

Hotels.com's journey to becoming an Algorithmic Business

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Hotels.com

Hotels.com

Part of Expedia, Inc. family

385,000 properties

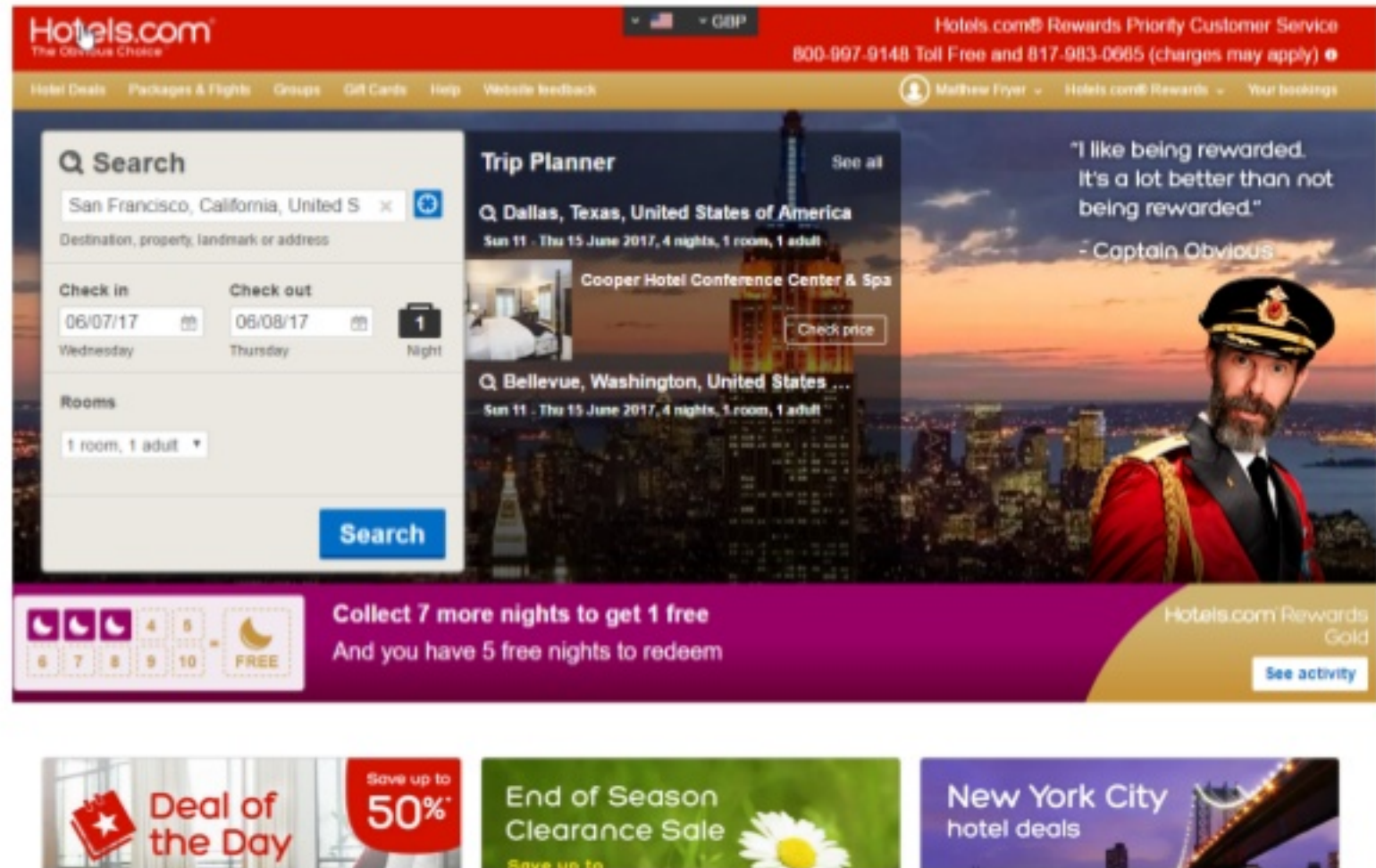
89 countries

39 languages

>27m Hotels.com Rewards Members

Home of Captain Obvious

Billions of Recommendations, based on real-time Data per day







Data Science



Engineering



Front End Development





Barry Diller
Chairman & Senior Executive,
Expedia, Inc.

“Artificial Intelligence Will Be
Travel’s Next Big Thing”

