
A Machine Learning approach to image scoring for Paid Internet Marketing

2020-01-27

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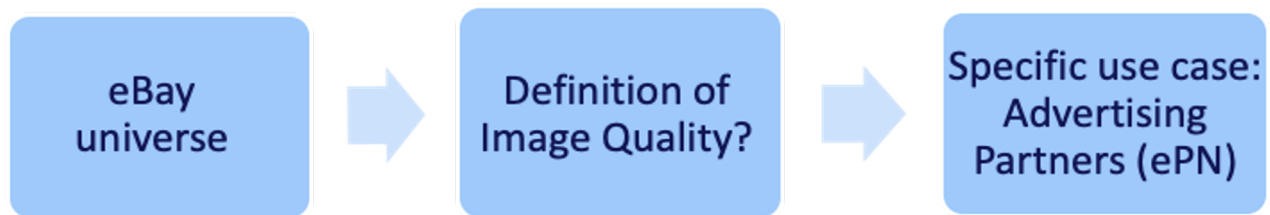
Colton Christensen

Maciej Bledowski

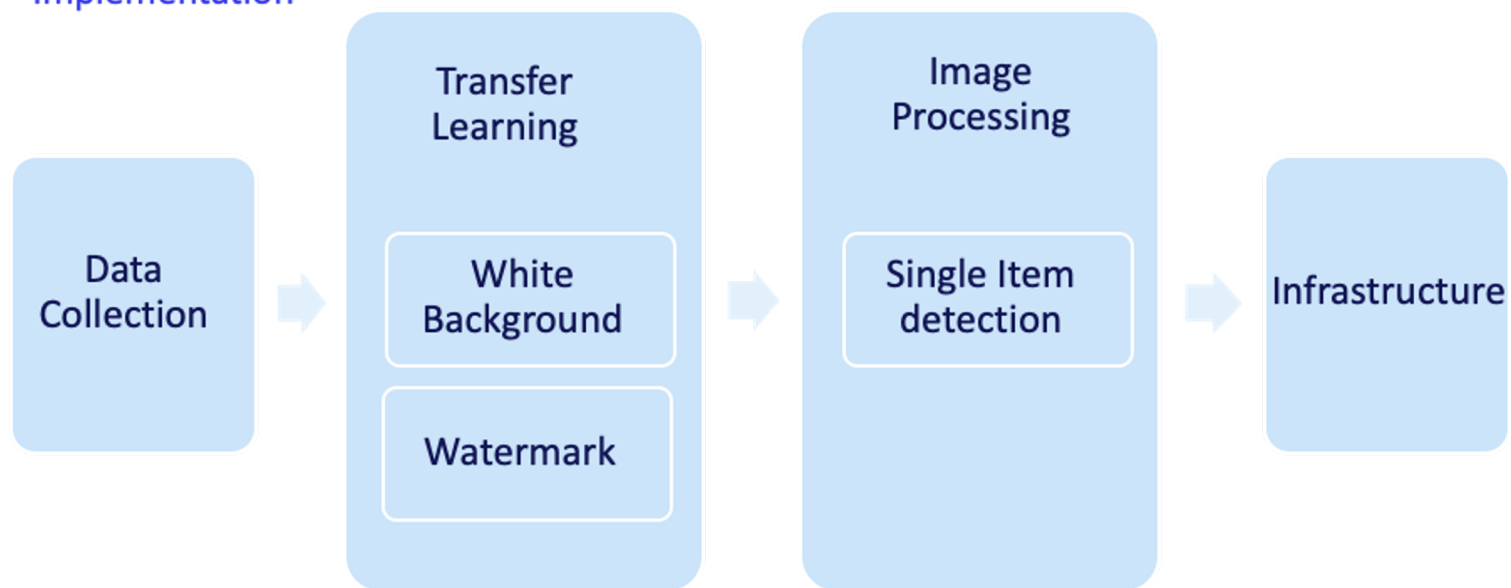
ebay

Outline

Motivation

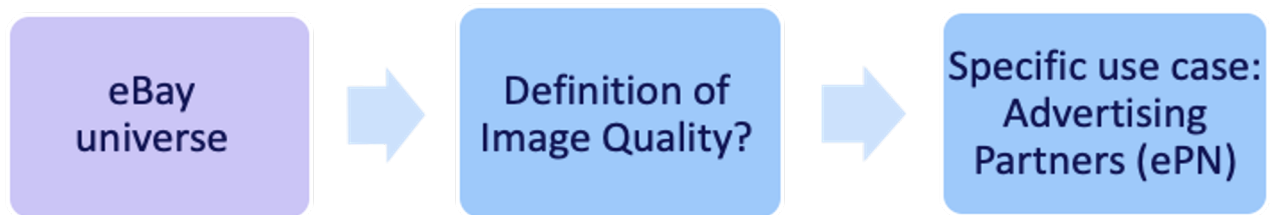


Implementation

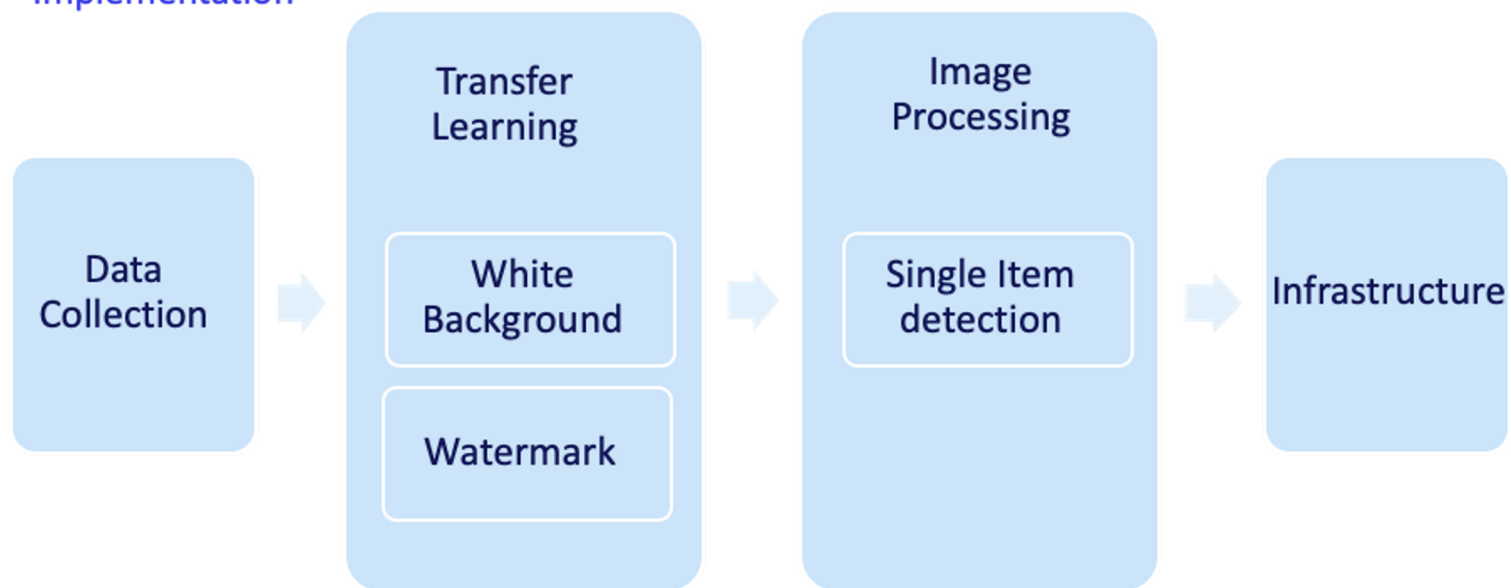


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eBay Inc.



