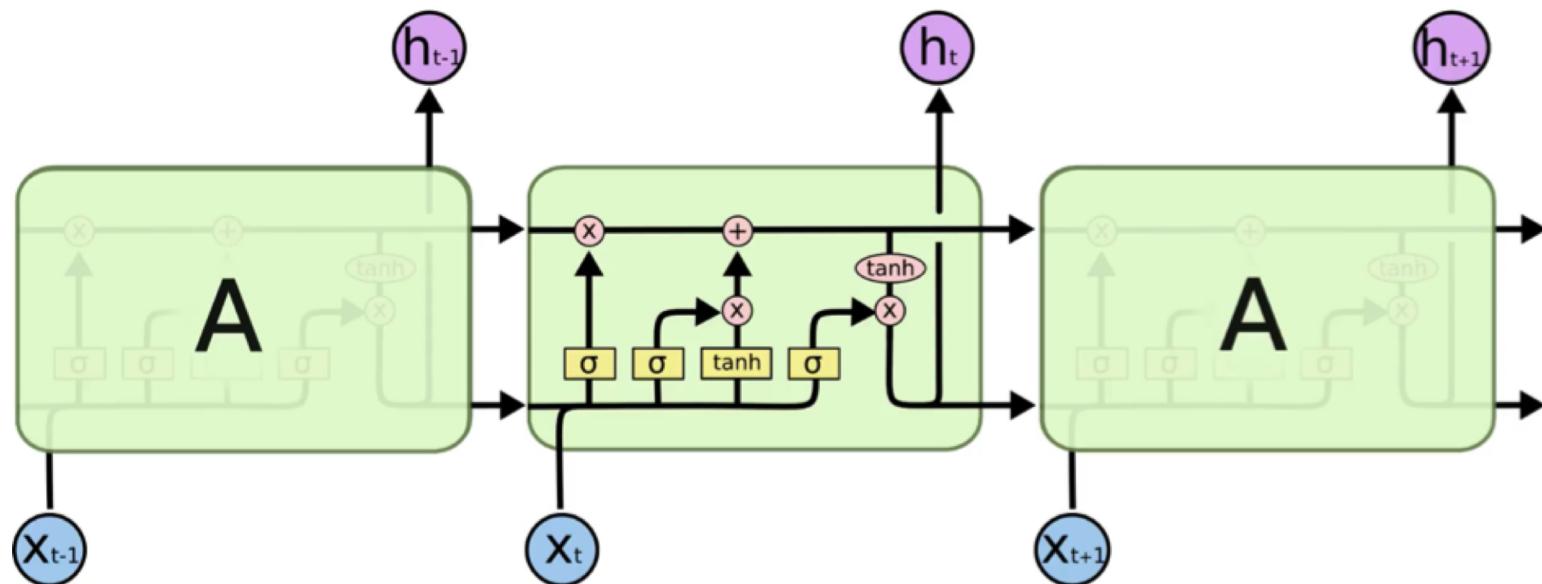
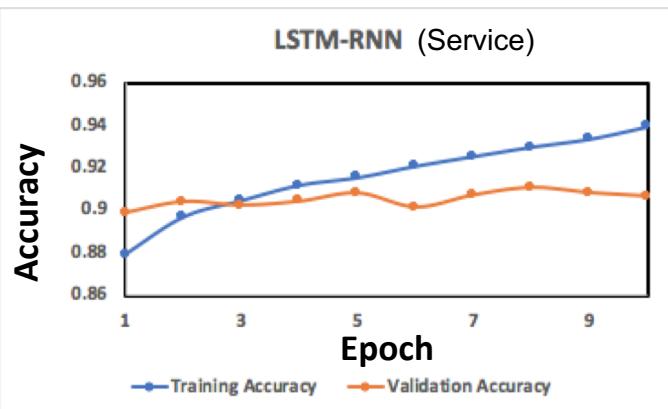
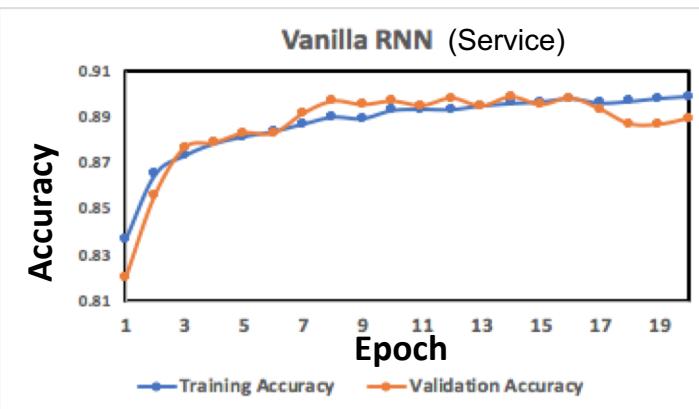
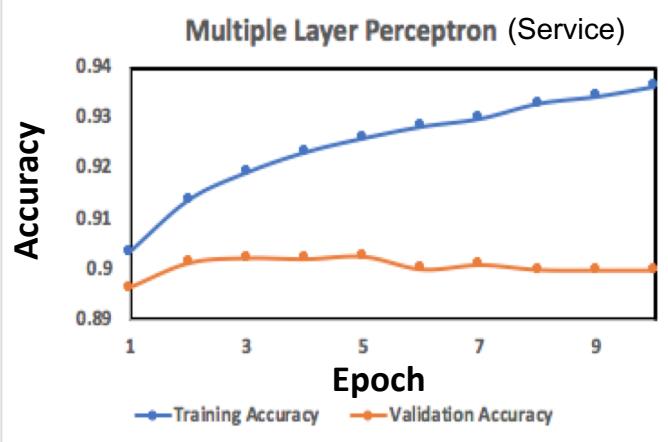
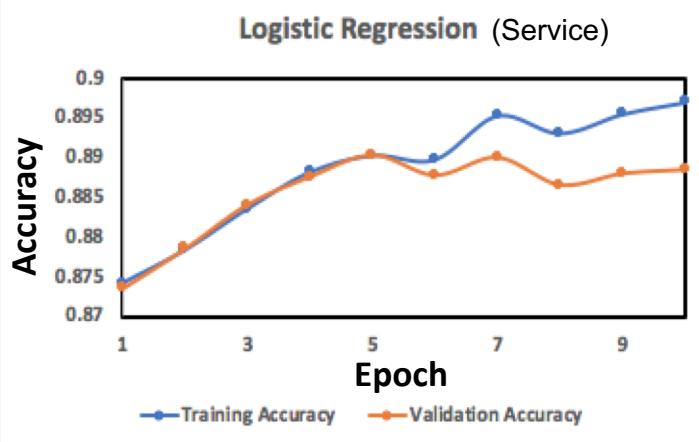