3M’s are disruptive
technology

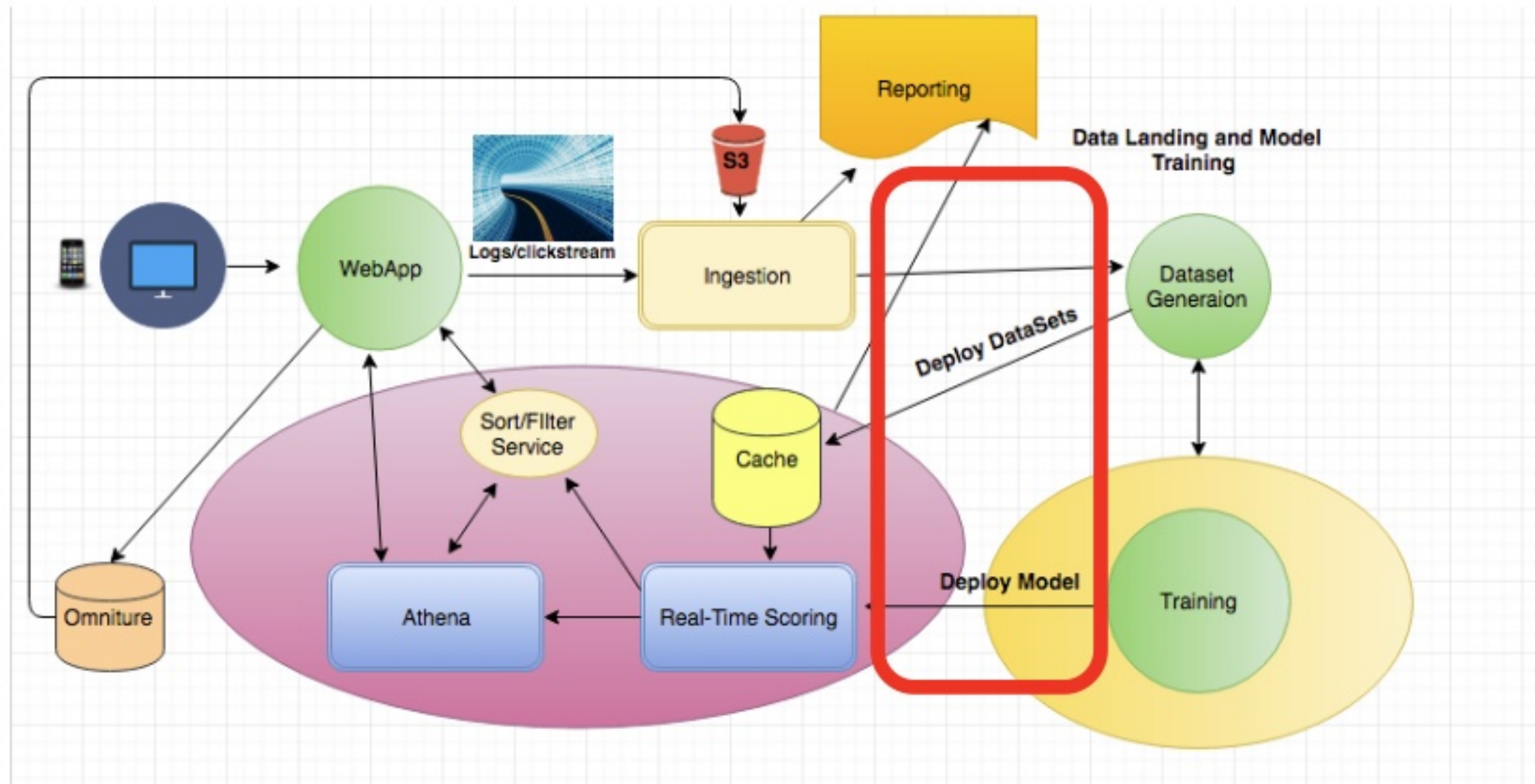
Mobile

Messaging / NLP

Machine Learning



Our overall ecosystem



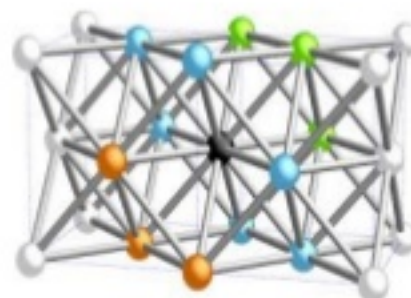
Core Elements of our Data Science Cloud Platform

Maestro – Our Internally Developed Platform on AWS

(EMR, Spark, R-Studio, IntelliJ, SBT, Jupyter, Zeppelin, Unit / QA, Metastore, Apache Airflow, Keras, Tensorflow)