StubHub



183M
Active
Buyers
Q3 2019

190
Markets

59%
International
Revenue

14K
Employees
12/31/2018

\$21.7B
GMV
Q3 2019

eBay

eBay Velocity

Ride Out the Weather

4WD and AWD vehicles ready for your next trip.

Shop Now →



It's Happening Here.

ebay



US

A watch sells every **5** sec.

A sports trading card sells every **2** sec.



Germany

A video game sells every **14** sec.

A car or truck part sells every **13** sec.



UK

A makeup product sells every **3** sec.

An appliance sells every **5** sec.



Australia

A car or truck part sells every **4** sec.

A smartphone case or cover sells every **7** sec.

eBay's diverse inventory - diverse images



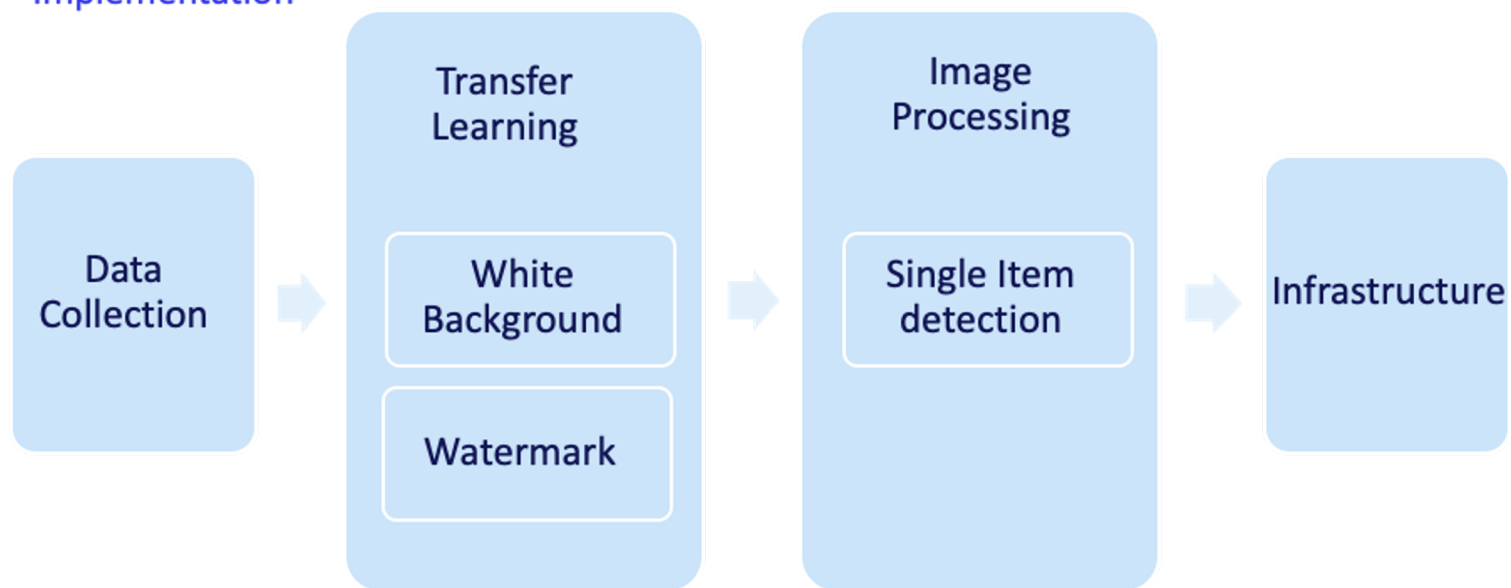
*Source: eBay investor relations, Q3 2019

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eBay image diversity: what is Image Quality?

Men's Fashion



- Mostly new
- Only B2C sellers
- Often white background
- Sometimes multiple items displayed

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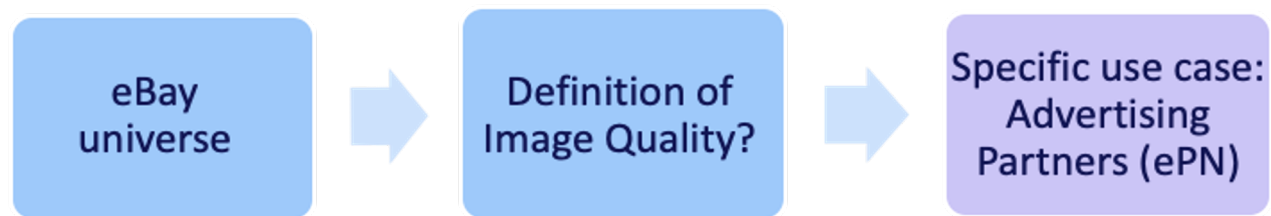
Video Games



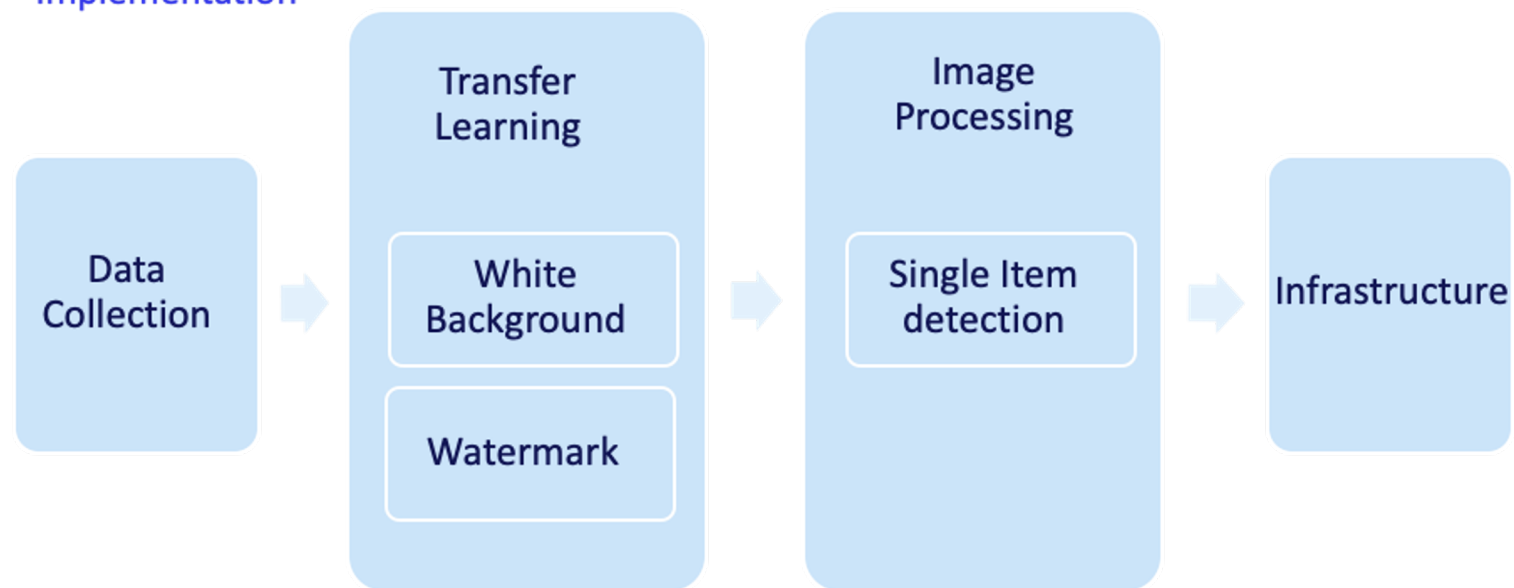
- Mostly used
- Many C2C sellers
- Rarely white background

Outline

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Need to filter eBay's images in order to meet specific requirements of the advertising partners



536.928 Ergebnisse für Herren shuhe [Diese Suche speichern](#) Versand nach EC2V5AA

Meinten Sie: **herren shuhe** (1.903.212 Artikel)?

