

Proofpoint Logo Detection & Classification

11th November 2020

Duke

The Duke Team



Altamash Rafiq

Vishaal Venkatesh

Varun Prasad



Dr. David Eagle

Project Manager
&
Assistant Research Professor Global Health

Duke

Problem Motivation

Duke

Context - Phishing

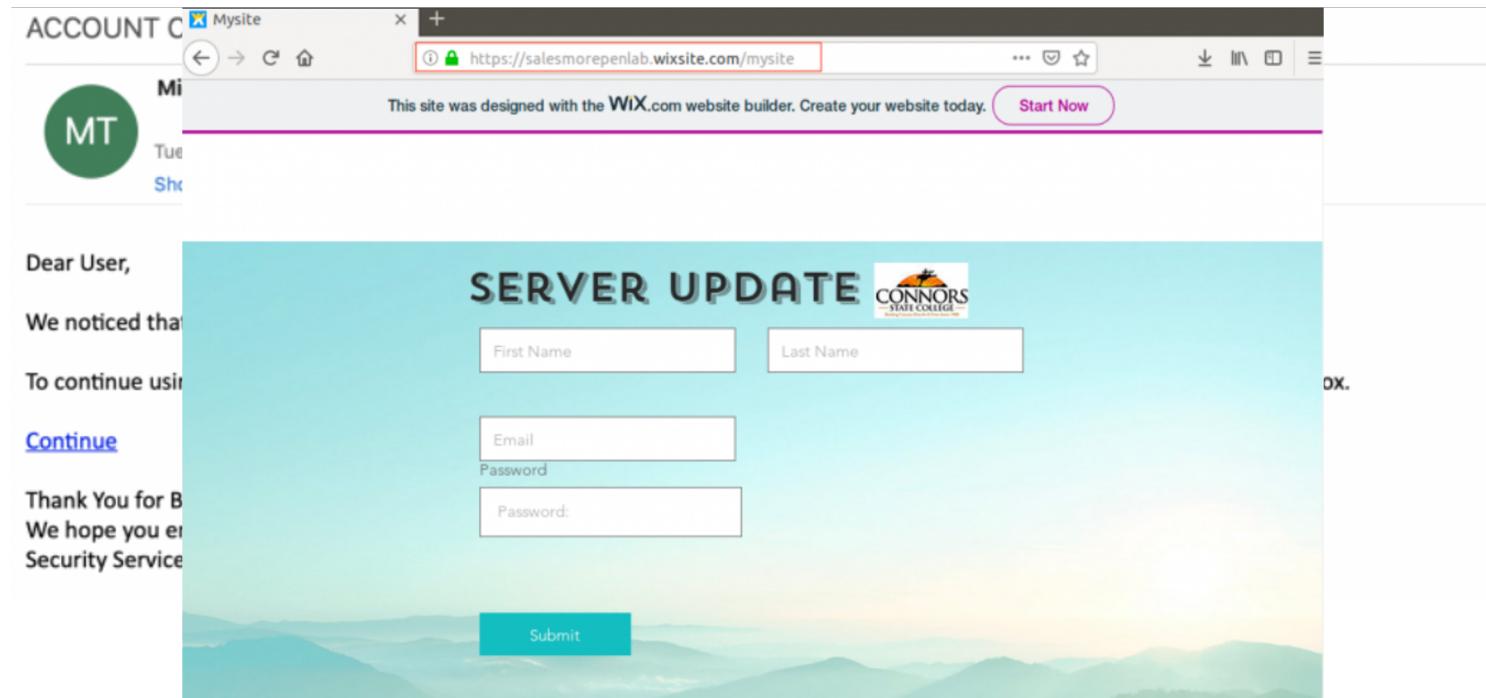
- Fraudulent impersonation of legitimate source
- Highly common and dangerous
 - 64% organizations experienced¹ phishing attack in 2019
 - 65% of attackers used spear phishing in 2019²
 - 93% of breaches occurred through phishing in 2017³
- Logos increase legitimacy
 - May be slightly distorted or modified



<https://www.duocircle.com/email-security/spear-phishing-takes-advantage-of-your-employees-trust>

1. <https://www.phishingbox.com/assets/files/images/Check-Point-Research-Information-Security-Report-2018.pdf>
2. <https://www.phishingbox.com/downloads/Symantec-Security-Internet-Threat-Report-ISRT-2019.pdf>
3. <https://www.phishingbox.com/downloads/Verizon-Data-Breach-Investigations-Report-DBIR-2017.pdf>

Standard Phishing/Spam Email



Duke

Examples of Phishing Emails with Logos

Felicidades! Ya tienes 6 meses gratis, tu correo ha sido registrado exitosamente - Mozilla Firefox

From: Netflix - Mexico <admin@sabacloud.com>☆
Subject: Felicidades! Ya tienes 6 meses gratis, tu correo ha sido registrado exitosamente
7/10/20, 3:28 PM

To: [REDACTED]

Tu periodo de prueba gratis de Netflix empieza hoy.

NETFLIX Netflix Mexico

Felicidades! Con tu prueba **GRATIS** de Netflix, el correo registrado es [REDACTED] ahora puedes disfrutar lo mejor del entretenimiento.

Tu membresía incluye:

- Disfruta miles de películas y series de TV
- Hasta 4 pantallas resolución 4K

Inicia sesión y acepta los términos del servicio para empezar a disfrutar 6 meses gratis de tu membresía.

<https://onlinevr99.netflix.com.mx/>

Disfruta Netflix,

Al ingresar en tu correo electrónico, saldrá un recordatorio de los términos debes aceptar para hacer uso de este servicio.

TU MEMBRESIA

Membresía	Netflix Periodo de prueba de 6 Meses
Tipo de Plan	Semestral
Pago Actual	\$0.00

Toma en cuenta que el precio y la disponibilidad de los productos están sujetos a cambios sin previo aviso. El precio y la disponibilidad de los productos se encontraban vigentes en la fecha en que esta comunicación fue enviada; sin embargo, podrían diferir de aquellos que ves cuando visites el sitio de Netflix.

Se activó una oferta para 6 meses gratis! - Mozilla Thunderbird

From: Amazon-Prime <admin@compuzone.co.kr>☆
Subject: Se activó una oferta para 6 meses gratis!
To: [REDACTED]

Tu periodo de prueba gratis de Amazon Prime empieza hoy.

amazon prime Amazon Mexico

Felicidades! Con tu prueba **GRATIS** de Amazon Prime, el correo registrado es [REDACTED] ahora puedes disfrutar lo mejor del entretenimiento.

Tu membresía incluye:

- Disfruta miles de películas y series de TV con Prime Video.
- Escucha 2 millones de canciones sin anuncios en todos tus dispositivos con Prime Music.

Inicia sesión y acepta los términos del servicio para empezar a disfrutar 6 meses gratis de tu membresía.

<https://registro.amazon.com.mx/>

Disfruta Prime,

Al ingresar en tu correo electrónico, saldrá un recordatorio de los términos debes aceptar para hacer uso de este servicio.

TU MEMBRESIA

Membresía	Amazon Prime Periodo de prueba de 6 Meses
Tipo de Plan	Semestral
Pago Actual	\$0.00

Toma en cuenta que el precio y la disponibilidad de los productos están sujetos a cambios sin previo aviso. El precio y la disponibilidad de los productos se encontraban vigentes en la fecha en que esta comunicación fue enviada; sin embargo, podrían diferir de aquellos que ves cuando visites el sitio de Amazon.com.mx.
Amazon.com.mx y Amazon México son nombres comerciales de Servicios Comerciales Amazon S. de R. L. de C.V. con domicilio en Juan Salvador Agraz No. 73, Piso 7 Colonia Lomas de Santa Fe, Delegación Cuajimalpa de Morelos, C.P. 05346, Ciudad de México.

Duke

Phishing at Duke

🔒 <https://shib.oit.duke.edu/idp/authn/external?conversation=e1s1>



Duke Log In

You are on the correct Duke login page if the above begins with: <https://shib.oit.duke.edu>.

NetID
Current students, faculty, staff, sponsored guests

NetID

Password

[Forgot your password?](#)

Multi-factor Authentication

Use Duo Push (phone)
 Call phone (phone)
 Send SMS codes (phone)

Or, enter pass code/YubiKey®:
 [What are pass codes?](#)

Remember device for 72 hours [?](#)

[Forgot your device?](#) [Have a new device?](#)

Log In

For assistance, please visit [oit.duke.edu/help](#) or [dhts.duke.edu](#).



ray-kimono.jp/duke.edu/

Duke Log In

NetID
Current students, faculty, staff, sponsored guests

NetID

Password

[Forgot your password?](#)

Multi-factor Authentication

Pass codes have been sent to your phone.
Enter pass code/Yubikey®:
 [What are pass codes?](#)

Remember device for 72 hours [?](#)

[Forgot your device?](#) [Have a new device?](#)

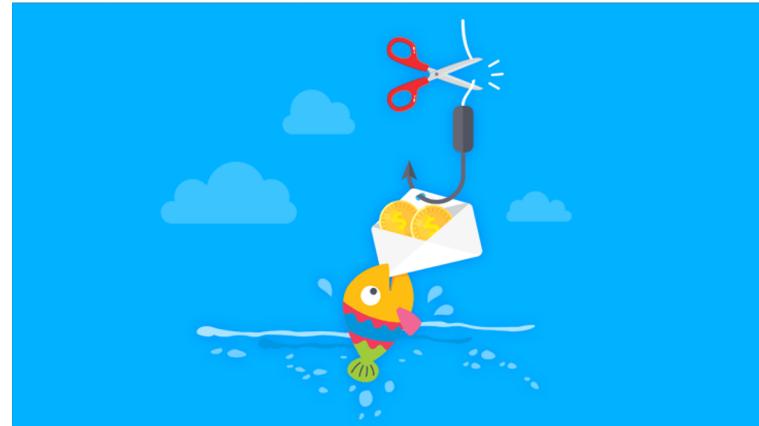
Log In

For assistance, please visit [oit.duke.edu/help](#) or [dhts.duke.edu](#).