Proof of Concept on Google Cloud, Beam, Spark & Tensorflow

Databricks Unified Platform



Use your own data to train models



TensorFlow



Cloud Machine Learning Engine

Ready to use Machine Learning models



Cloud Vision API



Cloud Speech API



Cloud Jobs API



Cloud Translation API



Cloud Natural Language API



Cloud Video Intelligence API

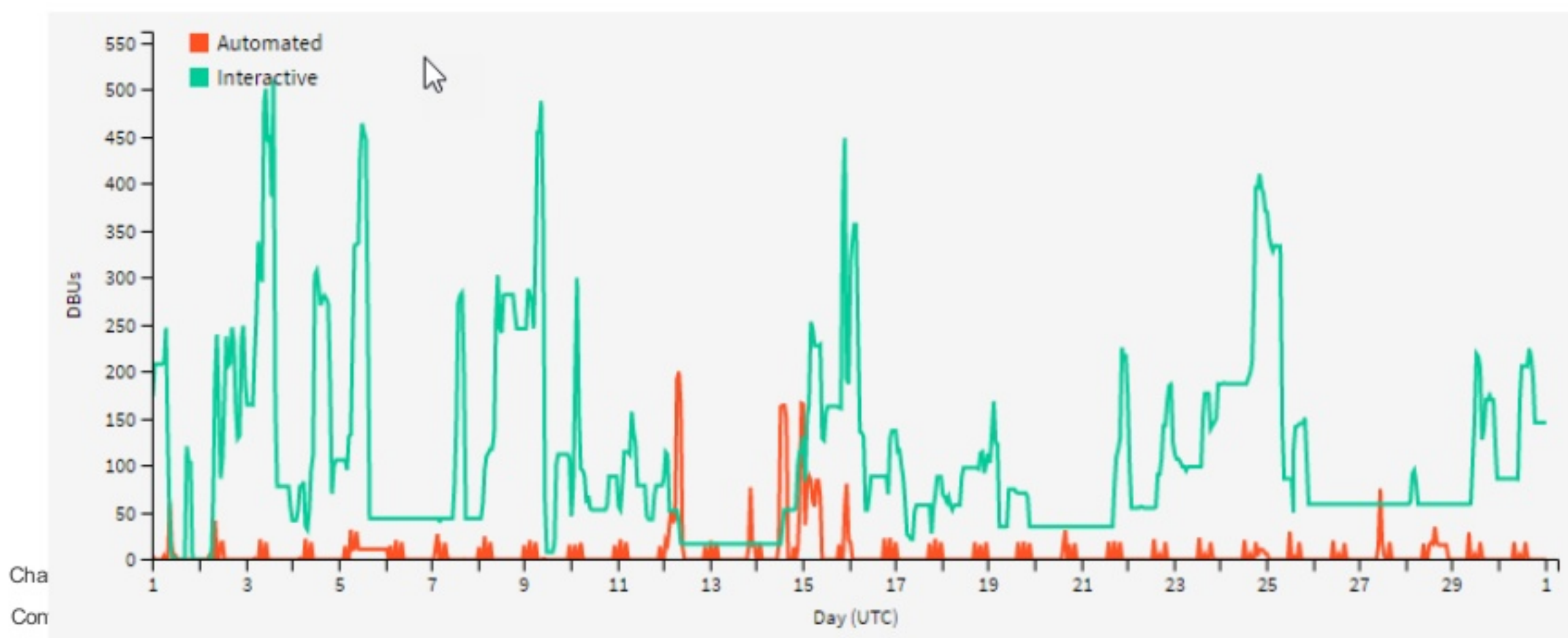


Coming soon



Databricks Unified Platform

- Key asset to the success of data science at Hotels.com
- Key in driving up data scientist productivity / efficiency / flexibility
- Helps make our data science lifecycle operate much easier and faster driving speed to market
- Reliable / secure + facilitates 'Highly Elastic' workflows exploiting cost effective spot instance on AWS.

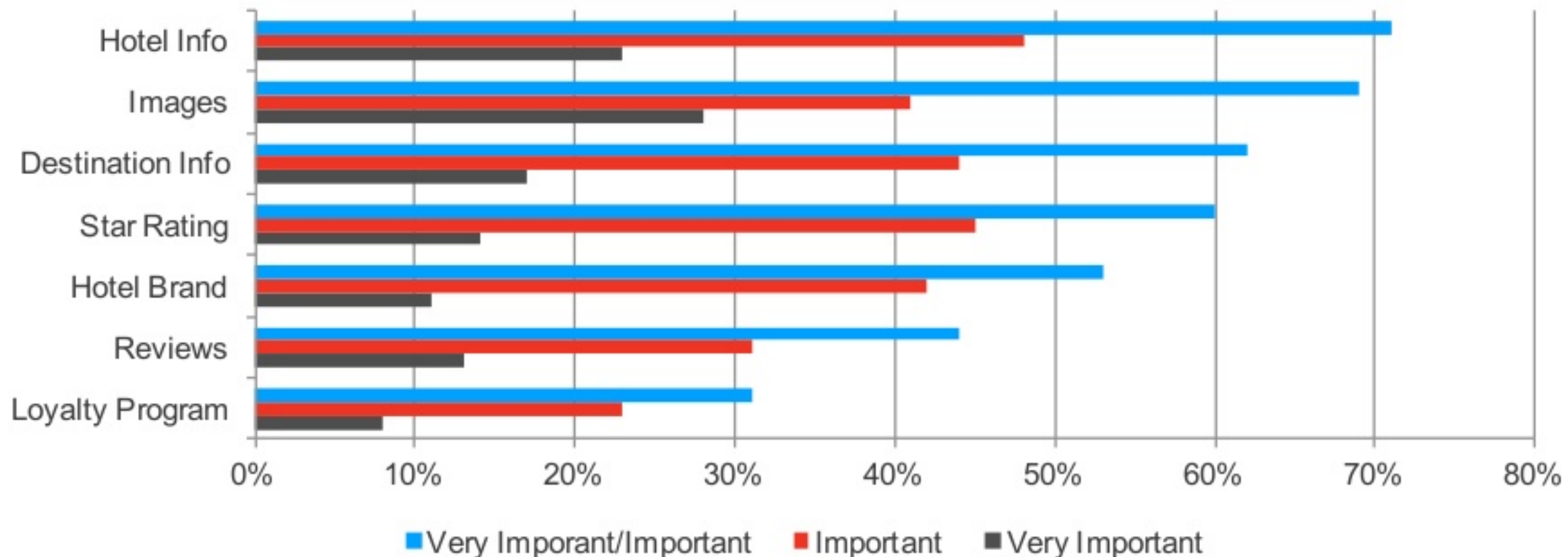


ALPs – Algorithm Lifecycle Pipeline Service



Images are an important factor while choosing a hotel

Factors other than price/location



Reference: [The Influence of Visuals in Online Hotel Research and Booking Behaviour](#)