 <p>NEU Herren/Gents Blau/Weiß Adidas Leder Leichte Laufschuhe EUR 66,63 UVP: EUR-88,09 Kostenloser Versand</p>	 <p>Adidas Originals ZX 750 Gr 7-12 schwarz blau Herren Sneaker EUR 62,10 bis EUR 84,69 Sofort-Kaufen Kostenloser Versand Ich beobachte 40+</p>	 <p>Asics Gel-Kayano Trainer EVO-weiß Gr. uk5.5 EUR 33,87 oder Preisvorschlag</p>	 <p>ANZEIGE NB New Balance ML574 Sneaker Herren Fashion Schuhe EUR 58,97 Sofort-Kaufen ebayplus</p>
 <p>ANZEIGE Herren Jungen LED leuchten Schuhe USB Flashing Fiber Optic EUR 24,99 Sofort-Kaufen 271+ verkauft</p>	 <p>Herren Damen Jungen Mädchen Sport Sneaker Running Gym EUR 10,15 bis EUR 11,28 Sofort-Kaufen Kostenloser Versand 321+ verkauft</p>	 <p>Herren Merrell Atmungsaktiv Leichte Walking Running Sport EUR 39,47 Sofort-Kaufen Kostenloser Versand 12+ verkauft</p>	 <p>Herren Henleys Schnüren Lässig Canvas Schlichtschuhe Pumps EUR 14,62 Sofort-Kaufen Kostenloser Versand</p>

 <p>IN HIGH DEMAND USD \$64.99 Nike Mens Court Vision Shoes Sneakers DELIVERY: FREE</p>	 <p>USD \$44.99 Vans Boys Ward Shoes Sneakers DELIVERY: FREE</p>	 <p>-40% USD \$198.00 USD \$330.00 Yohji Yamamoto Ren Split-sole Mesh Trainers - M... DELIVERY: FREE</p>	 <p>USD \$59.99 Puma Boys Axelion Sneaker Grade-Sch... DELIVERY: FREE</p>	 <p>USD \$211.00 Versace FOOTWEAR - Low-tops & sneake... DELIVERY: FREE</p>
 <p>-30%</p>	 <p>-46%</p>	 <p>-42%</p>		

We have adopted several algorithms to solve this problem



Classifiers



scores



Algorithms

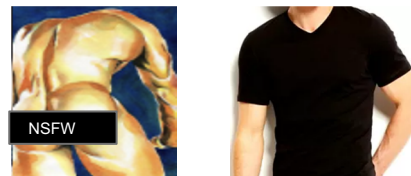
White Background



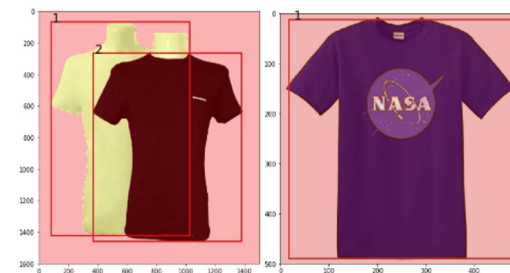
Watermark Detection



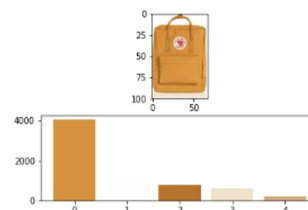
NSFW



Single Item Detection

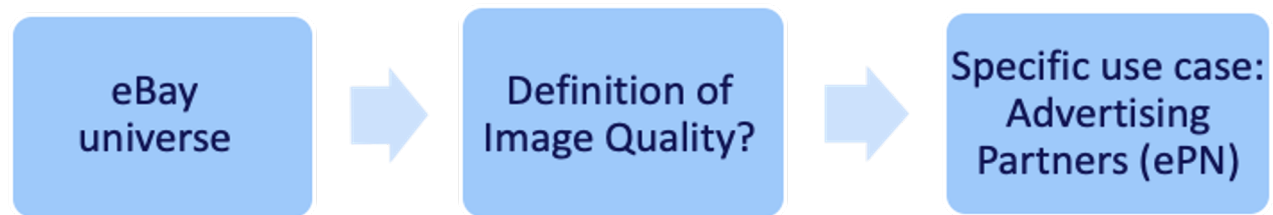


Color Mapping

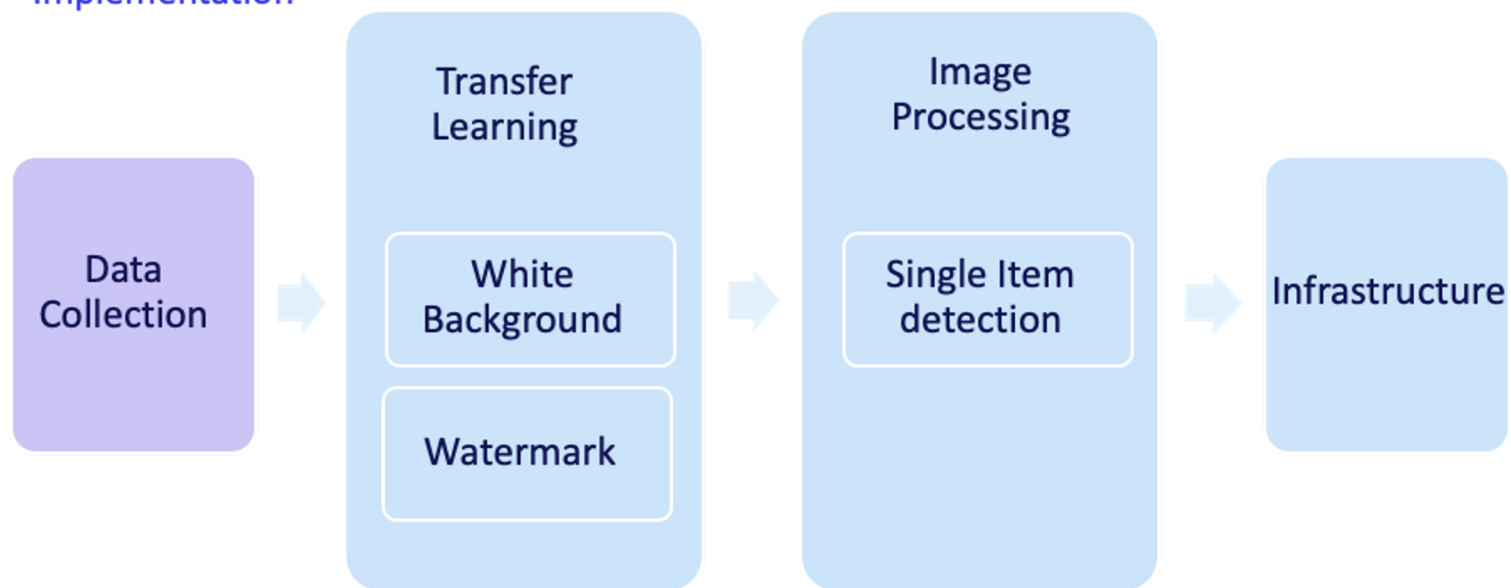


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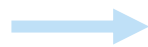


Implementation



White Background: labeled data generation

Naïve Algorithm
on existing images:
Count White Pixels %
+
Manual Curation



40% -> 1



0.4% -> 0



45% -> 1

...