Duke

Project Significance

- No readily available dataset of emails, websites, and documents with annotated logos
- Additional effective tool in combating more sophisticated phishing attempts
- Identifying brand impersonation and misuse



<https://www.kratikal.com/blog/best-defense-against-phishing-attacks/>

Project Goals

- Curate well-annotated database of website, email, and document screenshots
- Develop robust models that both detect logos and identify the brand
- Provide well-documented codebase that can be reproduced and used by the client
- Suite of models → “outrageous goal”
 - Time vs. performance



<https://highperformanceadvocates.com/goal-person-system-person/>

Pipeline

Duke

Pipeline

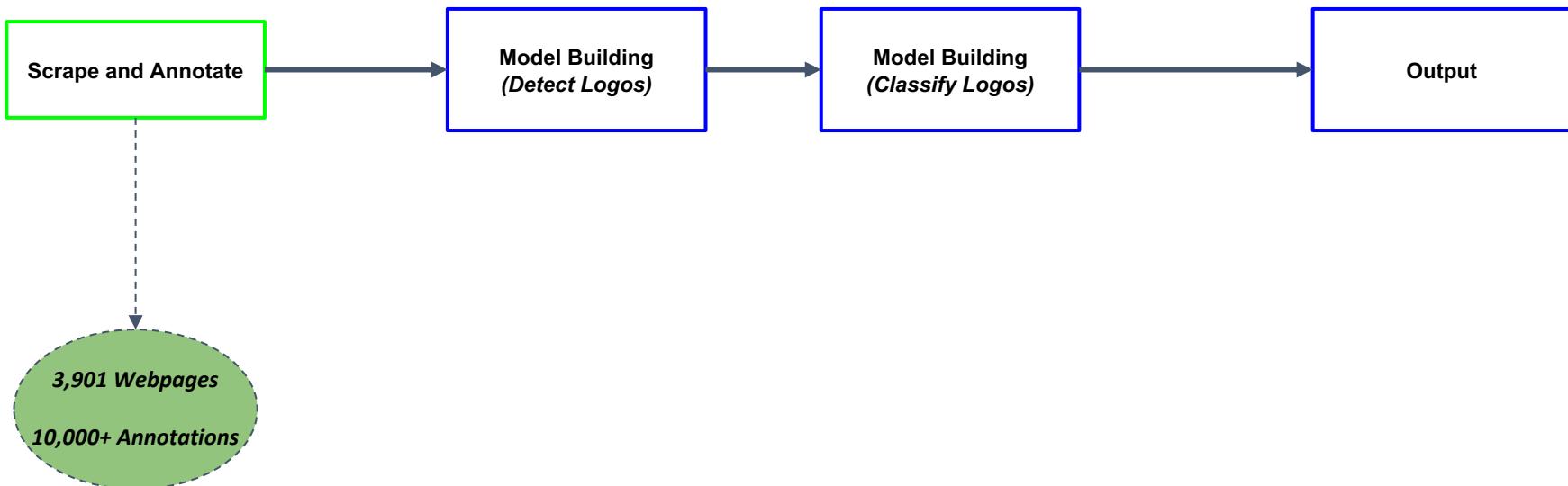


Duke

Web-Scrape & Annotate

Duke

Pipeline



Duke

Image Scraping

- Scraped images for S&P 500.
- Screenshots data set for Logo Detection
- Clean logo data set for Logo Classification
- Future Work: add images of government documents (PDFs), social media sites, university and government web pages.



amazon.com



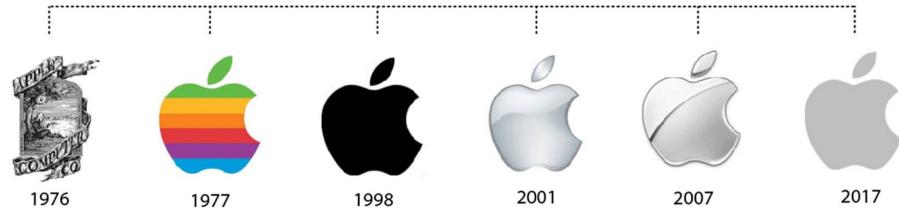
3M



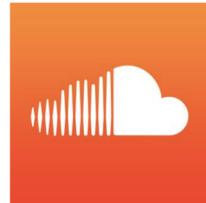
Duke

Clean Logo Collection

- Scraped 1000logos.com using BeautifulSoup Python package.
- Contains most recent and all historical logos for each company and brand
- Contains highly similar logos to popular logos.



Apple Logo History



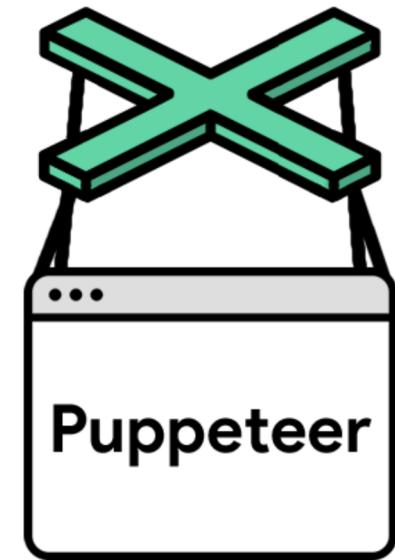
SoundCloud



3DPrinterOS

S&P 500 Screenshot Collection

- Images scraped from web pages using **Pypeteer (Puppeteer's Python API)**.
- Resolution: **1440x2560**.
- High resolution chosen for clarity of smaller logos.
- Scraped 3,901 images from:
 - a. Official Company Websites
 - b. Google Images Search Results
 - c. Wikipedia Articles.



Duke

Variety Among Screenshots

- Screenshots have logos with a large amount of variety.
- Model needs to be able to detect logos in a wide variety of states.
- Catch all ‘generic logo’ label reserved for unfamiliar logos.



Size Variety Among Logos

This website uses cookies. If you continue without changing your settings, we'll assume that you are happy to receive all cookies on the vanillaplus.com website. [Dismiss](#)

The screenshot shows the homepage of vanillaplus.com. At the top, there's a dark banner for the "IoT GLOBAL AWARDS 2020" with a "ENTER NOW" button and a "SPONSOR" logo. Below this is a pink header with the "Vanilla+" logo, the text "THE GLOBAL VOICE OF TELECOMS IT", and a search bar. The main navigation menu includes Home, News, Verticals, Digital Edition, Events, Videos, VP Featured, Directory, Tech Trends, and Subscribe. A sub-navigation bar shows "You are here: Home > News Ericsson, RED Technologies and Qualcomm Inc. conduct the first Licensed Shared Access (LSA) pilot in France > Qualcomm-Logo.8.15". The main content area features a large image of the Qualcomm logo and a news article titled "Qualcomm-Logo.8.15" dated 08 January, 2016 at 8:39 AM. The article has social sharing icons. To the right is a sidebar with a "bics" logo and text about improving efficiency and throughput with seamless connectivity, along with a "DOWNLOAD case study" button. A vertical column on the far right contains social media icons for Facebook, LinkedIn, YouTube, and Twitter, and a "SUBSCRIBE" button.

IoT GLOBAL AWARDS 2020

ENTER NOW

SPONSOR

Vanilla+ THE GLOBAL VOICE OF TELECOMS IT

About Us | Privacy Policy | Contact us | Log in

How AI solves emerging COVID19 challenges facing the Retail Industry

Home News Verticals Digital Edition Events Videos VP Featured Directory Tech Trends Subscribe

You are here: Home > News Ericsson, RED Technologies and Qualcomm Inc. conduct the first Licensed Shared Access (LSA) pilot in France > Qualcomm-Logo.8.15

Qualcomm-Logo.8.15

08 January, 2016 at 8:39 AM

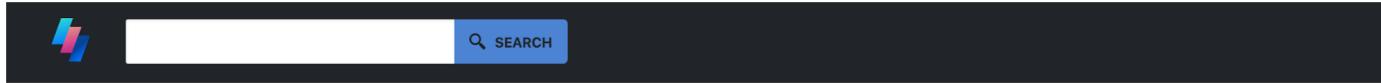
bics

Improve efficiency and throughput with seamless connectivity

DOWNLOAD case study

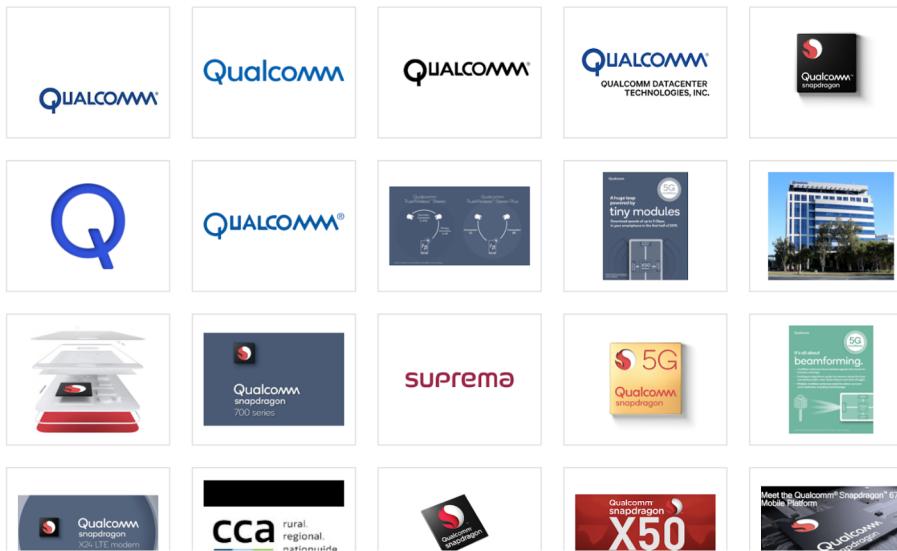
Duke

Logo Count & Location Variety (~3.3 / Image)



Qualcomm Technologies Inc Logo

We have found 35 **Qualcomm Technologies Inc** logos. Do you have a better **Qualcomm Technologies Inc** logo file and want to share it? We are working on an upload feature to allow everyone to upload logos!