Computer Vision problems we try to tackle



Near Duplicate Detection



Scene Classification

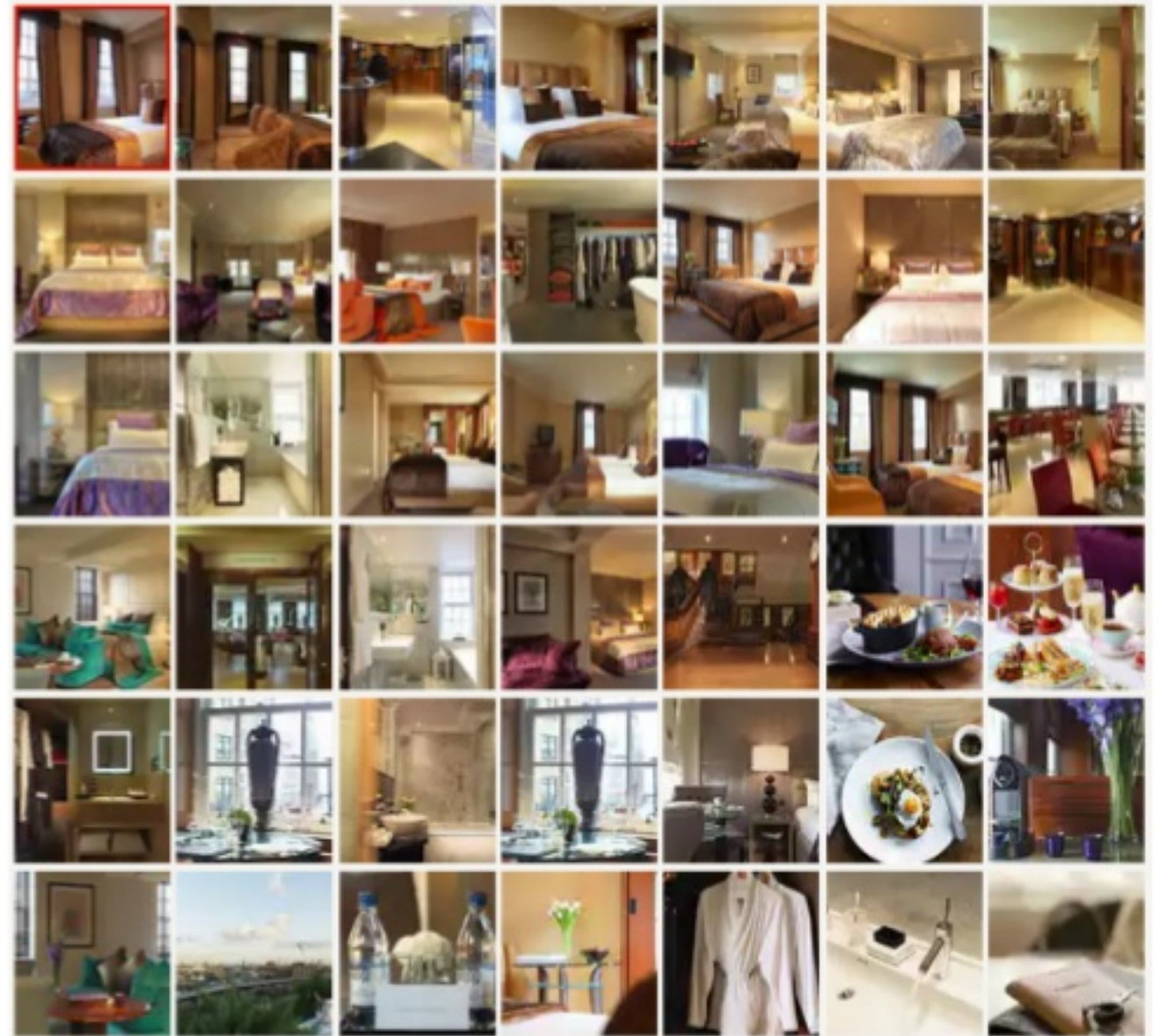


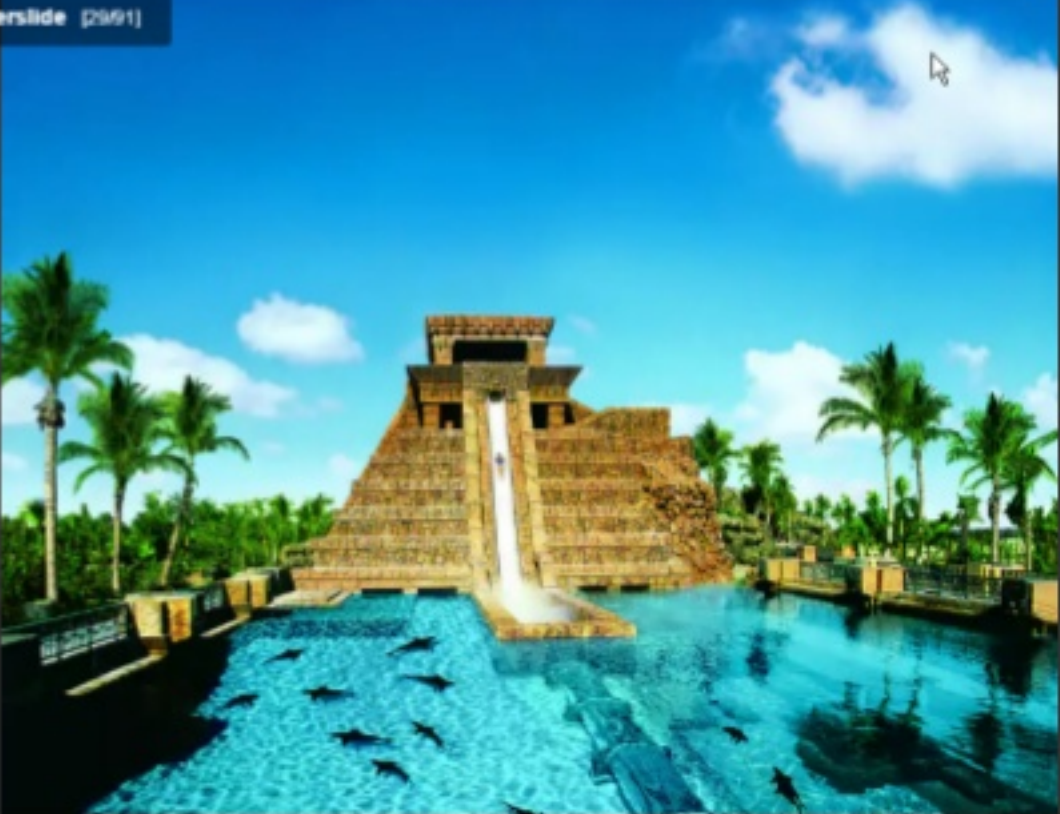




Image Ranking

 **The Cove Atlantis, Autograph Collection** 5 stars
Paradise Beach Drive, Paradise Island, New Providence, 0, Bahamas, 0203 027 9779
Upscale beachfront resort with free water park, near Fort Fincastle
 Free WiFi