Watermark: labeled data generation



text

tEXt

text

...



Generating new images:

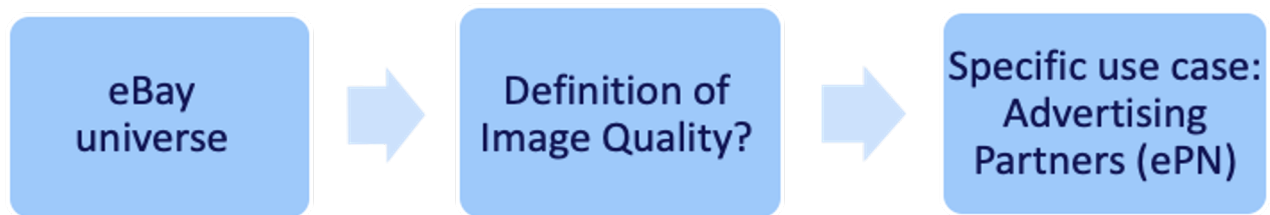
Adding text and watermarks

+

Existing internal dataset

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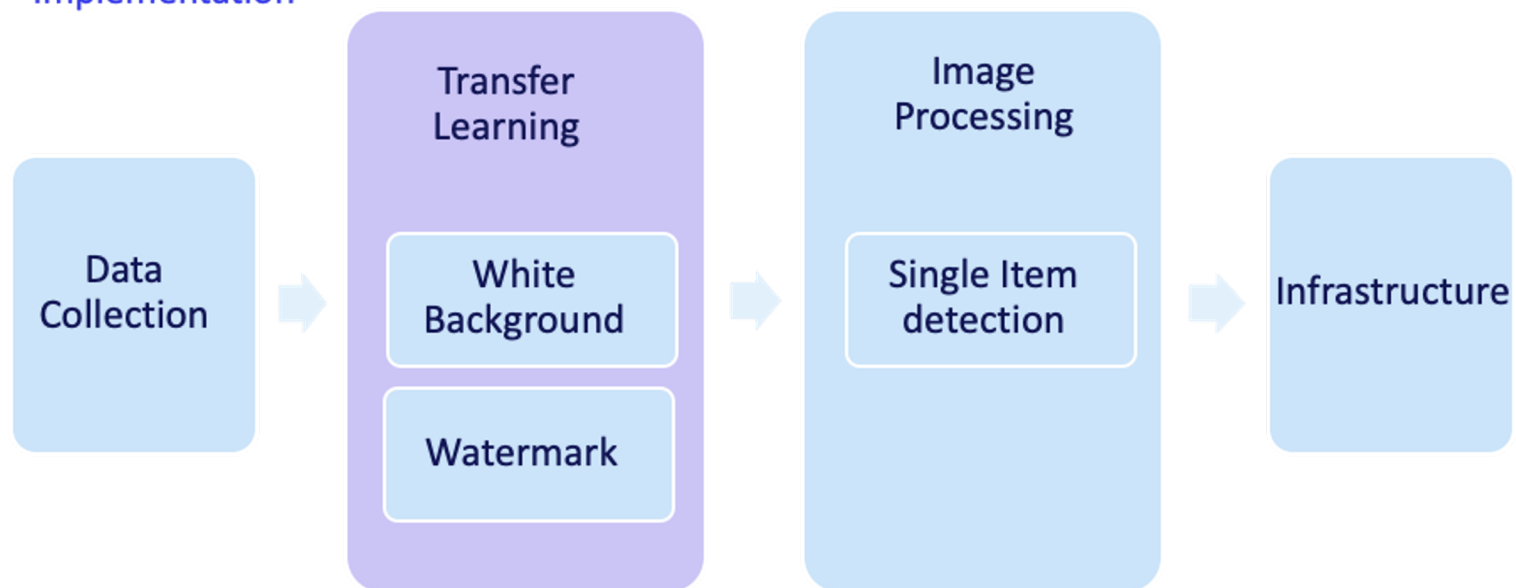