Image Source: colah.github.io

Sentiment Analysis Models :

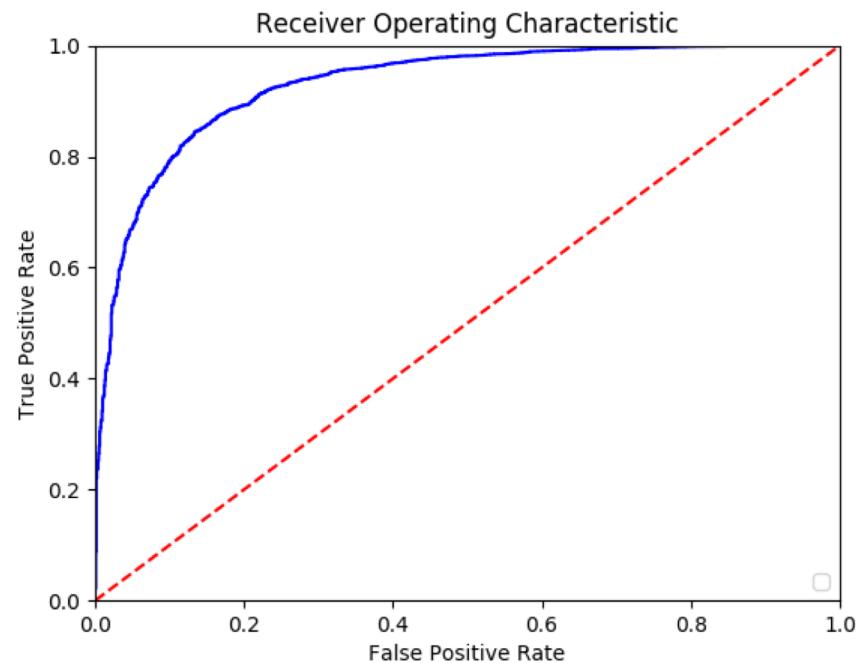


Model	Test Acc.	Test F1 Score
LR	0.8941	0.8912
MLP	0.9014	0.9007
Vanilla RNN	0.8980	0.8947
LSTM-RNN	0.9102	0.9085