Jump to: [Overview](#) | [Room choices](#) | [Hotel information](#)

Waterslide [29/1]



La Tinassara
Lazise
0.51 mi from Bardolino
020 3564 4852 [\(Call cost\)](#)

Superb! 4.5/5
(5 reviews)
2 nights from
1 left at
£201



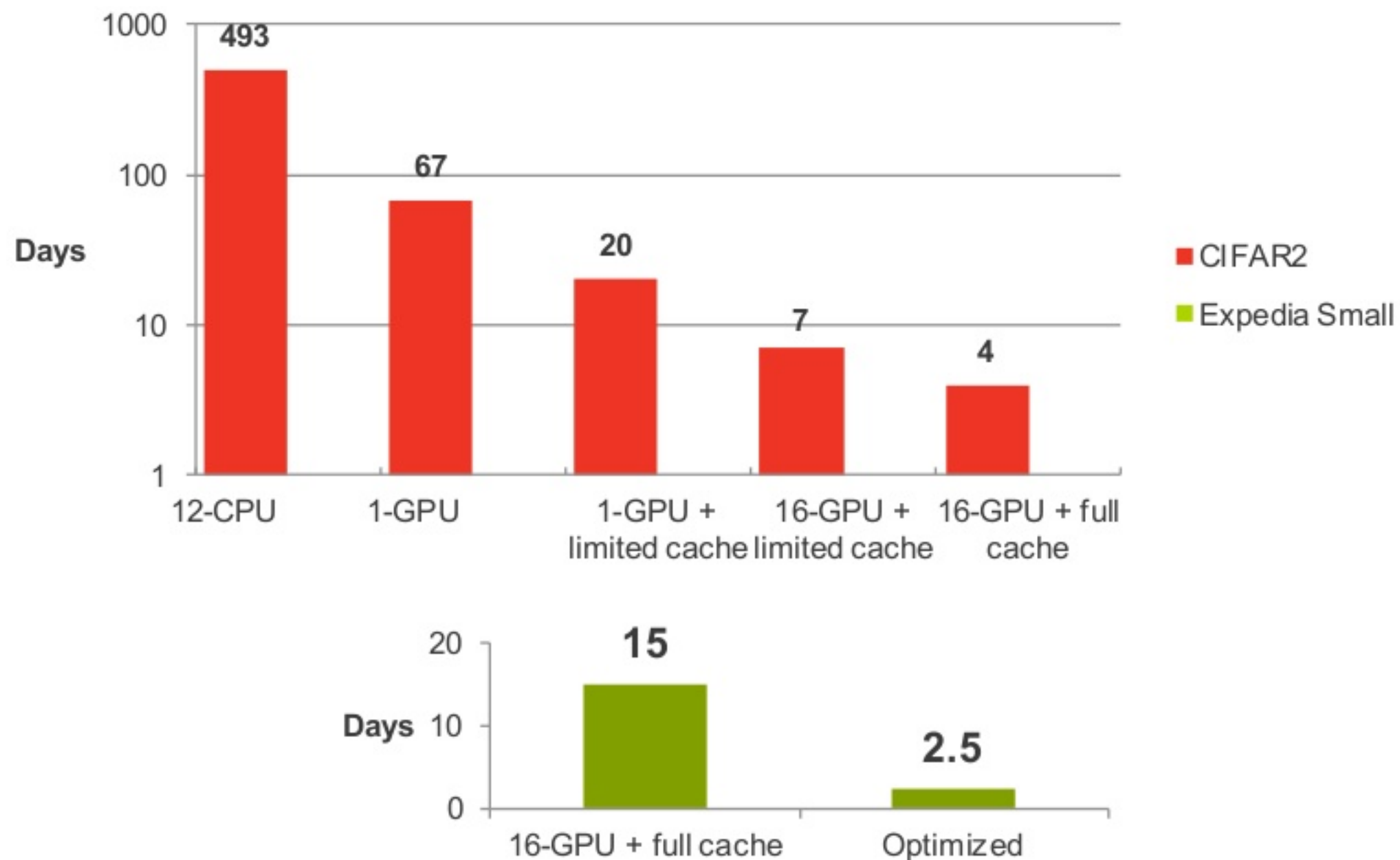
Hotel Remat ★★★
Garda (Garda)
0.64 mi from Bardolino
020 3564 4852 [\(Call cost\)](#)
 Free Cancellation

Superb! 4.5/5
(51 reviews)
2 nights from
3 left at
£202
+2.00 EUR due at hotel



Tagged as Bathroom

GPU's quickly became key, took a large effort to optimize using Keras + Tensorflow (Inception v3 + ResNet)