Image Classification: Convolutional Neural Networks

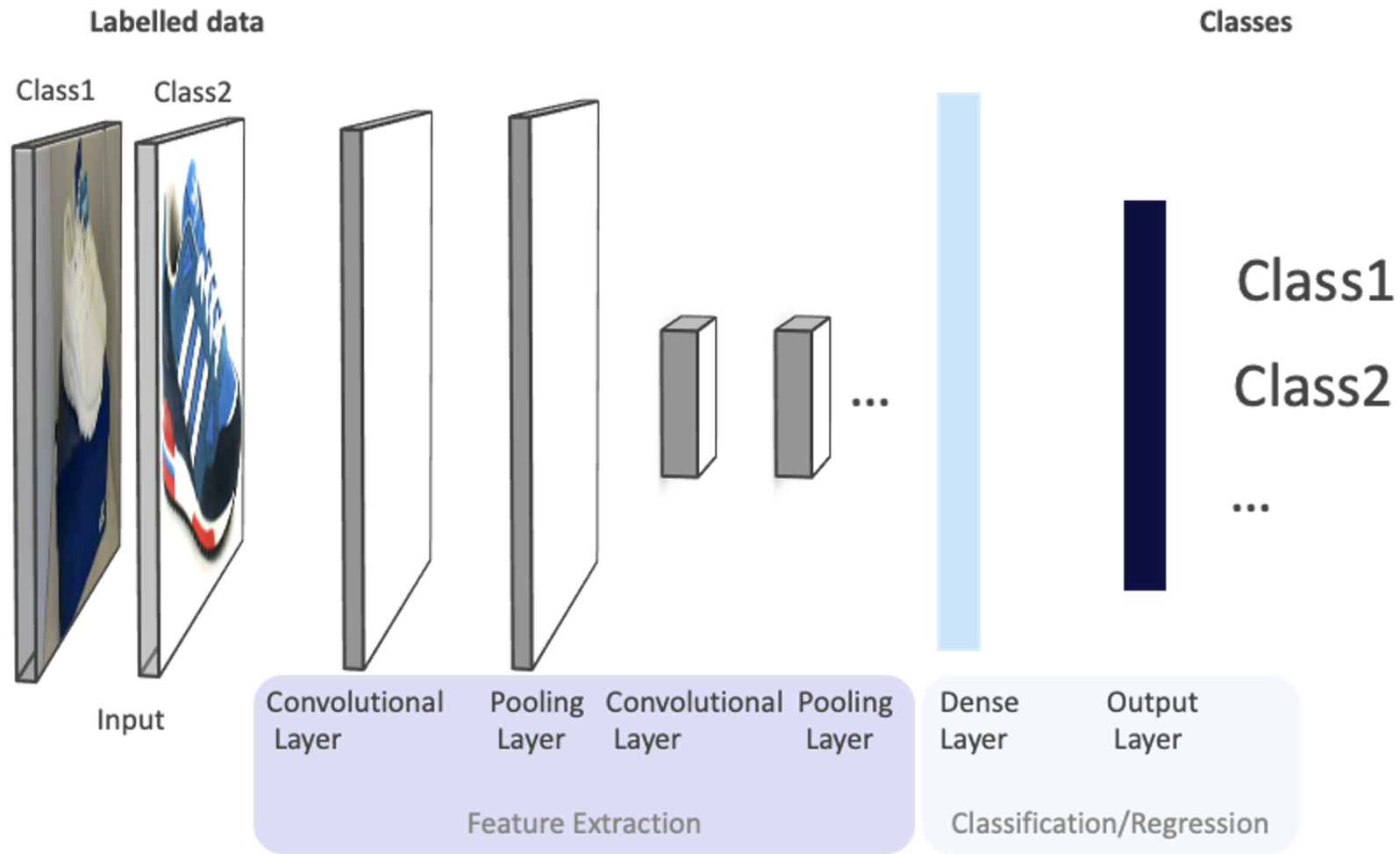
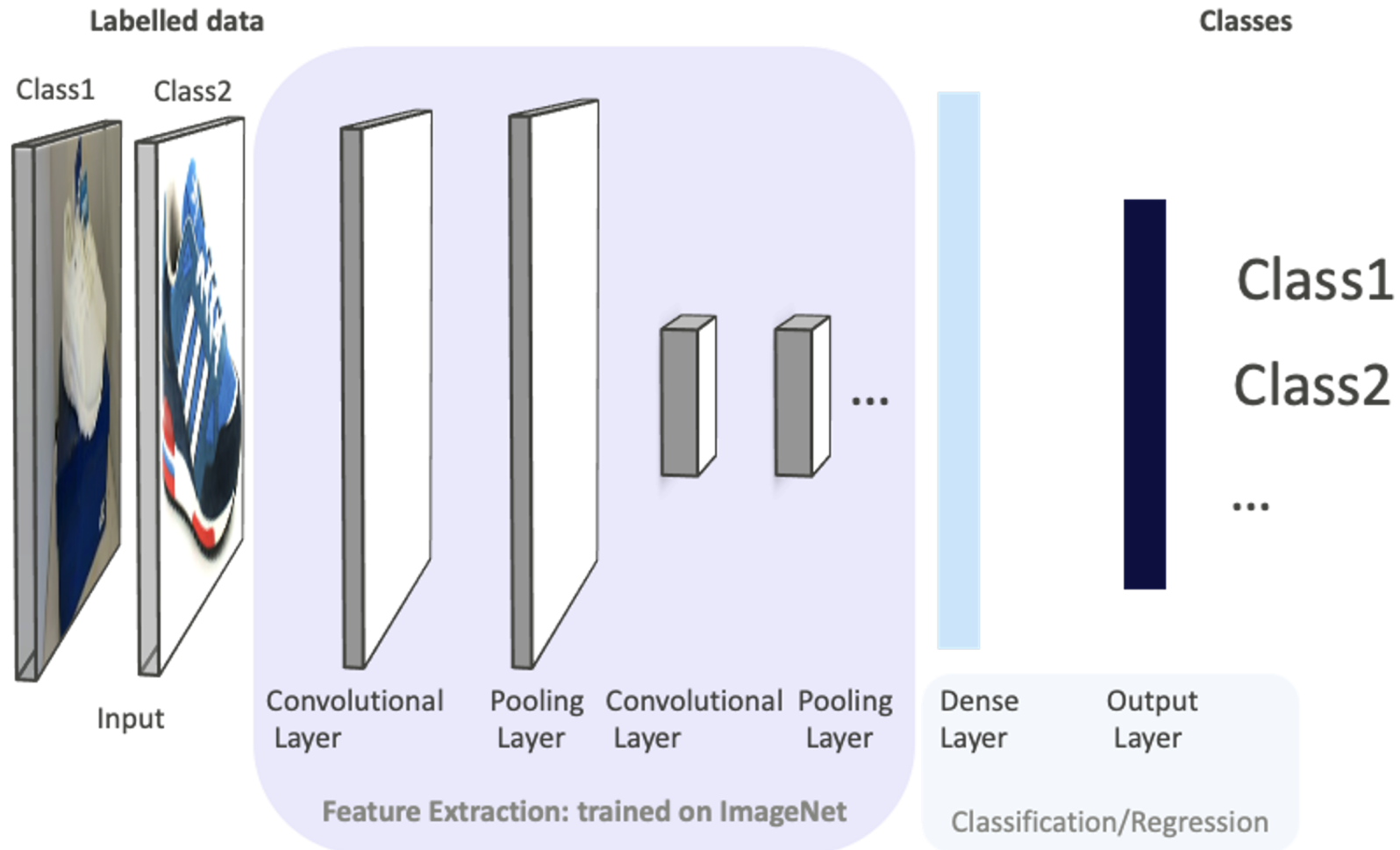
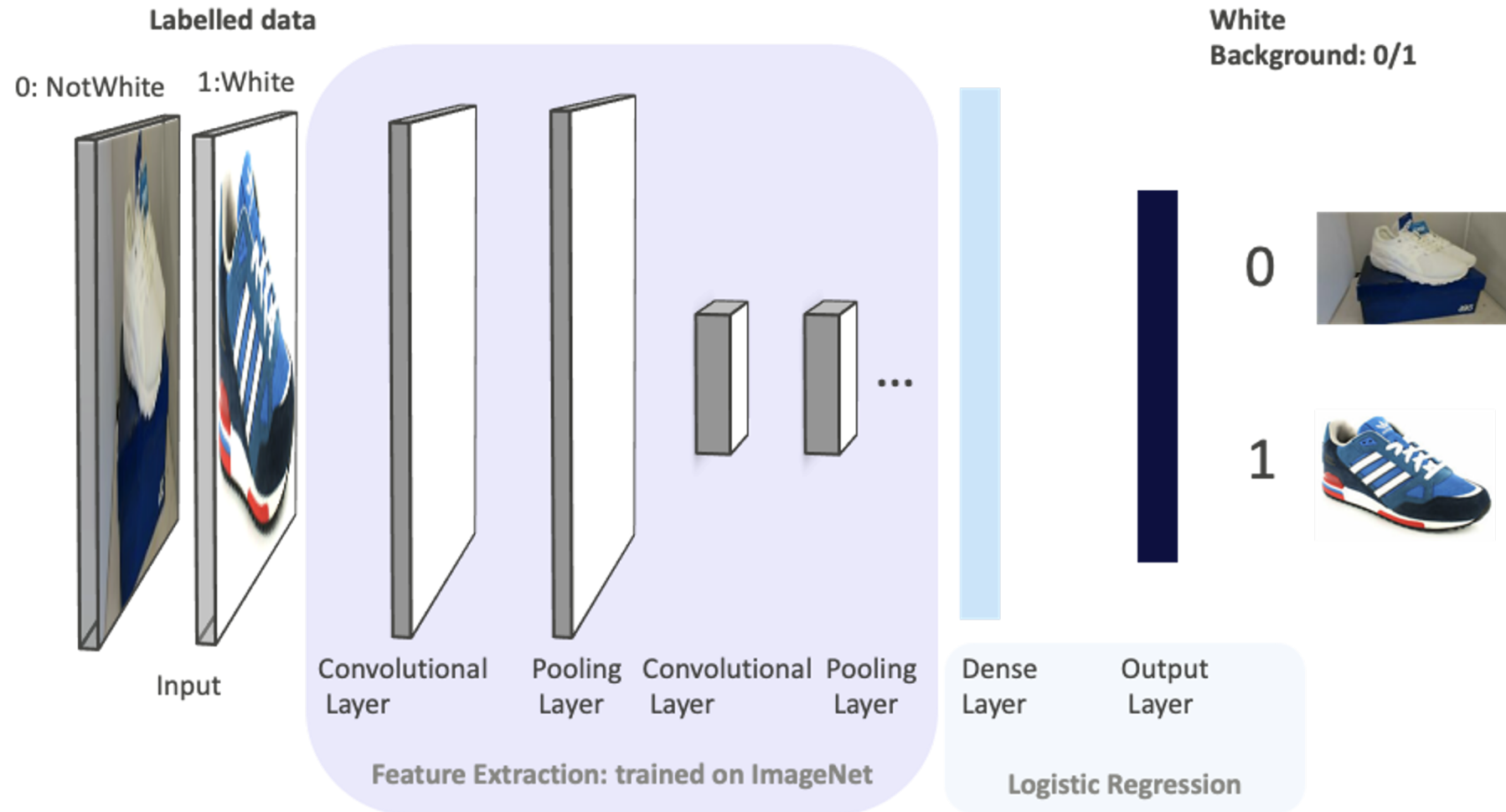