Duke

Variety in Logo Density



Explore > Food and Drinks > Drinks > Non Alcoholic Drinks > **Monster Energy**



Article from [freelogovectors.net](#)

Monster Energy Logo Download Vector

Monster Energy Logo vector download, Monster Energy Logo 2020, Monster Energy Logo png hd, Monster Energy Logo svg cliparts



Article by **Nancy Anderson-Casey**

10

[Monster Energy Drink Logo](#) [Monster Energy Cake](#) [Monster Energy](#) >

People also love these ideas



Duke

Darkened Logos

MENU SEARCH

Linkage

+1 (781) 402-5555

GET IN TOUCH

SUCCESS STORIES

We use cookies to improve your browsing experience on our website. By closing this banner or interacting with our site, you acknowledge and agree to our Privacy Policy

GOT IT!

Creating Purposeful Leaders with Dentsply Sirona

INDUSTRY

Life Sciences

SOLUTION

Accelerating Purposeful Leadership

Dentsply Sirona

Dentsply and Sirona joined forces in 2016, to become

Duke

Occluded Logos

BrandNew

Search



Submit Tips/Work

Log in

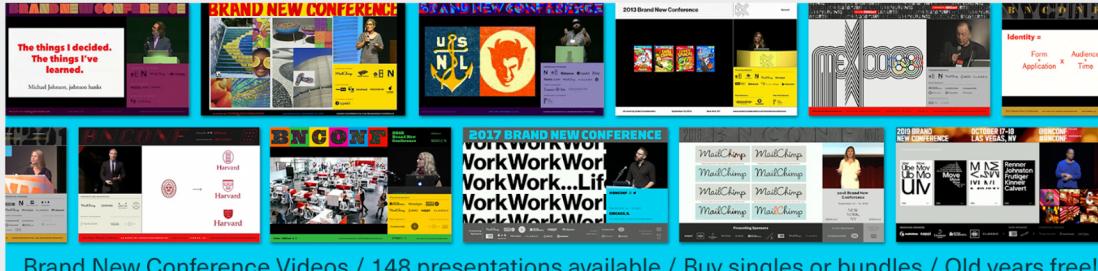


Browse



About

SUBSCRIBE



Brand New Conference Videos / 148 presentations available / Buy singles or bundles / Old years free!

Share >



+ More

New Name and Logo for Raytheon Technologies

Spotted

Raytheon



Duke

No Logos - 375 Screenshots

We are committed to serving you during this global pandemic. To visit Everest's website, click here.

Everest's 25th Anniversary | Careers | Contact Us | [Add your logo here](#) | Site Search | Everlink® Log In

Reinsurance ▾ Insurance ▾ Investors ▾ Insights ▾ Corporate Responsibility ▾ About Everest ▾

Positioned for success

Get an unmatched global network of professionals for:

[REINSURANCE →](#) [INSURANCE →](#)

Strength and stability you can rely on.

You need rock-solid financial protection. With wise investments, solid ratings, and substantial reserves, we're your most reliable and resourceful partner yet.

Duke

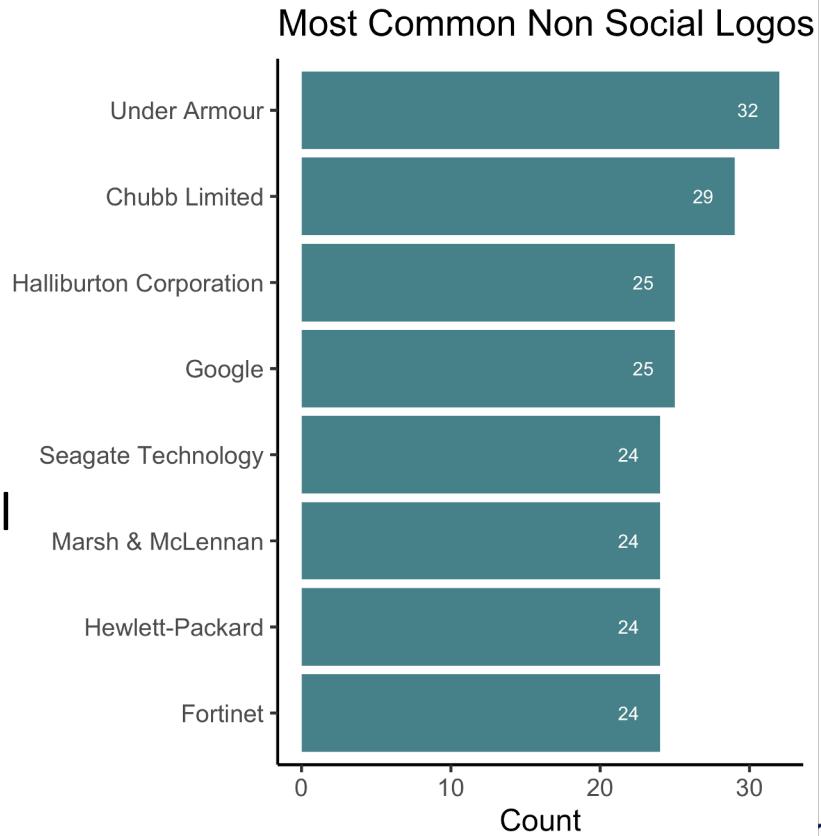
Image Annotation

- Undertaken using labellImg.
- Pascal VOC format used for annotations - can be easily converted to other formats e.g. COCO and YOLO.
- Images with no logos not annotated.
- Over **10,000** logos annotated.



Annotation Consistency

- Used agreed upon rules for labeling:
 - What counts as a logo?
 - How to deal with unfamiliar logos?
 - How to label occluded logos?
 - How to deal with darkened logos?
- Inconsistencies between labeling will be resolved through an annotation *cleaning* script.



Sample Annotation

The screenshot shows the homepage of BraindNew, featuring a large "BraindNew" logo at the top left. The top right contains navigation links: Search, Submit Tips/Work, Log in, Browse, About, and a black SUBSCRIBE button. Below the navigation is a grid of thumbnail images representing various Brand New Conference presentations. A blue banner at the bottom of the grid reads: "Brand New Conference Videos / 148 presentations available / Buy singles or bundles / Old years free!". Below the banner are social sharing icons for Facebook, Twitter, Email, Pinterest, and More, along with a "Share >" link. A "Spotted" section is visible on the right side.

New Name and Logo for Raytheon Technologies

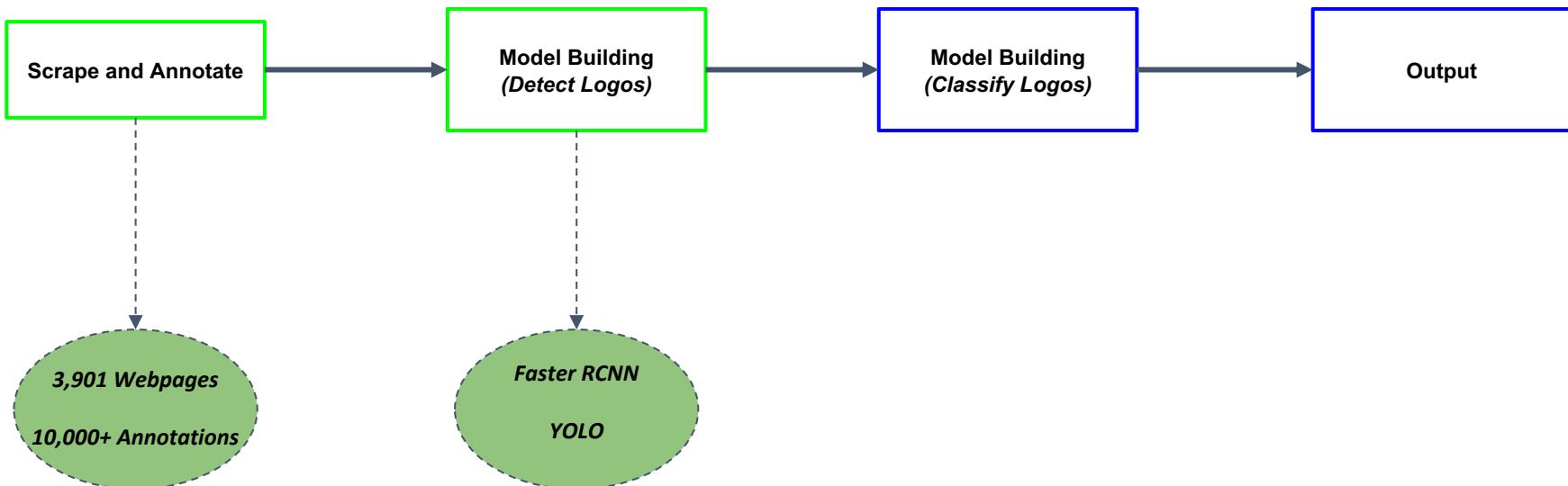
The screenshot shows the Raytheon logo, which consists of the word "Raytheon" in a bold, red, sans-serif font. Below the logo is a stylized sunburst graphic made of red lines radiating from the bottom left. The entire logo is enclosed within a light gray rectangular frame with green corner markers.

Duke

Models & Results (Logo or Not?)