Near Duplicate Detection: Real world examples



Non-Duplicates – probability 100%



Duplicates – probability 97.98%



Non-Duplicates – probability 95.91%



Duplicates – probability 98.43%

Using the model: Real world examples



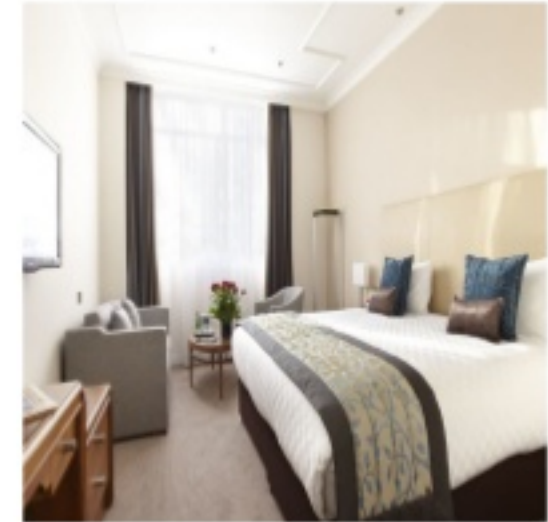
EXTERIOR/HOTEL



INTERIOR/SEATING_LO



INTERIOR/SEATING_LOBBY



ROOM/GUESTROOM



ROOM/BATHROOM



ROOM/LIVING_ROOM

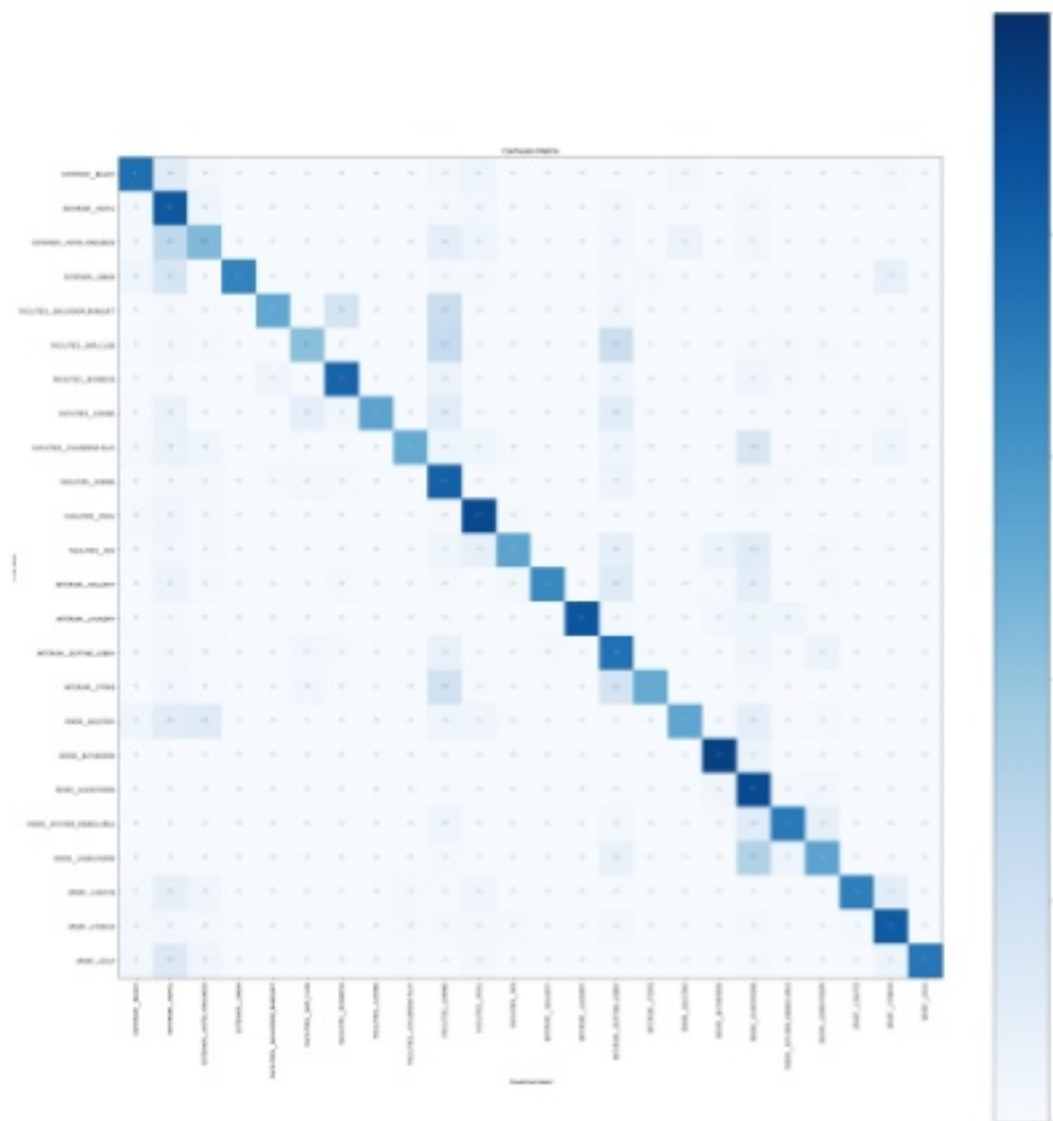


FACILITIES/DINING



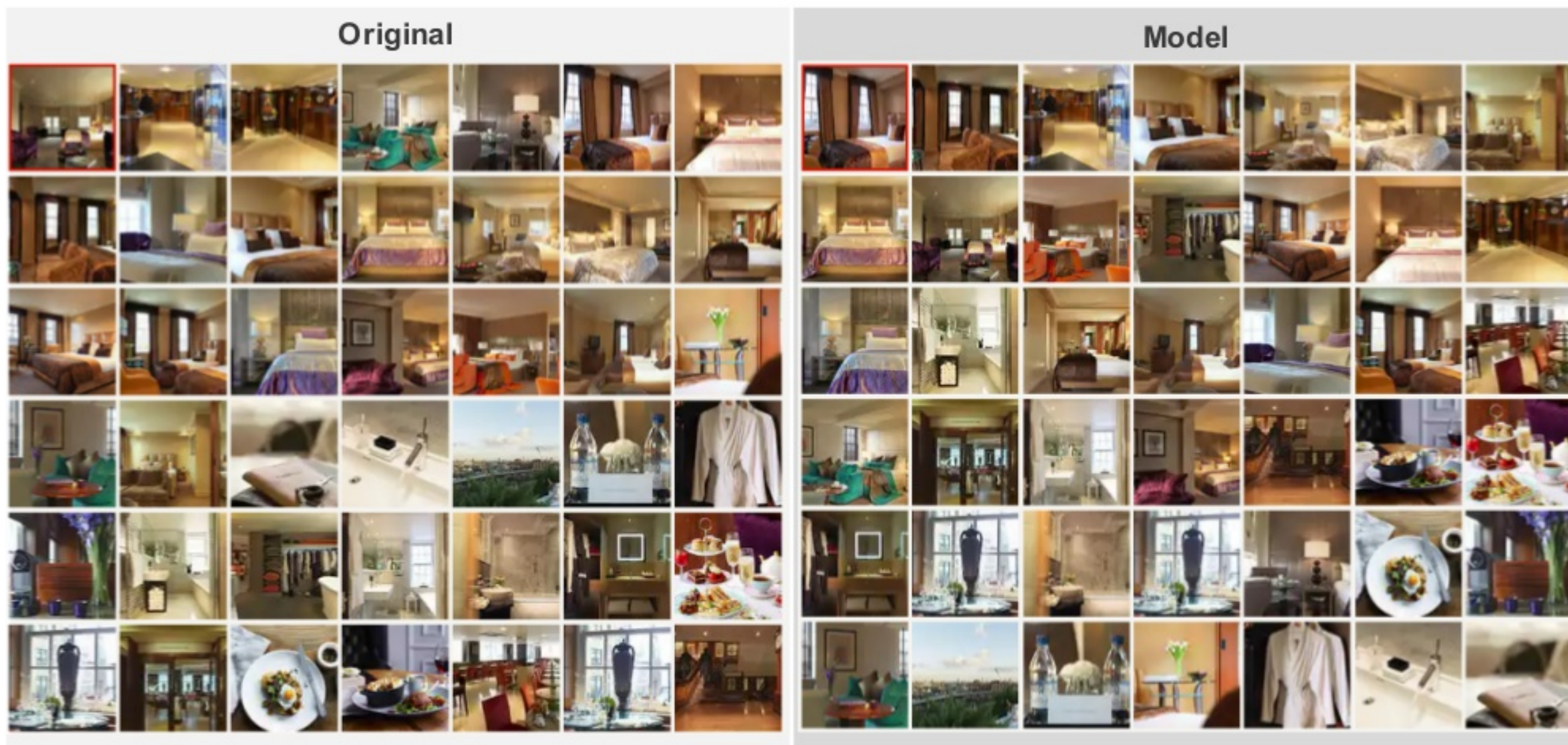
FACILITIES/POOL

Accuracy & Confusion Matrix



- After many manual / long winded iterations and regularization processes tuning hyperparameters
- We achieved good accuracy and low confusion matrix

Optimizing the photo order for improved customer experiences



Reference: [Radisson Blu Edwardian Berkshire Hotel, London](#)

Finding the right hotel in our marketplace is core to our customers needs.

Hotels.com
The Official Choice

San Francisco, California, USA
Fri 10 - Sun 12 June 2016, 2 nights, 1 room, 2 adults

Destination, hotel or landmark: San Francisco, California, United States of America
Check in: 06/10/16
Check out: 06/12/16
Rooms: 1
Adults: 2
Children: 0

Narrow results: 541 hotels

- Name contains
- Average Nightly Rate: \$0 to \$500+
- Star rating: 5 stars, 4 stars, 3 stars, 2 stars, 1 star
- Guest rating: 0 to 5
- Payment preference: Hotels.com Rewards, Neighborhood, Landmarks, Accommodation type, Amenities, Themes / types, Accessibility Features