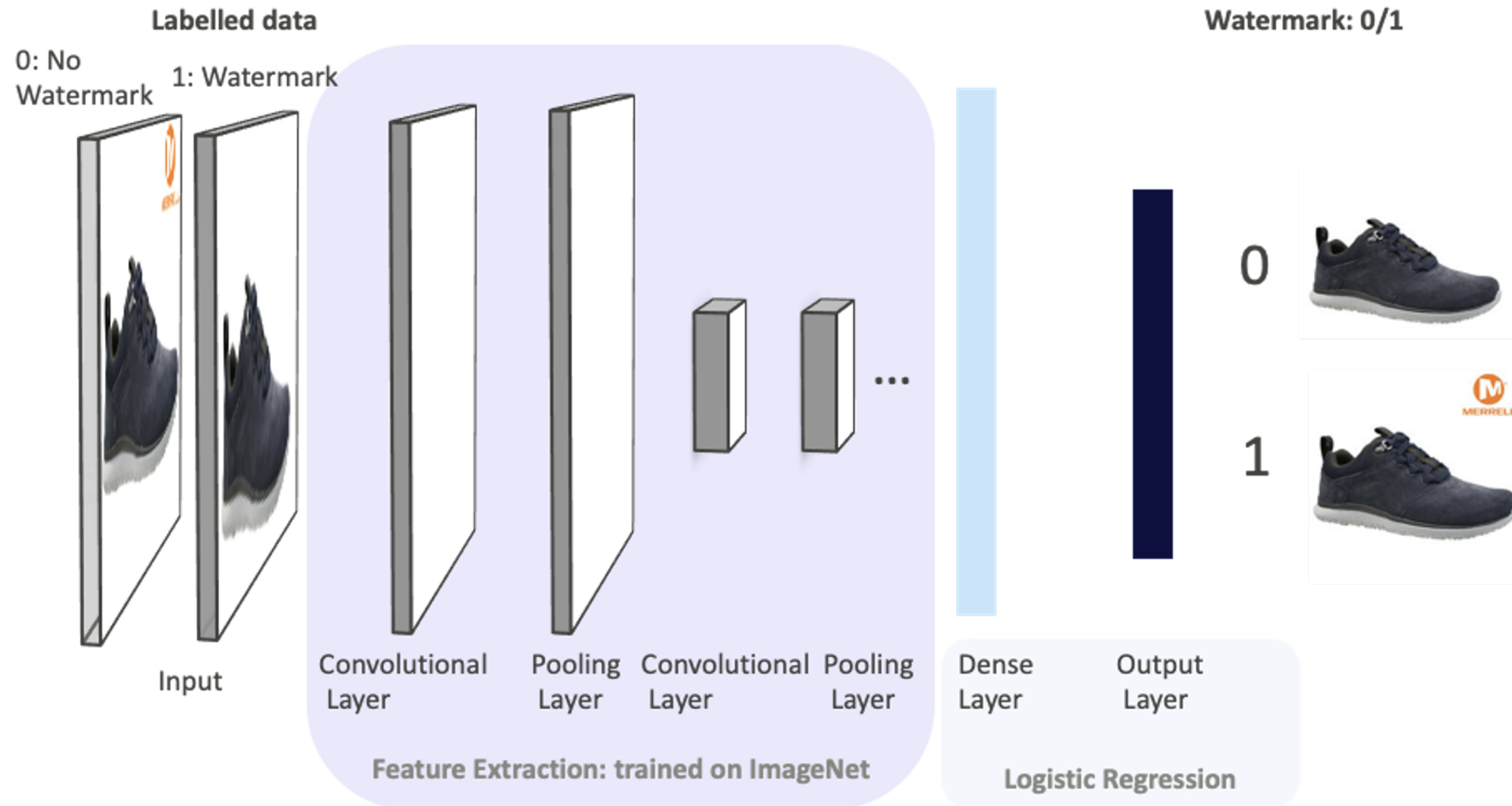
Image Classification using Transfer learning