Duke

Pipeline



Duke

Faster RCNN

1. State-of-the-art

1. High Accuracy

1. Tradeoff - Not the fastest

1. Versatile (2-stages)

Faster R-CNN: Towards Real-Time Object Detection with Region Proposal Networks

Shaoqing Ren, Kaiming He, Ross Girshick, and Jian Sun

Abstract—State-of-the-art object detection networks depend on region proposal algorithms to hypothesize object locations. Advances like SPPNet [1] and Fast R-CNN [2] have reduced the running time of these detection networks, exposing region proposal computation as a bottleneck. In this work, we introduce a *Region Proposal Network* (RPN) that shares full-image convolutional features with the detection network, thus enabling nearly cost-free region proposals. An RPN is a fully convolutional network that simultaneously predicts object bounds and objectness scores at each location. The RPN is trained end-to-end to generate region proposals that can be used by a Fast R-CNN for detection. We turn both the RPN and Fast R-CNN into a single network by sharing their convolutional features, using the recently popular terminology of neural networks with “attention” mechanisms, the RPN component tells the unified network where to look. For the very deep VGG-16 model [3], our detection system has a frame rate of 5fps (including all steps) on a GPU, while achieving state-of-the-art object detection accuracy on PASCAL VOC 2007, 2012, and MS COCO datasets with only 300 proposals per image. In ILSVRC and COCO 2015 competitions, Faster R-CNN and RPN are the foundations of the 1st-place winning entries in several tracks. Code has been made publicly available.

Index Terms—Object Detection, Region Proposal, Convolutional Neural Network.

arXiv:1506.01497v3 [cs.CV] 6 Jan 2016

1 INTRODUCTION

Recent advances in object detection are driven by the success of region proposal methods (e.g., [4]) and region-based convolutional neural networks (R-CNNs) [5]. Although region-based CNNs were computationally expensive as originally developed in [5], their cost has been drastically reduced thanks to sharing convolutions across proposals [1], [2]. The latest incarnation, Fast R-CNN [2], achieves near real-time rates using very deep networks [3], *when ignoring the time spent on region proposals*. Now, proposals are the test-time computational bottleneck in state-of-the-art detection systems.

Region proposal methods typically rely on inexpensive features and economical inference schemes. Selective Search [4], one of the most popular methods, greedily merges superpixels based on engineered low-level features. Yet when compared to efficient detection networks [2], Selective Search is an order of magnitude slower, at 2 seconds per image in a CPU implementation. EdgeBoxes [6] currently provides the best tradeoff between proposal quality and speed, at 0.2 seconds per image. Nevertheless, the region proposal step still consumes as much running time as the detection network.

• S. Ren is with University of Science and Technology of China, Hefei, China. This work was done when S. Ren was an intern at Microsoft Research. Email: sren@mail.ustc.edu.cn

• K. He and J. Sun are with Visual Computing Group, Microsoft Research Asia. Email: {kaiming.he, jiansun}@microsoft.com

• R. Girshick is with Facebook AI Research. The majority of this work was done when R. Girshick was with Microsoft Research. E-mail: rbg@fb.com

One may note that fast region-based CNNs take advantage of GPUs, while the region proposal methods used in research are implemented on the CPU, making such runtime comparisons inequitable. An obvious way to accelerate proposal computation is to re-implement it for the GPU. This may be an effective engineering solution, but its implementation ignores the detection network and therefore misses important opportunities for sharing computation.

In this paper, we show that an algorithmic change—computing proposals with a deep convolutional neural network—leads to an elegant and effective solution where proposal computation is nearly cost-free given the detection network’s computation. To this end, we introduce novel *Region Proposal Networks* (RPNs) that share convolutional layers with state-of-the-art object detection networks [1], [2]. By sharing convolutions at test-time, the marginal cost for computing proposals is small (e.g., 10ms per image).

Our observation is that the convolutional feature maps used by region-based detectors, like Fast R-CNN, can also be used for generating region proposals. On top of these convolutional features, we construct an RPN by adding a few additional convolutional layers that simultaneously regress region bounds and objectness scores at each location on a regular grid. The RPN is thus a kind of fully convolutional network (FCN) [7] and can be trained end-to-end specifically for the task of generating detection proposals.

RPNs are designed to efficiently predict region proposals with a wide range of scales and aspect ratios. In contrast to prevalent methods [8], [9], [1], [2] that use

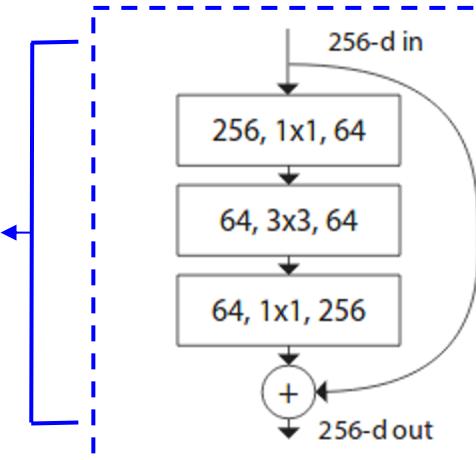
Faster RCNN

- Facebook's Detectron2
- Used a ResNeXt backbone with FPN
- No resizing of images
- Training time: ~ 5-6 hours (NVIDIA Tesla K80)



ResNet Vs ResNeXt

Residual Skip Connection



Cardinality

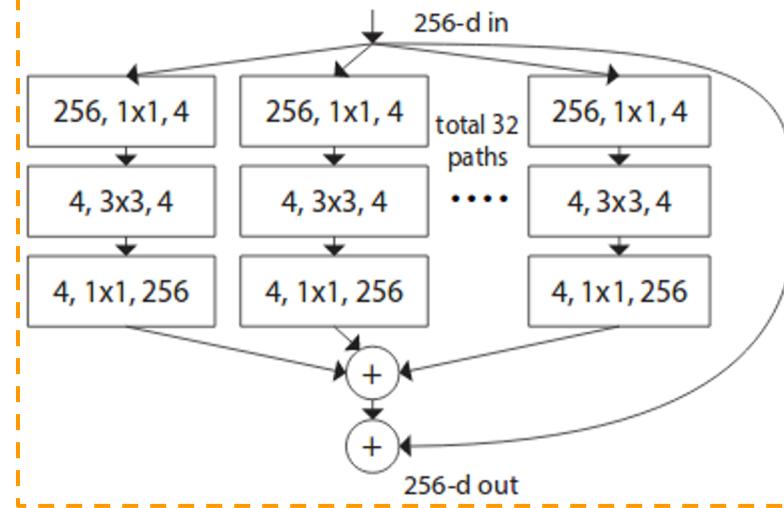
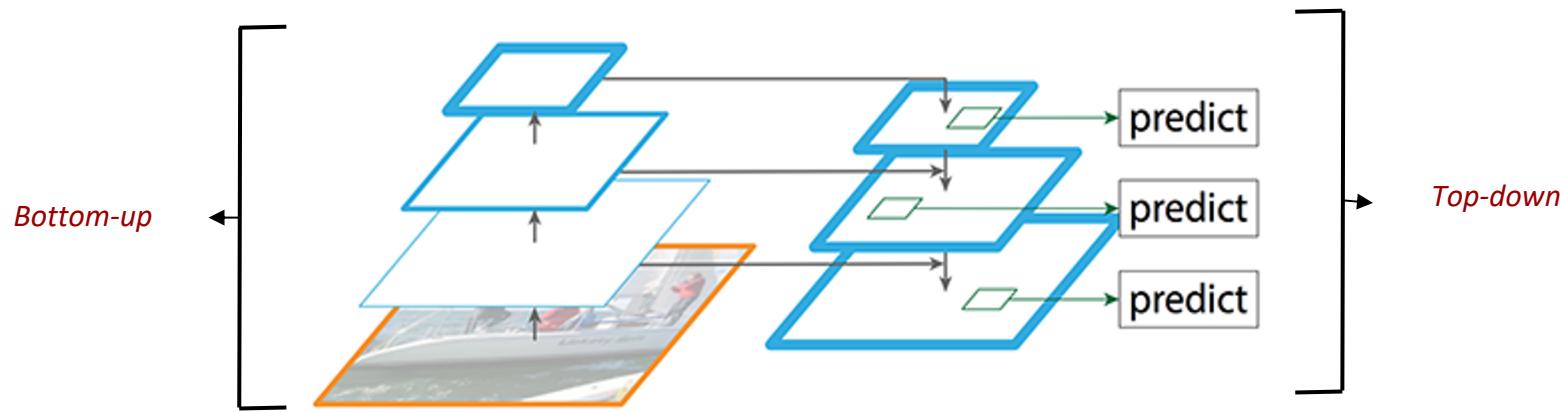


Figure 1. **Left:** A block of ResNet [14]. **Right:** A block of ResNeXt with cardinality = 32, with roughly the same complexity. A layer is shown as (# in channels, filter size, # out channels).