- Why book with us? Hotels.com doesn't charge cancellation fees, Best Price Guarantee, We're just a phone call away: 800-997-9138 Toll Free and 817-983-0664 (charges may apply)

Sort by: Our favorites, Star rating, Distance, Guest rating, Price

Hotel Zelos San Francisco (Last booked 1 hour ago)
12 4th St., San Francisco, CA, 94103 United States, 866-638-0161
Union Square
0.2 miles to City center
12 miles to San Francisco International Airport (SFO)
Collected nights
Excellent 4.2 / 5
823 Hotels.com guest reviews
367 reviews
Great Rate
\$320 \$240
nightly price
✓ pay now or at hotel
Choose Room
Sponsored listing

Hotel Akri - Union Square
127 Ellis Street, San Francisco, CA, 94102 United States, 866-638-0217
Theater District
0.1 miles to City center
12 miles to San Francisco International Airport (SFO)
Collected nights
Excellent 4.1 / 5
822 Hotels.com guest reviews
1,316 reviews
Special Deal
\$249 \$175
nightly price
✓ free cancellation
✓ pay now or at hotel
Choose Room

The Opal San Francisco (Booked 1 hour ago)
1080 Van Ness Avenue, San Francisco, CA, 94109 United States, 866-638-1270
Civic Center
0.7 miles to City center
12 miles to San Francisco International Airport (SFO)
Collected nights
Good 3.6 / 5
1,782 Hotels.com guest reviews
954 reviews
Your Secret Price
\$464 \$148
nightly price
✓ free cancellation
✓ pay now or at hotel
Choose Room