White Background detection using Transfer Learning

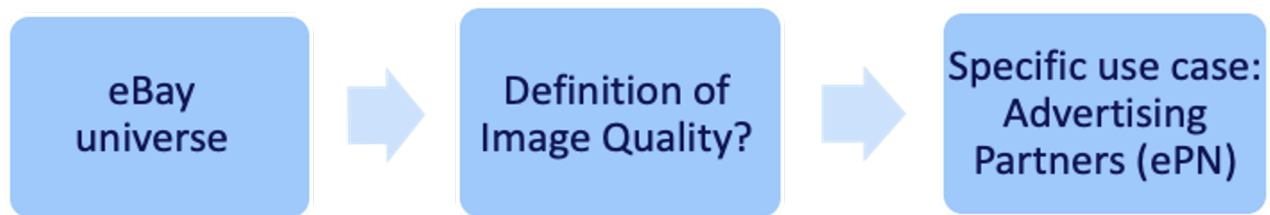


Watermark/Text detection using Transfer Learning

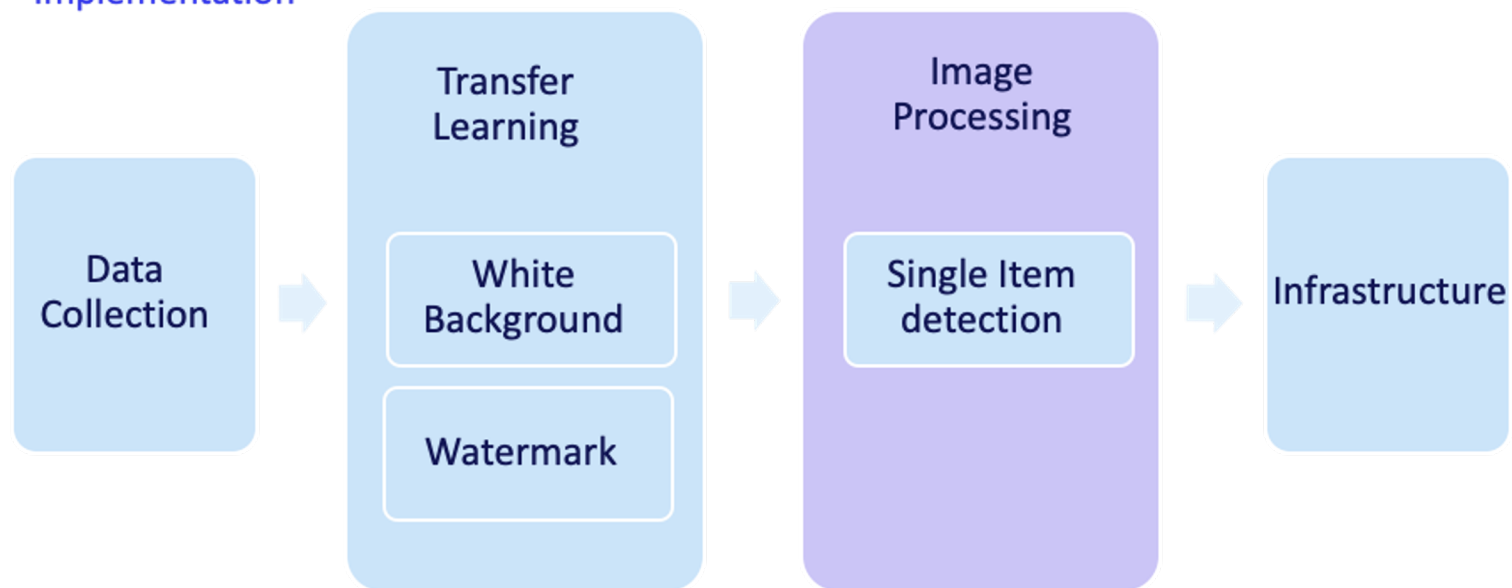


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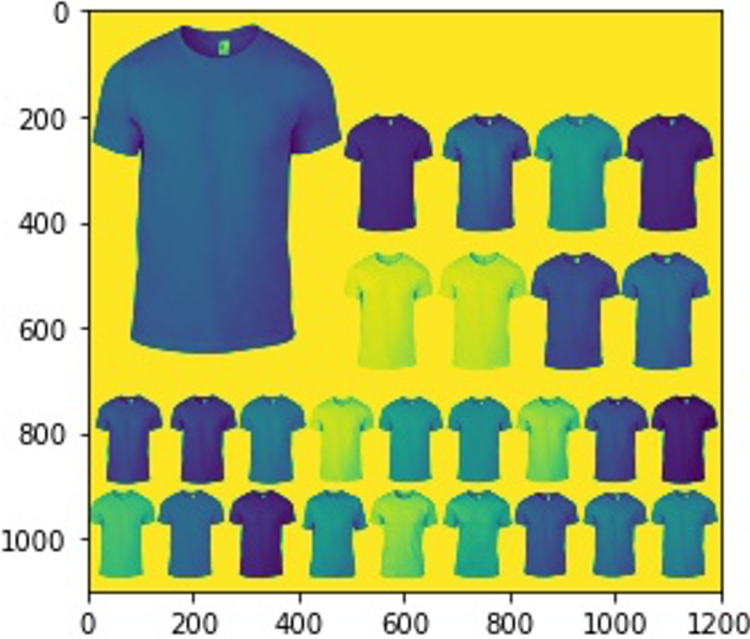


Implementation

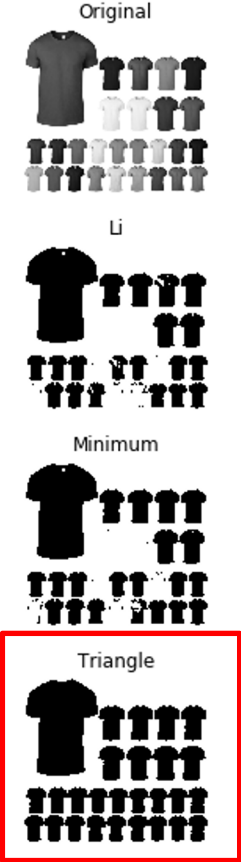


Single item algorithm: cut outlines and count regions.