Feature Pyramidal Network (FPN)



*FPN good when we have
small and big objects in
our images*



News

Products

Contact

Search

News in Focus

Business & Money

Science & Tech

Lifestyle & Health

Policy & Public Interest

People & Culture

Equinix Expands Rio de Janeiro Data Center

New phase will nearly double the total capacity to meet customer demand for data center colocation



NEWS PROVIDED BY

[Equinix, Inc. →](#)

Mar 31, 2015, 07:00 ET

SHARE THIS ARTICLE



REDWOOD CITY, Calif. and RIO de JANEIRO, March 31, 2015 /PRNewswire/ -- [Equinix, Inc.](#) (Nasdaq: EQIX), the global interconnection and [data center company](#), today announced it is expanding its [Rio de Janeiro data center](#) known as RJ2. This new phase of expansion is scheduled to open in Q3 of this year and will enable Equinix to continue to meet



Ecolab

From Wikipedia, the free encyclopedia

*This article is about the consolidated history of the 1986 established **Ecolab Inc.**; including its foundation in 1923 as *Economics Laboratory*, and the acquisition of *Nalco* in 2011. For the history of acquired businesses of *Nalco*, see [Nalco Holding Company](#).*

Ecolab Inc., headquartered in [St. Paul, Minnesota](#), is an American global provider of water, hygiene and infection prevention solutions and services to the food, healthcare, hospitality and industrial markets.^[3] It was founded as **Economics Laboratory** in 1923 by Merritt J. Osborn, and renamed "Ecolab" in 1986.^{[4][5]}

Contents [hide]

- 1 [History](#)
 - 1.1 [Early years: 1923 - 1950s](#)
 - 1.2 [Transition to a public corporation and expansion: 1950s - 1986](#)
 - 1.3 [Ecolab Inc.: 1986 - 2000](#)
 - 1.4 [Ecolab Inc.: 2000 - Present](#)
- 2 [Operations](#)
- 3 [Products and services](#)
- 4 [See also](#)
- 5 [References](#)
- 6 [External links](#)

History [edit]

Early years: 1923 - 1950s [edit]

Merritt J. "M.J." Osborn founded Economics Laboratory in 1923 with the tagline "Saving time, lightening labor and reducing costs to those we serve." The company's original product was Absorbit, a product designed to quickly clean carpets in hotel

Ecolab Inc.



Formerly	Economics Laboratory
Type	Public
Traded as	NYSE: ECL
	S&P 500 Component
Industry	Chemicals, Service, Water Management, Food Safety, Infection Prevention
Founded	1923
Founder	Merritt J. Osborn
Headquarters	St. Paul, Minnesota, United States
Key people	Douglas M. Baker Jr. (Chairman and CEO)
Revenue	▲ US\$14.9 billion (2019) ^[1]
Operating income	▲ US\$2.0 billion (2019) ^[1]
Net income	▲ US\$1.558 billion (2019) ^[1]
Total assets	▲ US\$20.869 billion (2019) ^[1]
Total equity	▲ US\$8.685 billion (2019) ^[1]
Number of	~50,000 (June 2020)

95%

Operations Update





YouTube

Search



SIGN IN

Home

Trending

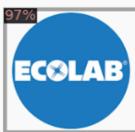
Subscriptions

Library

History



ecolab.com



Ecolab

9.93K subscribers

SUBSCRIBE

HOME

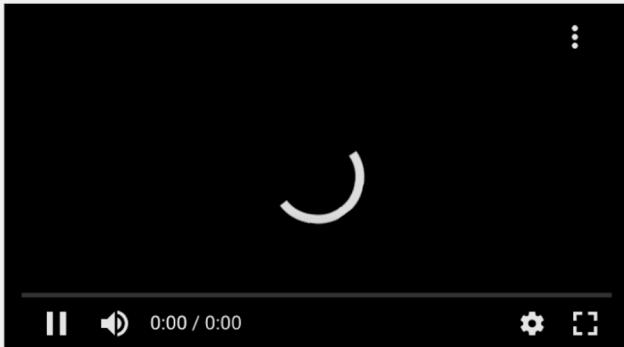
VIDEOS

PLAYLISTS

COMMUNITY

CHANNELS

ABOUT



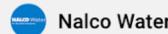
Ecolab Science Certified: Advancing Cleaner, Safer Practices™

4,949 views • 1 week ago

Ecolab's scientists, public health experts and sales-and-service team members have combined our science-based solutions and expertise to develop the Ecolab Science Certified program, available in the U.S. The program helps deliver a high standard of cleanliness for public health, so you can feel more confident visiting hotels, restaurants and other businesses that have earned the seal. Advancing cleaner, safer practices:

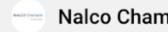
[READ MORE](#)

FEATURED CHANNELS



Nalco Water

SUBSCRIBE

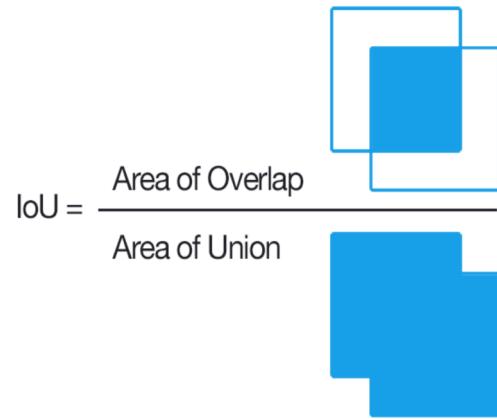


Nalco Champion

SUBSCRIBE

Results

Intersection over Union (IoU)	Mean Average Precision (mAP %)
0.5	87.6%
0.75	65.9%



YOLO

- Delivered strong performance on clear logos.
- Performs faster at test time than Faster R-CNN.
- Struggled with:
 - Low quality or deformed logos
 - Darkened logos

Intersection over Union (IoU)	Mean Average Precision (mAP %)
0.5	80.9%

go.docusign.com

Safe, secure, and easy to use

 OPEN

Hard Rock Rocksino - MGM Grand Logo MGM Resorts International Hotel



User [hemmmza](#) uploaded this Hard Rock Rocksino - MGM Grand Logo MGM Resorts International Hotel PNG image on May 22, 2019, 7:51 am. The resolution of this file is 850x385px and its file size is: 66.36 KB. The image can be used for Personal Use (non-commercial use) only. This PNG image is filed under the tags: [logo](#), [brand](#), [hotel](#), [las vegas](#), [mgm resorts international](#).

Daz 3D

 DOWNLOAD Download PNG (66.36 KB)

1,303 views

5 likes

66.36 KB

850x385

May 22, 2019

PNG (72dpi)



hemmmza



Send Message



logo

brand

hotel

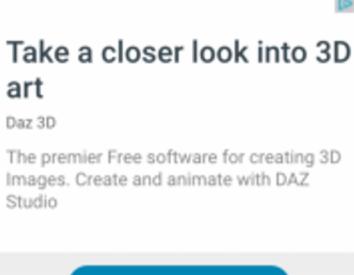
las vegas

mgm resorts international

resort

spiderscribe

text



Take a closer look into 3D art

Daz 3D

The premier Free software for creating 3D Images. Create and animate with DAZ Studio

[Buyer Protection](#)[Help](#)[Save big on our app!](#)[Ship to / USD](#)[Language](#)

I'm shopping for...

[Sign In | Join My AliExpress](#)[Home > All Categories > Automobiles & Motorcycles > Exterior Accessories > Car Stickers](#)**OEM Snap On Tools Plastic Chrome Emblem Badge Logo**

4.4 (7 votes)

Store: [autofinest Store](#)**US \$10.69**

US \$3.00

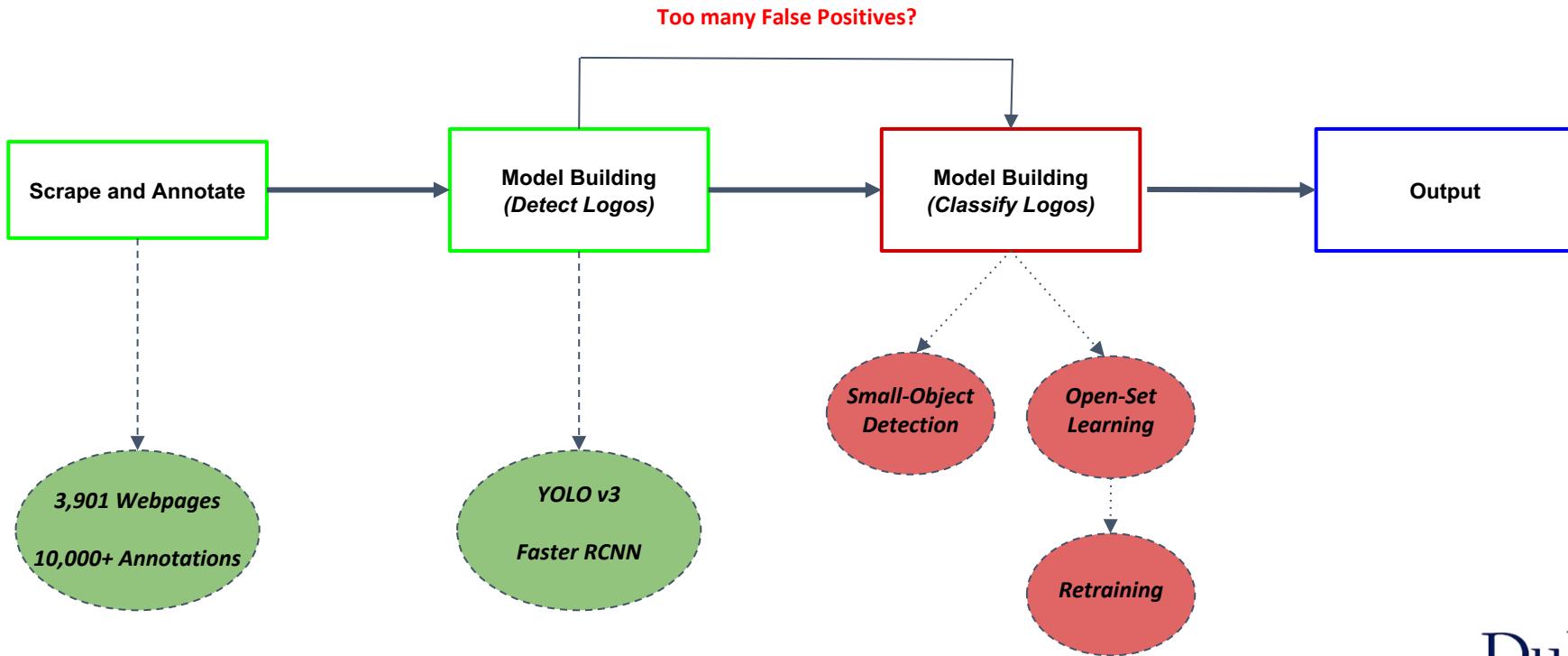
New user coupon on orders over US \$4.00

[View details & Buy](#)**Buyer Protection** Money Back Guarantee Refund in 15 Days**Duke**

Future Work

Duke

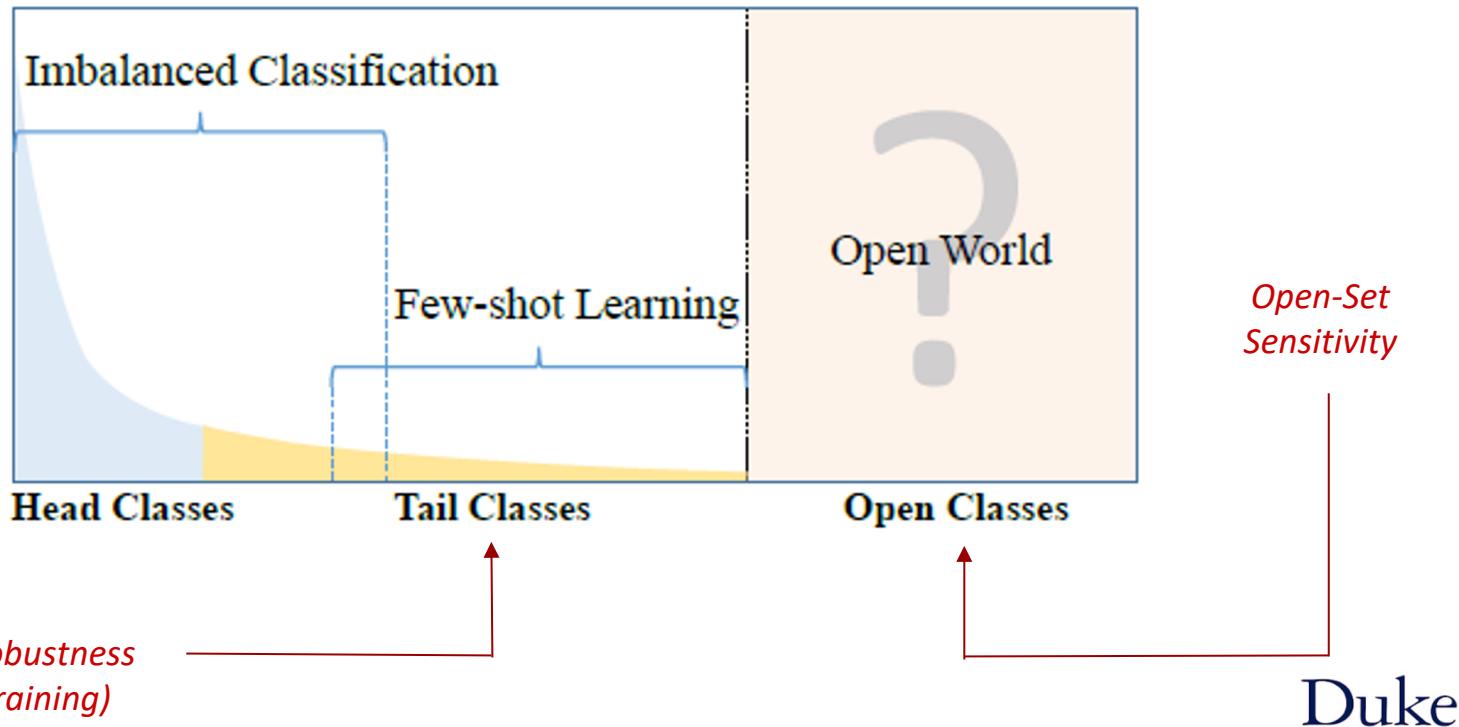
Pipeline



Small Object Detection

- Data Augmentation / Adaptive Zoom-In.
- Focal Loss.
- Use dilated convolutional layers i.e. expand the convolutional filters and use sparse parameters.
- Use GANs: Narrow the representations between small and large objects.

Open-Set Learning



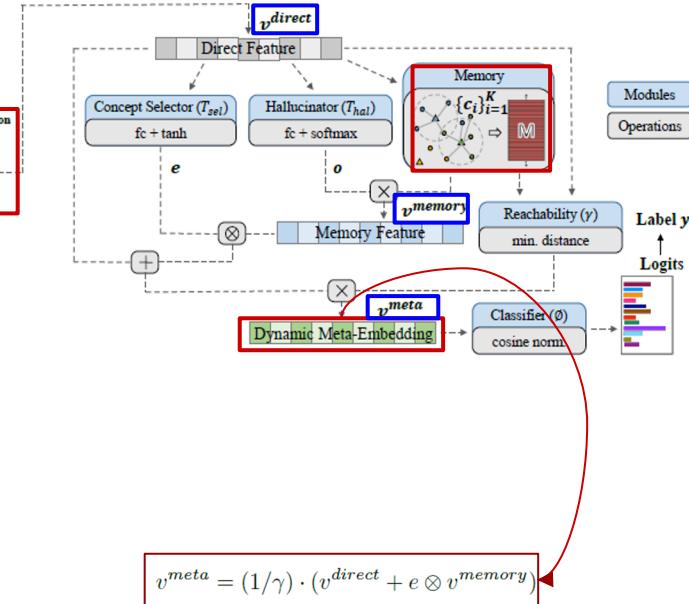
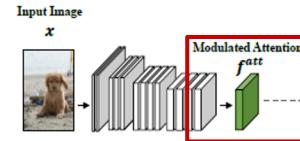
Two-Pronged Solution

Dynamic Meta Embedding

- Direct feature lacks sufficient supervision
- Direct feature + Induced Feature
- Visual Memory

Modulated Attention

- Encourages use of different features
- Enhances discrimination



Documents/Emails

Form I-90

1 / 7

 Application to Replace Permanent Resident Card

Department of Homeland Security
U.S. Citizenship and Immigration Services

USCIS
Form I-90
OMB No. 1615-0082
Expires 07/31/2019

For USCIS Use Only	<input type="checkbox"/> Applicant Interviewed Date: _____	Receipt	Action Block
	Class of Admission		
	Remarks		

► START HERE - Type or print in black ink.

Part 1. Information About You

- Alien Registration Number (A-Number)
A-
- USCIS Online Account Number (if any)

Your Full Name

NOTE: Your card will be issued in this name.

- Family Name (Last Name)
- Given Name (First Name)
- Middle Name

- Has your name legally changed since the issuance of your Permanent Resident Card?

Mailing Address (USPS ZIP Code Lookup)

- In Care Of Name
- Street Number and Name
- Apt. Ste. Flr.
- City or Town
- State 6.f. ZIP Code
- Province
- Postal Code
- Country



Acknowledgements



proofpoint[®]

Duke

Thank You
Q/A

Duke

Appendix

Duke

Appendix

1. Web page with logo.
2. Wikipedia article with logos.
3. Google screenshot with logo.
4. Small logos.
5. Size variety of logos.
6. Location variety of logos.
7. Dense logos.
8. Darkened logo.
9. Occluded logo.
10. No logo.

[Mac](#)[iPad](#)[iPhone](#)[Watch](#)[TV](#)[Music](#)[Support](#)

[Evaluate COVID-19 symptoms and understand next steps >](#)

[Shop online](#) and get free, no-contact delivery, Specialist help, and more.

iPhone SE

Lots to love. Less to spend.
Starting at \$399.

From \$9.54/mo. or \$229 with trade-in.¹

[Learn more >](#) [Buy >](#)





WIKIPEDIA
The Free Encyclopedia

Main page

Contents

Current events

Random article

About Wikipedia

Contact us

Donate

Contribute

Help

Community portal

Recent changes

Upload file

Tools

What links here

Related changes

Special pages

Permanent link

Page information

Cite this page

Wikidata item

Print/export

Download as PDF

Printable version

Languages

Article

Talk

Read

Edit

View history

Search Wikipedia

Not logged in Talk Contributions Create account Log in

Applied Materials

From Wikipedia, the free encyclopedia

Applied Materials, Inc. is an American corporation that supplies equipment, services and software for the manufacture of semiconductor ([integrated circuit](#)) chips for electronics, [flat panel displays](#) for computers, smartphones and televisions, and [solar products](#). The company also supplies equipment to produce coatings for [flexible electronics](#), packaging and other applications. The company is headquartered in [Santa Clara, California](#), in Silicon Valley.^[4]

Contents [hide]

- 1 History
- 2 Finances
- 3 Organization
 - 3.1 Semiconductor Systems
 - 3.2 Applied Global Services
 - 3.3 Display and Adjacent Markets
 - 3.4 Energy and Environmental Solutions (former sector)
- 4 Facilities
- 5 Management
- 6 See also
- 7 References
- 8 External links

History [edit]

Founded in 1967 by Michael A. McNeilly and others, Applied Materials [went public](#) in 1972. In subsequent years, the company diversified, until James C. Morgan became CEO in 1976 and returned the company's focus to its core business of semiconductor manufacturing equipment.^{[5][6]} By 1978, sales increased by 17%.^[7]

Applied Materials, Inc.

	APPLIED MATERIALS®
Type	Public
Traded as	NASDAQ: AMAT  FWB: AP2  NASDAQ-100 Component S&P 500 Component
ISIN	US0382221051 
Industry	Semiconductors
Founded	November 10, 1967; 52 years ago
Founder	Michael A. McNeilly
Headquarters	Santa Clara, California, U.S.
Area served	Worldwide
Key people	Gary E. Dickerson (President & CEO) Thomas J. Iannotti (Chairman) ^[1]
Revenue	▲ US\$17.254 billion (2018) ^[2]
Operating income	▲ US\$3.87 billion (2018) ^[2]
Net income	▲ US\$3.33 billion (2018) ^[2]
Total assets	▲ US\$19.42 billion



Home › Technology logos

GE LOGO



Stop Brand Infringement

Three Simple Steps - Search Availability, Answer a Few Questions, Submit Your Application.

[APPLY NOW](#)

For more than 125 years of its history, the GE logo has remained basically the same. So far, there have been only subtle modifications.



— Sonic Branding —

[▷ X](#)

stephen arnold
music
THE WORLD LEADER IN SONIC BRANDING®

Sonic Branding

Music solutions for your company from The World Leader in Sonic Branding®

Stephen Arnold Music

[OPEN >](#)

News

▪ Casey's General Store rebrands itself as Casey's, rolling out new logo

▪ Uncle Ben's changes its name to Ben's Original

▪ Google is about to replace Gmail logo

Technologies

▪ ABB Logo

ce

[About Quanta](#) [Capabilities](#) [Safety](#) [People](#) [Projects](#) [Training](#) [Investor Relations](#)[Corporate Responsibility](#)

#WEAREQUANTA

WORLD-CLASS PEOPLE. UNMATCHED EXECUTION

With the largest craft-skilled workforce, a best-in-class safety program

COMMITMENT
TO SAFETY

CAPABILITIES

E & S

This website uses cookies. If you continue without changing your settings, we'll assume that you are happy to receive all cookies on the vanillaplus.com website. [Dismiss](#)

IoT GLOBAL AWARDS 2020

ENTER NOW



THE
GLOBAL
VOICE OF
TELECOMS IT



How AI solves
emerging COVID19 challenges
facing the Retail Industry

[About Us](#) | [Privacy Policy](#) | [Contact us](#) | [Log in](#)

[Home](#)

[News](#)

[Verticals](#)

[Digital Edition](#)

[Events](#)

[Videos](#)

[VP Featured](#)

[Directory](#)

[Tech Trends](#)

[Subscribe](#)



You are here: [Home](#) > News Ericsson, RED Technologies and Qualcomm Inc. conduct the first Licensed Shared Access (LSA) pilot in France > Qualcomm-Logo.8.15

Qualcomm-Logo.8.15

08 January, 2016 at 8:39 AM



bics

Improve efficiency and throughput with seamless connectivity

DOWNLOAD case study

SUBSCRIBE





SEARCH

Qualcomm Technologies Inc Logo

We have found **35 Qualcomm Technologies Inc logos**. Do you have a better **Qualcomm Technologies Inc** logo file and want to share it? We are working on an upload feature to allow everyone to upload logos!





Explore > Food and Drinks > Drinks > Non Alcoholic Drinks > **Monster Energy**



Article from [freelogovectors.net](#)

Monster Energy Logo Download Vector

Monster Energy Logo vector download, Monster Energy Logo 2020, Monster Energy Logo png hd, Monster Energy Logo svg cliparts



Article by **Nancy Anderson-Casey**

10

[Monster Energy Drink Logo](#) [Monster Energy Cake](#) [Monster Energy](#) >

People also love these ideas



≡ MENU

SEARCH

Linkage

+1 (781) 402-5555

GET IN TOUCH

SUCCESS STORIES

We use cookies to improve your browsing experience on our website. By closing this banner or interacting with our site, you acknowledge and agree to our Privacy Policy

GOT IT!

Creating Purposeful Leaders with Dentsply Sirona

INDUSTRY

Life Sciences

SOLUTION

Accelerating Purposeful Leadership



Dentsply and Sirona joined forces in 2016, to become





Brand New Conference Videos / 148 presentations available / Buy singles or bundles / Old years free!

[Share >](#)[Facebook](#)[Twitter](#)[Email](#)[Pinterest](#)[More](#)

New Name and Logo for Raytheon Technologies

Spotted

Raytheon

Raytheon

We are committed to serving you during this global pandemic. To visit Everest's COVID-19 Emergency Response Headquarters, click [here](#).

Everest's 25th Anniversary

Careers | Contact Us

Site Search



[Everlink® Log In](#)



[Reinsurance](#) ▾

[Insurance](#) ▾

[Investors](#) ▾

[Insights](#) ▾

[Corporate Responsibility](#) ▾

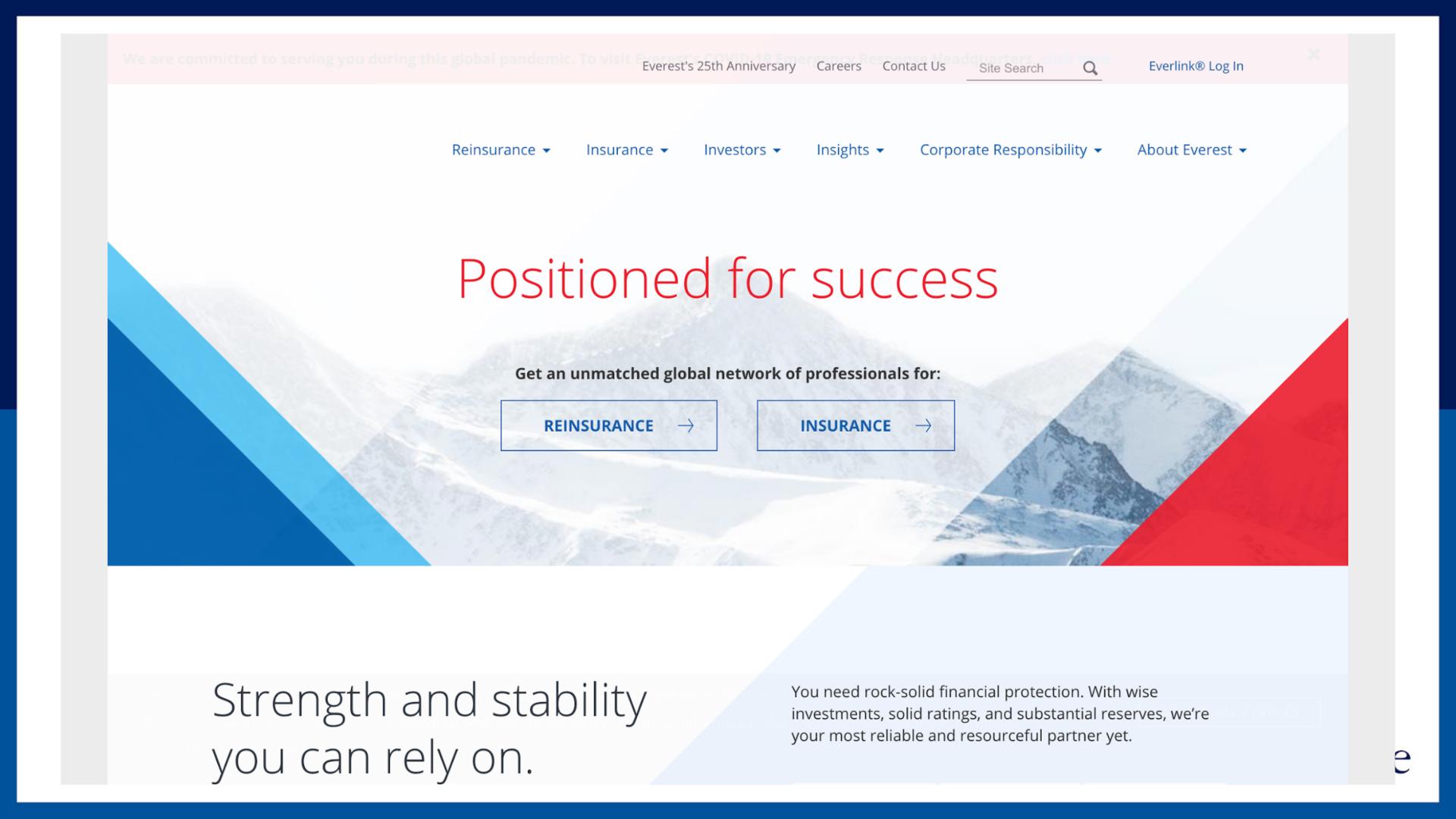
[About Everest](#) ▾

Positioned for success

Get an unmatched global network of professionals for:

[REINSURANCE](#) →

[INSURANCE](#) →

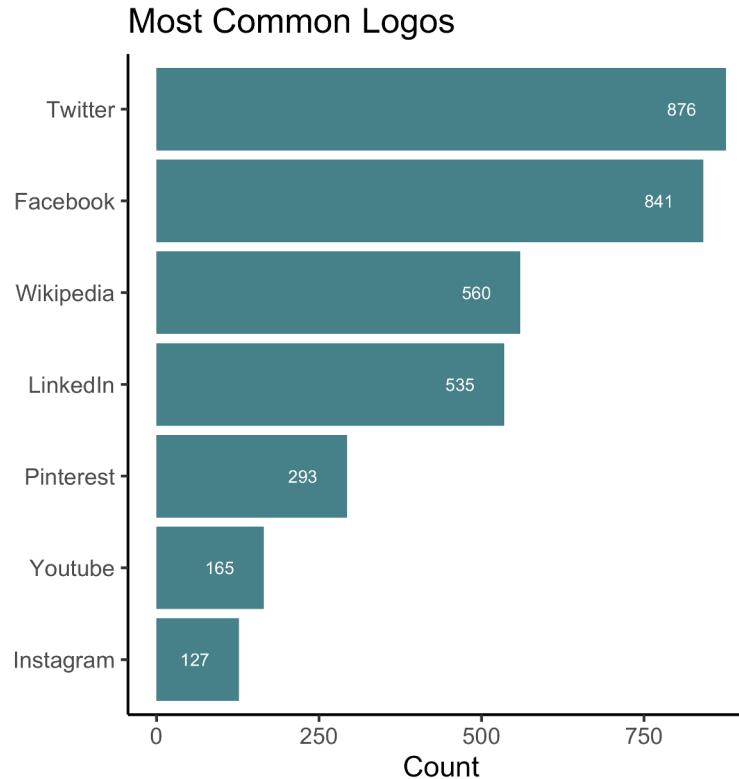


Strength and stability
you can rely on.

You need rock-solid financial protection. With wise investments, solid ratings, and substantial reserves, we're your most reliable and resourceful partner yet.

e

Most Common Logos



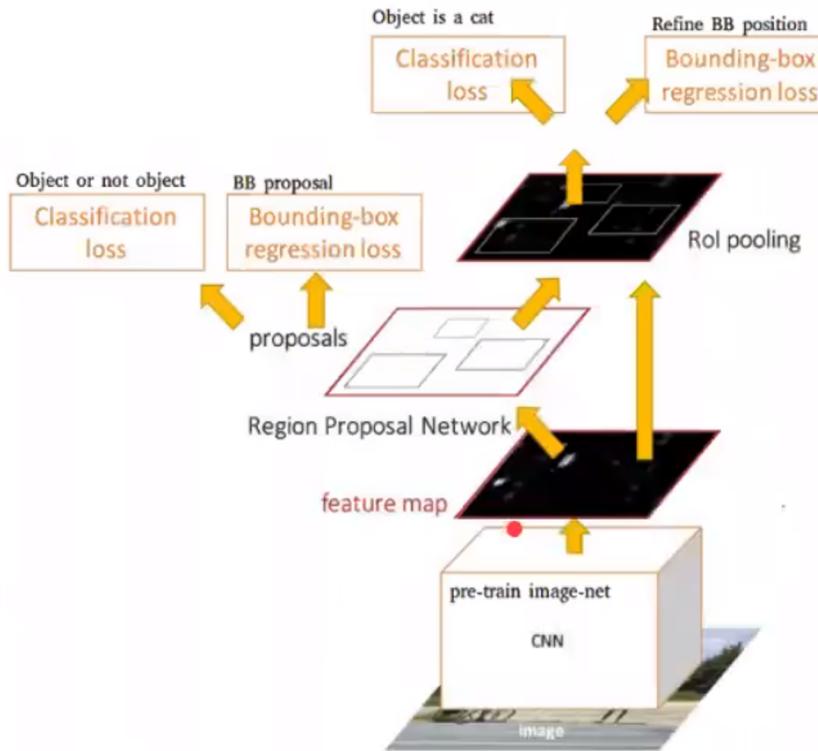


Fig 1. Region Proposal Network Architecture

S. Ren, K. He, R. Girshick, J. Sun, Faster R-CNN: towards real-time object detection with region proposal networks, *Adv. Neural Inf. Proces. Syst.* (2015), pp. 91-99

Duke

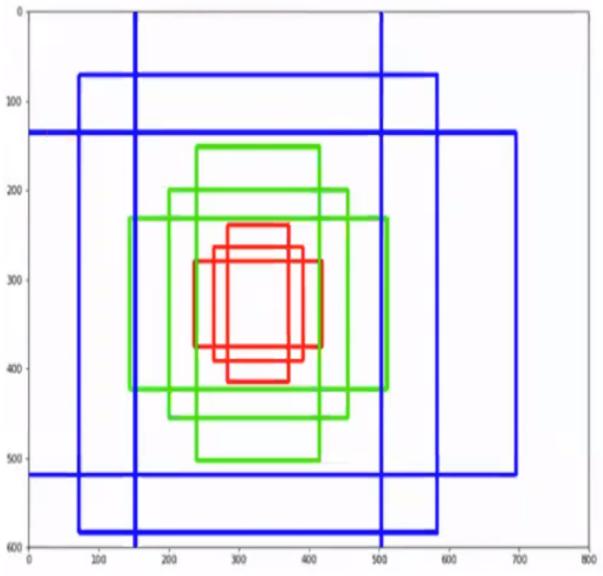


Fig 2. Anchor Boxes

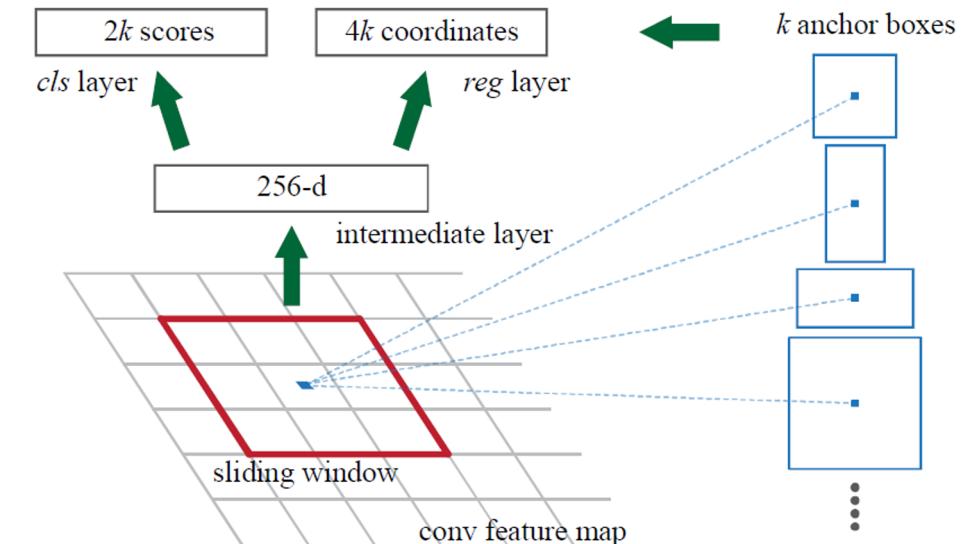
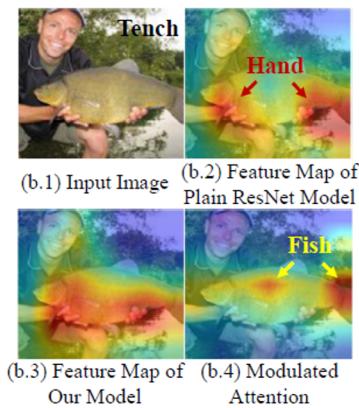
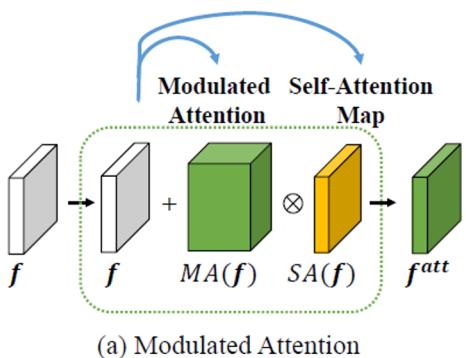
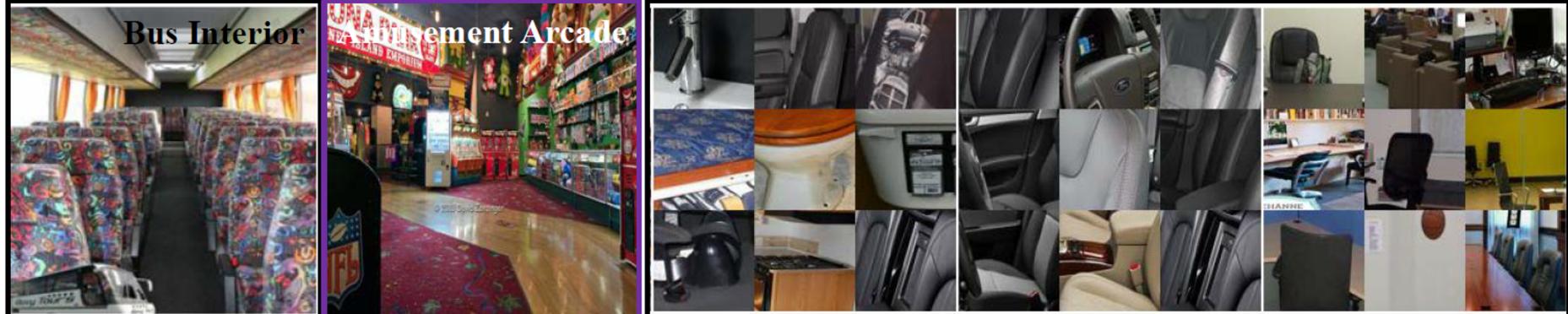


Fig 3. Generating Region Proposals

Input Image Plain Model Prediction Top-3 Transferred Neurons from Memory Feature



Duke

Average Precision	(AP)	@[IoU=0.50:0.95	area=	all	maxDets=100]	= 0.575
Average Precision	(AP)	@[IoU=0.50	area=	all	maxDets=100]	= 0.876
Average Precision	(AP)	@[IoU=0.75	area=	all	maxDets=100]	= 0.659
Average Precision	(AP)	@[IoU=0.50:0.95	area=	small	maxDets=100]	= -1.000
Average Precision	(AP)	@[IoU=0.50:0.95	area=	medium	maxDets=100]	= 0.410
Average Precision	(AP)	@[IoU=0.50:0.95	area=	large	maxDets=100]	= 0.626
Average Recall	(AR)	@[IoU=0.50:0.95	area=	all	maxDets= 1]	= 0.208
Average Recall	(AR)	@[IoU=0.50:0.95	area=	all	maxDets= 10]	= 0.643
Average Recall	(AR)	@[IoU=0.50:0.95	area=	all	maxDets=100]	= 0.684
Average Recall	(AR)	@[IoU=0.50:0.95	area=	small	maxDets=100]	= -1.000
Average Recall	(AR)	@[IoU=0.50:0.95	area=	medium	maxDets=100]	= 0.577
Average Recall	(AR)	@[IoU=0.50:0.95	area=	large	maxDets=100]	= 0.724
11/02 15:10:54 d2.evaluation.coco_evaluation]: Evaluation results for bbox:						
AP	AP50	AP75	APs	APm	APl	
57.526	87.632	65.925	nan	41.000	62.560	