Search

Filter Map Sorted by Our favorites

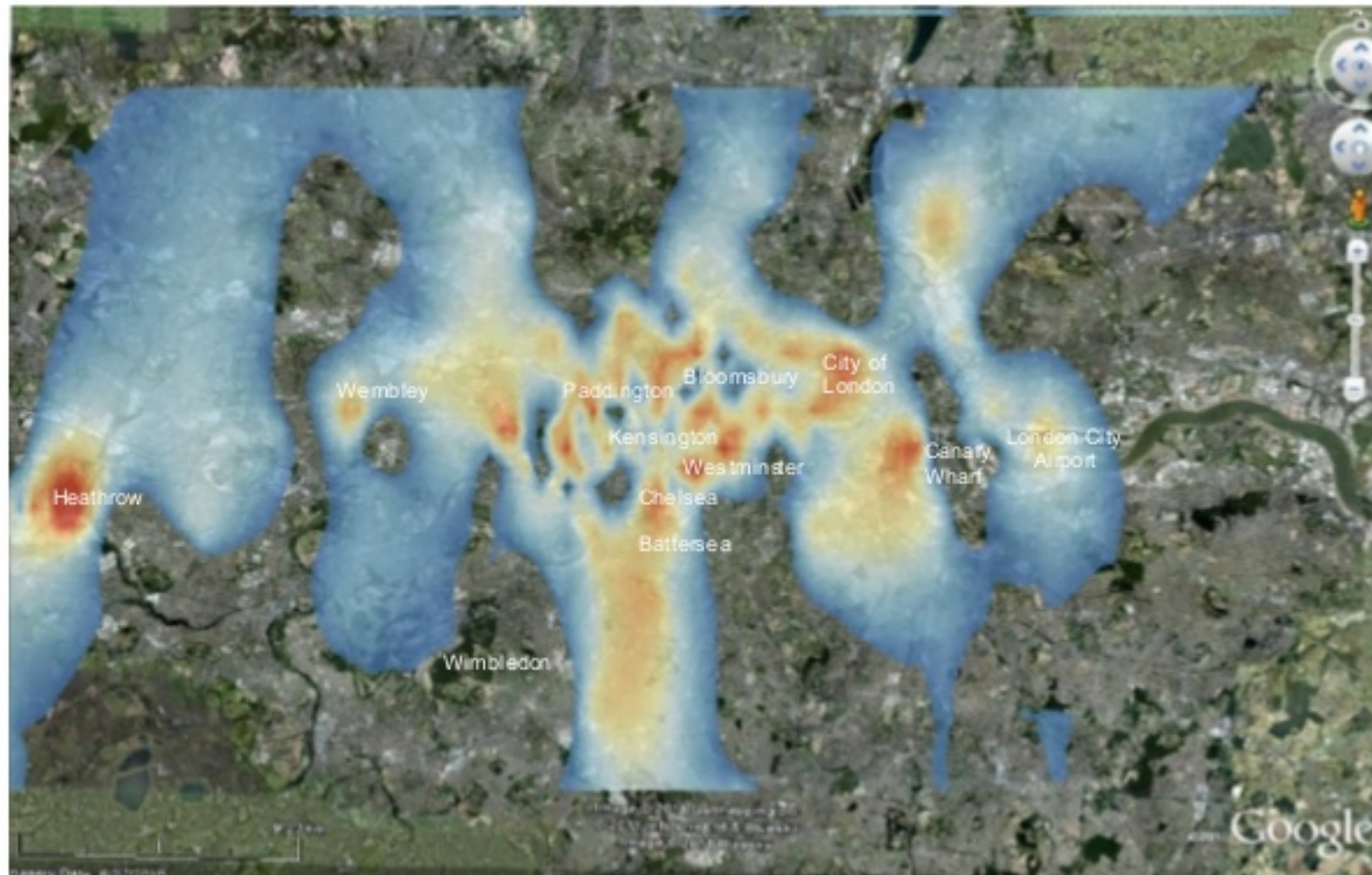
Omni San Francisco Hotel
★★★★★ Financial District - Ferry Building
Outstanding 4.6 / 5 1,438 reviews
4,093 reviews
\$479
Sponsored listing

Hotel G San Francisco
★★★★★ Union Square
Excellent 4.1 / 5 700 reviews
576 reviews
Your Secret Price
\$366 \$329

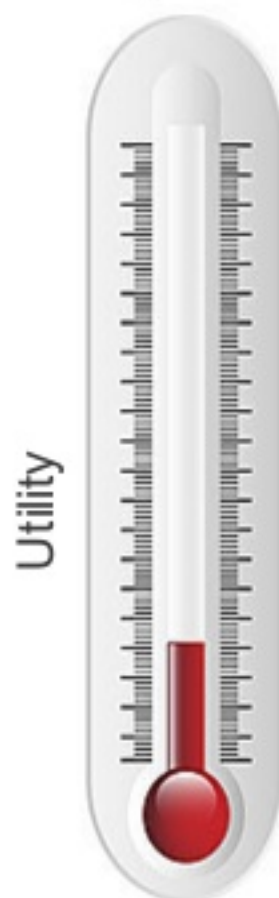
Bay Bridge Inn
★★★★★ South of Market
Good 3.6 / 5 317 reviews
235 reviews
\$299

Carriage Inn
★★★★★ South of Market
Good 3.9 / 5 317 reviews

As an example different user segments like to stay in different locations



just browsing!



Intent
(click)



BOOK!



Thank you

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<https://uk.linkedin.com/in/matthewfryer>

@mattfryer

Hotels.com