Convert to Greyscale
And Blur Slightly



Convert to Binary –
Thresholding

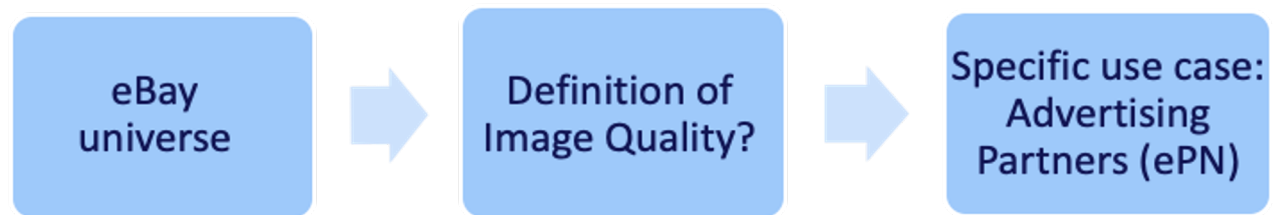


Label
Regions

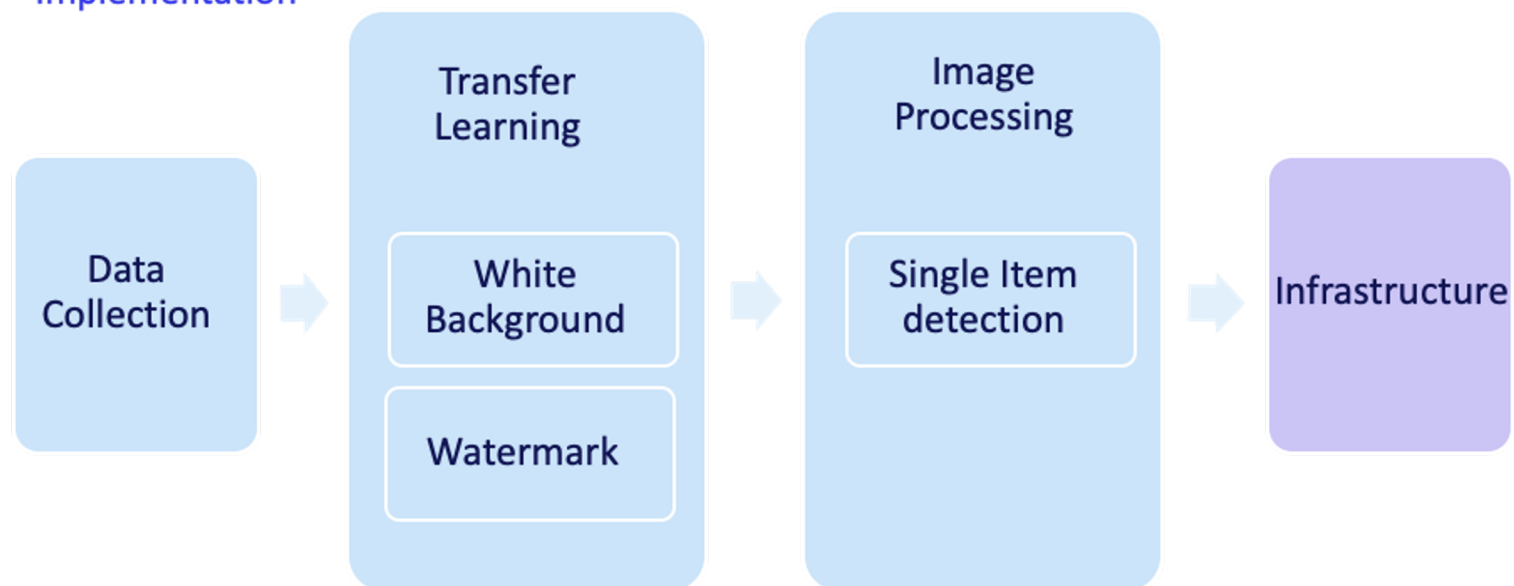


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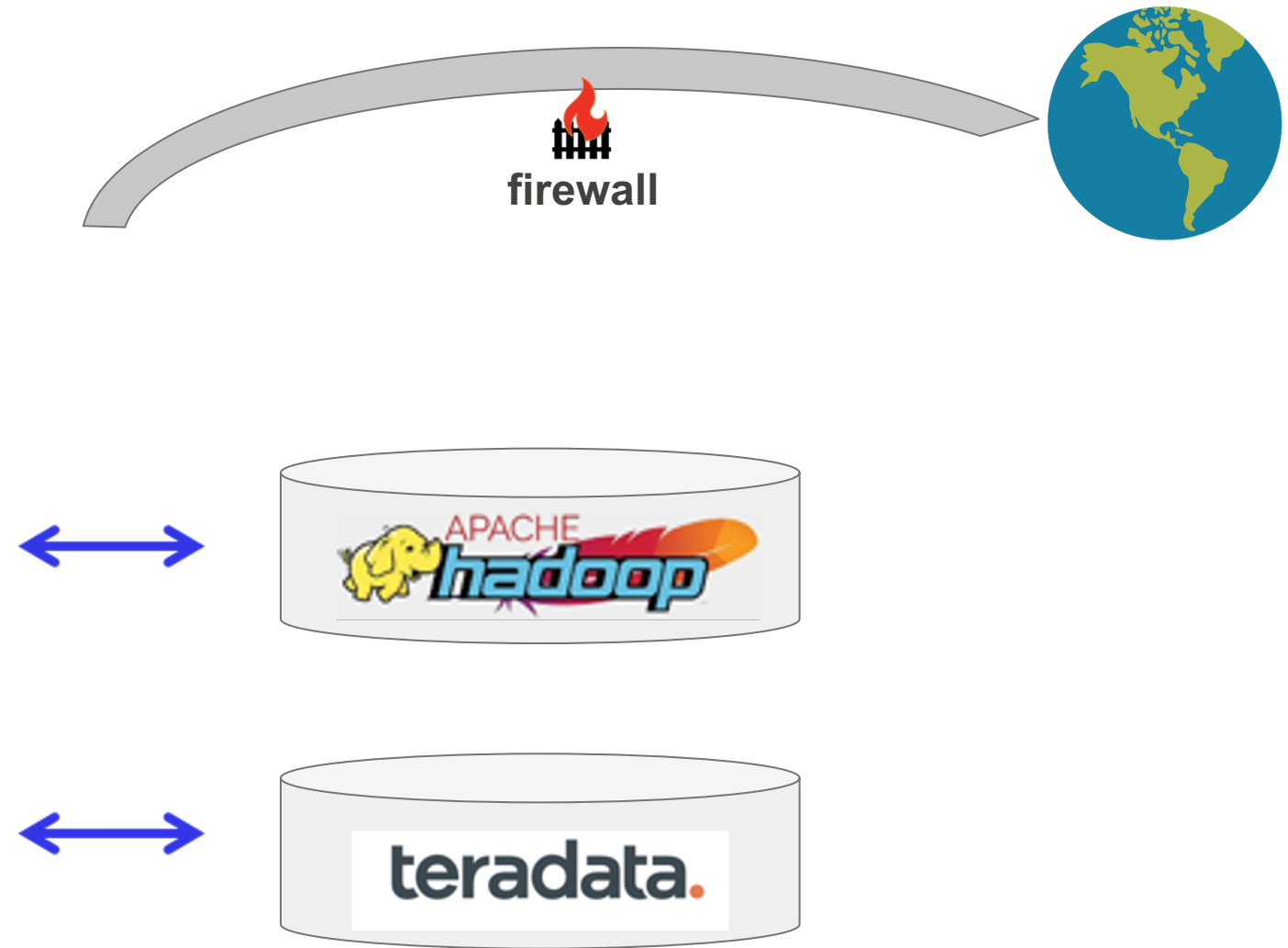
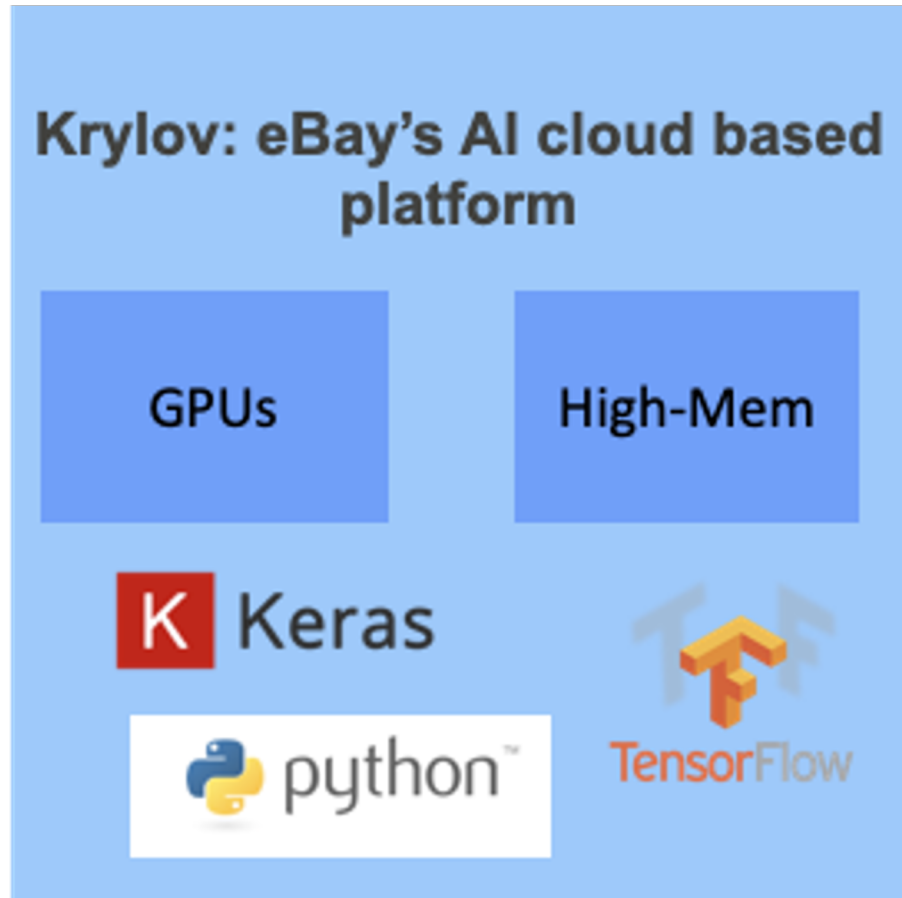
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Infrastructure we used



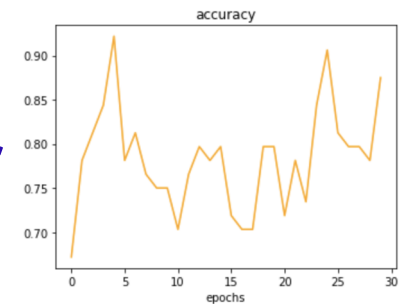
Our learnings

Motivation

- **Diversity of inventory leads to**
 - **Diversity of images**
 - **Diversity of use cases**
 - **Different definition of Image Quality for different use cases**
- **Define Image Quality as a set of attributes: White Background, Watermark, Blurriness,...**

Implementation

- **80/20 approach:**
 - **Quick development of Image Attributes using Transfer Learning with decent accuracy**
 - **Quick Proof of Concept using Advertising partners who did not work with us previously**





ebay