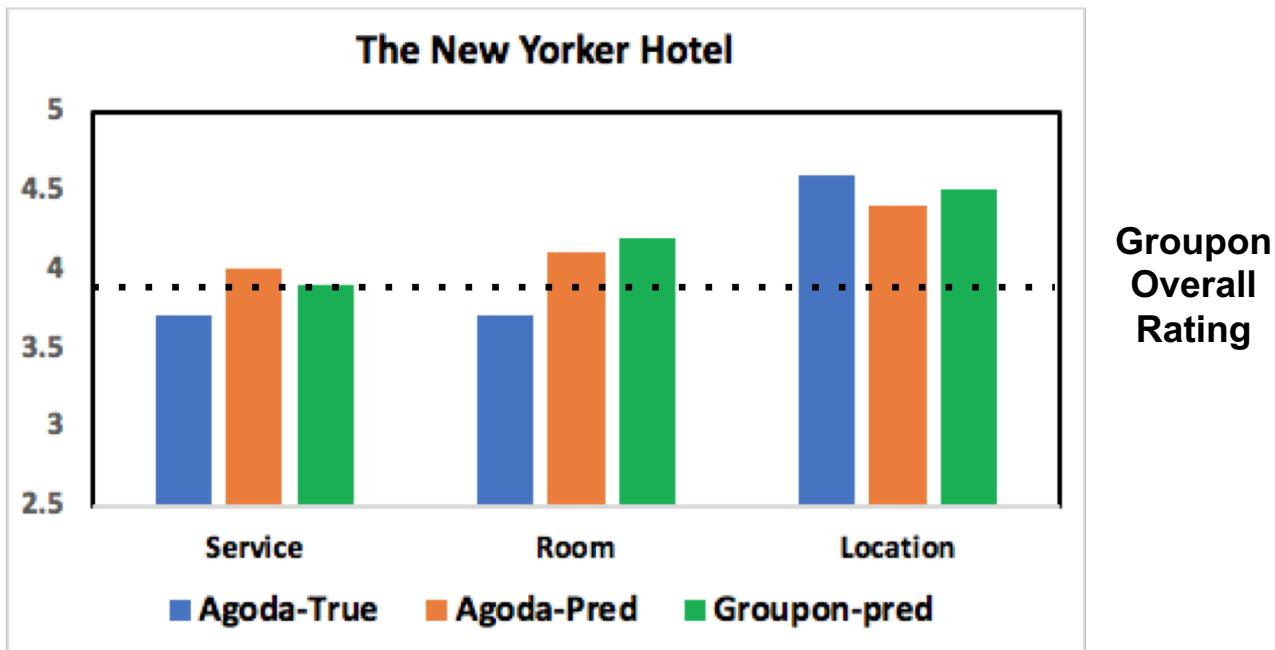
LSTM RNN Model (Service) Performance

Metric	Value
Test Accuracy	0.9102
F1 Score	0.9085
AUC-ROC	0.9299

Metric	Pred (1)	Pred (0)
True (1)	5287	489
True (0)	423	1945



Evaluation



Input:

The screenshot shows a web browser window titled "InnSpect" with the URL "Not Secure | 0.0.0.0:5000". The page content includes the "InnSpect" logo and tagline "an aspect-based hotel review analysis platform". Below this, a prompt asks "Please enter Groupon hotel link below:" followed by a text input field containing the URL "https://www.groupon.com/deals/ga-bk-park-west-hotel-1". A "Check" button is located next to the input field. At the bottom, there is a preview area showing a circular icon over a blurred screenshot of a hotel deal page.

InnSpect

an aspect-based hotel review analysis platform

Please enter Groupon hotel link below:

url:

Check



Output - page 1:

The screenshot shows a web browser window with the title bar "Results" and a tab labeled "Results". The URL in the address bar is "Not Secure | 0.0.0.0:5000/model_output?birth_month=https%3A%2F%2Fwww.groupon.com%2Fdeals%2Fga-bk-park-west-hotel-1". The main content area displays text about service, room, and location.

Service:

15.8% of the reviewers mentioned service. 68.8% of them spoke highly of it.

The staff was pretty friendly and it was super close to a subway station.

I was extremely disappointed in the customer service at Park West.

Room:

34.2% of the reviewers mentioned room. 69.6% of them spoke highly of it.

Loved the location and the beds are firm.

The establishment was under construction with spackle on the walls very dirty lobby and shotty rooms.

Location:

14.4% of the reviewers mentioned location. 86.2% of them spoke highly of it.

Right near Central Park, Harlem side, not Manhattan side.

No relevant comments found.

Output - page 2:

