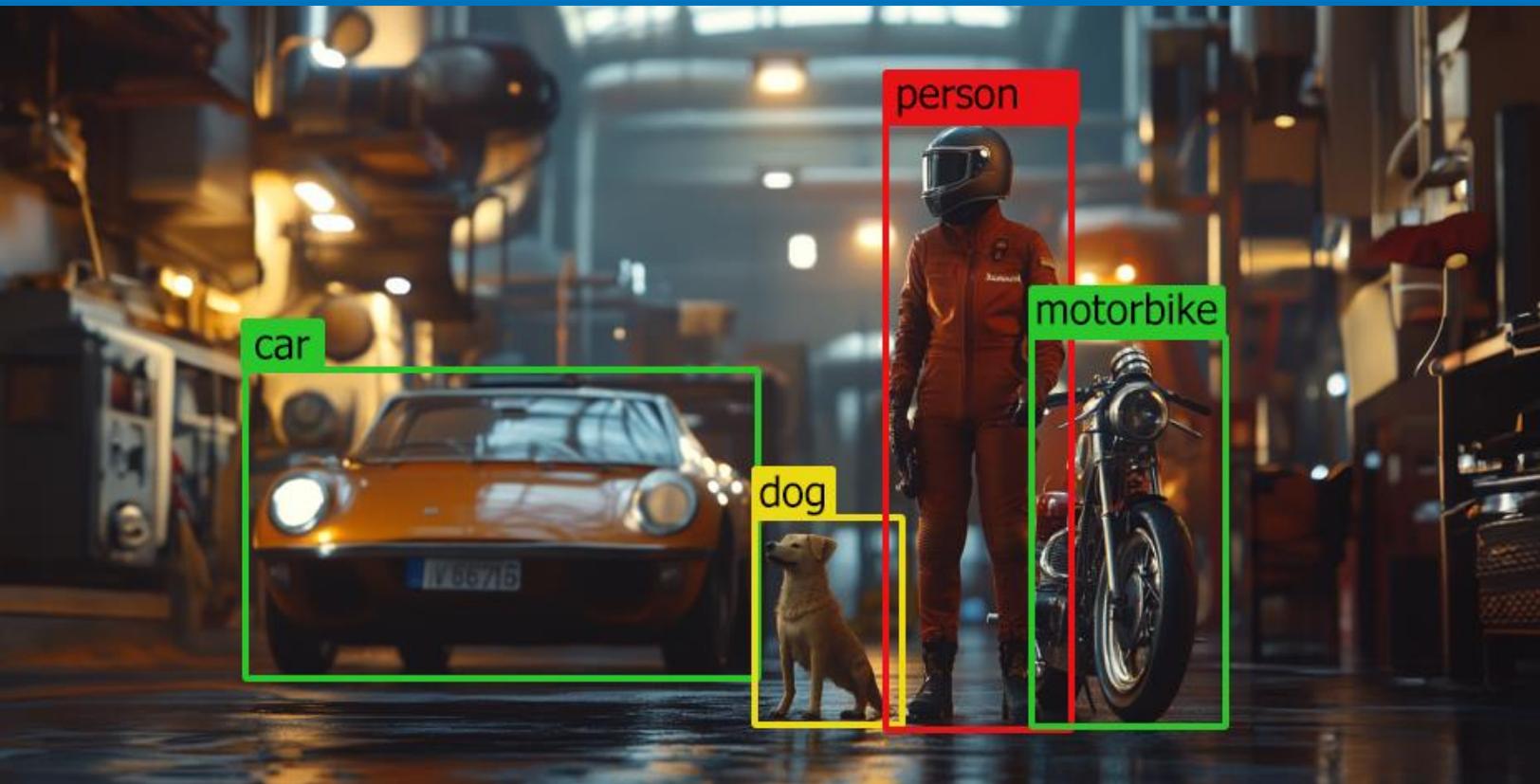
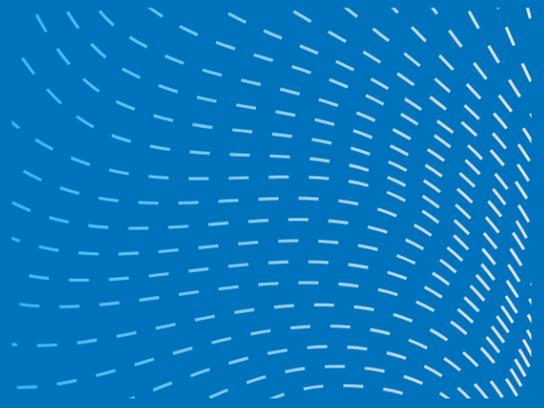


IPXAnalytics
Datasheet

General Module



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General Module

Compatibility: IPXAnalytics STANDARD, 2.0 or higher.

IPXAnalytics

IPXAnalytics is a software that uses Artificial Intelligence to learn and detect events in monitoring cameras. Artificial intelligence is based on neural networks and LLMs, which are algorithms that attempt to mimic the behavior of the human brain. Compared to video analysis software on the market today, IPXAnalytics is able to reduce the number of false alarms considerably.

General Module

The General module is intended to solve various types of problems with a more generic approach.

The module can detect different object classes: person, bicycle, car, motorcycle, plane, bus, train, truck, boat, traffic light, fire hydrant, stop sign, parking meter, bank, bird, cat, dog, horse, sheep, cow, elephant, bear, zebra, giraffe, backpack, umbrella, bag, tie, suitcase, frisbee, skis, snowboard, sports ball, kite, baseball bat, baseball glove, skateboard, surfboard, tennis racket, bottle, wine glass, cup, fork, knife, spoon, bowl, banana, apple, sandwich, orange, broccoli, carrot, hot dog, pizza, doughnut, cake, chair, sofa, potted plant, bed, dining table, bathroom, television, notebook, mouse, remote control, keyboard, cellphone, microwave, oven, toaster, sink, fridge, book, clock, vase, scissors, teddy bear, hair dryer, toothbrush.

Advantages of implementation

Versatility: With its ability to detect a wide range of objects, our system is extremely versatile and can be applied in a variety of scenarios.

Adaptability: Thanks to its generic approach, our system can be easily adapted to meet the specific needs of different applications and environments.

Operational Efficiency: By automating object detection and recognition processes, our system helps to improve operational efficiency by reducing the time and resources required for tasks such as security monitoring, traffic control, and inventory inventory.

Improved Security: By detecting and recognizing relevant objects in real-time, our system can help improve security in public places, homes, and industrial environments by identifying intruders, suspicious objects, and potential risks.

Informed Decision-Making: By providing valuable insights through data generation, our system empowers users to make strategic decisions in real-time, driving the effectiveness and success of operations.

Error Reduction: By automating object detection and recognition tasks, our system helps to reduce human errors and ensure greater accuracy and consistency in operations.

Customizations

In addition to the various functionalities mentioned here, the software can also assist in numerous other situations. It is designed to be customized to meet the client's needs. For example, in a production environment, the software could identify errors and critical failures in a specific part. To request a customization proposal, please contact us on our website: www.ipextreme.com.br.

Limitations and Considerations

We understand the importance of reliability in critical applications. Therefore, it is crucial to note that no artificial intelligence software can guarantee 100% accuracy. Our solution offers robust and rapid detection, but we always recommend maintaining backup systems and additional security protocols to ensure a comprehensive response in emergency situations.

IPXAnalytics offers demonstration licenses, and we recommend selling to the client only after successful tests in the desired environment.

Datasheet

Objects samples and descriptions:

Objects

The Geral Module can identify these objects:

- person
- bicycle
- car
- motorbike
- aeroplane
- bus
- train
- truck
- boat
- traffic light
- fire hydrant
- stop sign
- parking meter
- bench
- bird
- cat
- dog
- horse
- sheep
- cow
- elephant
- bear
- zebra
- giraffe
- backpack
- umbrella
- handbag
- tie
- suitcase
- frisbee

- skis
- snowboard
- sports ball
- kite
- baseball bat
- baseball glove
- skateboard
- surfboard
- tennis racket
- bottle
- wine glass
- cup
- fork
- knife
- spoon
- bowl
- banana
- apple
- sandwich
- orange
- broccoli
- carrot
- hot dog
- pizza
- donut
- cake
- chair
- sofa
- pottedplant
- bed
- diningtable
- toilet
- tvmonitor
- laptop
- mouse
- remote

- keyboard
- cell phone
- microwave
- oven
- toaster
- sink
- refrigerator
- book
- clock
- vase
- scissors
- teddy bear
- hair drier
- toothbrush

Examples of detections:

person

The person object is a fundamental element in object detection, allowing the software to recognize and track human presence. Detection is based on body features such as the head, torso, and limbs, ensuring identification even if only part of the body is visible.



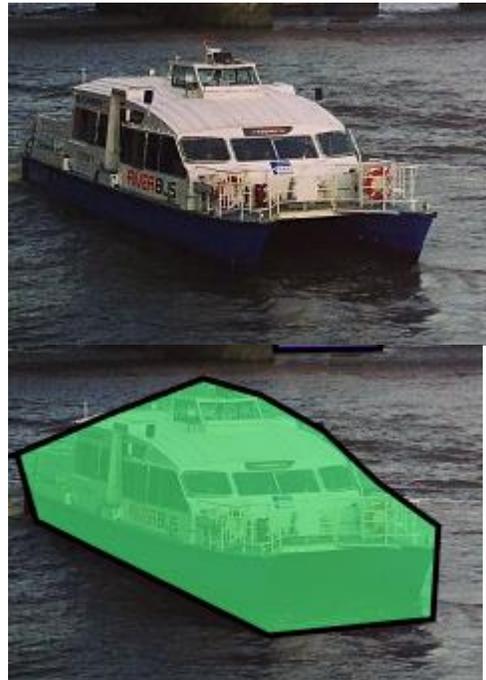
bicycle

The software detects bicycles based on their frame structure, wheels, and handlebars. Bicycle detection is useful in urban monitoring, traffic regulation, and accident analysis.



boat

Boats are detected based on hull. This detection is crucial for maritime security, port surveillance, and navigation assistance.



car

Car detection identifies vehicles based on their shape, size, and common features such as headlights and wheels. This is essential for traffic monitoring, parking management, and security surveillance.



motorbike

Motorbike detection focuses on two-wheeled vehicles by analyzing key components like handlebars, seats, and wheels. It is particularly useful in traffic control.



aeroplane

The system detects airplanes based on their wings, fuselage, and tail structure. This detection is relevant for aviation security.



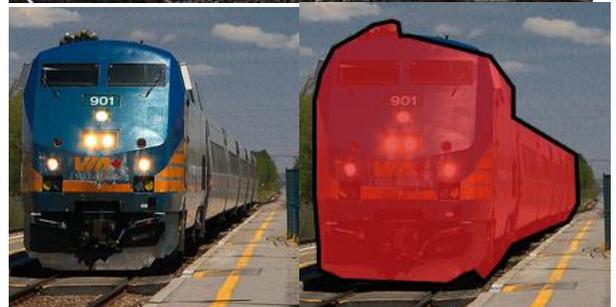
bus

Bus detection recognizes large passenger vehicles, distinguishing them from other automobiles based on size and structure. It is widely used in public transportation analysis.



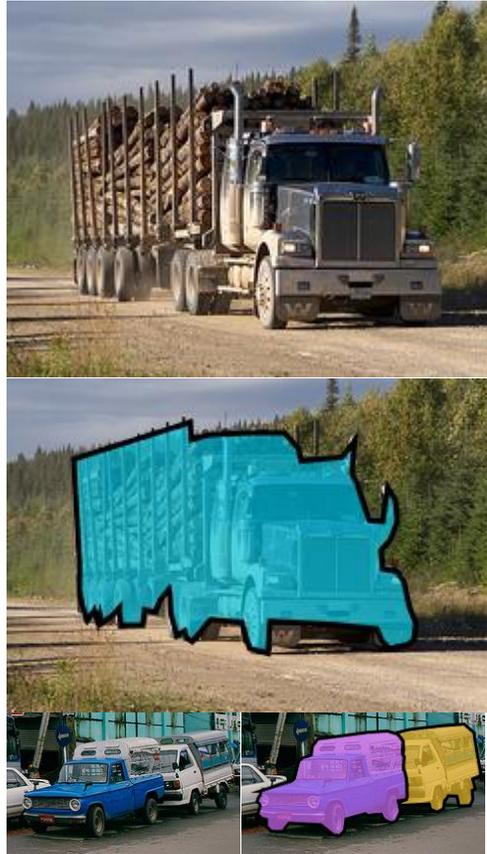
train

Trains are identified by their elongated shape, tracks, and carriages. This detection supports railway monitoring and safety enforcement.



truck

Truck detection differentiates cargo vehicles from other automobiles by analyzing size, wheels, and trailer attachments. It is useful for transportation monitoring.



traffic light

Traffic light detection identifies signalized intersections and their light states, and road safety monitoring.



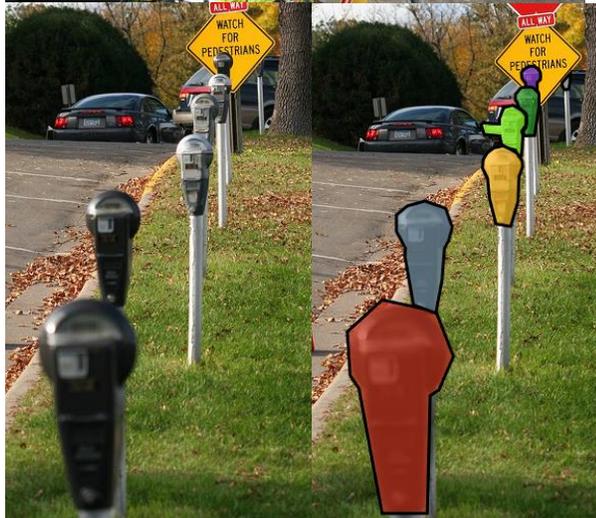
fire hydrant

Fire hydrants are detected based on their cylindrical shape and typical red or yellow coloring. This detection assists in urban planning, emergency response, and infrastructure mapping.



parking meter

Parking meters are detected using their upright structure and interface panel. This helps in parking enforcement, and city planning.



stop signs

Stop signs are detected based on their octagonal shape, red color, and bold white lettering. This detection is crucial for traffic regulation, and road safety enforcement.



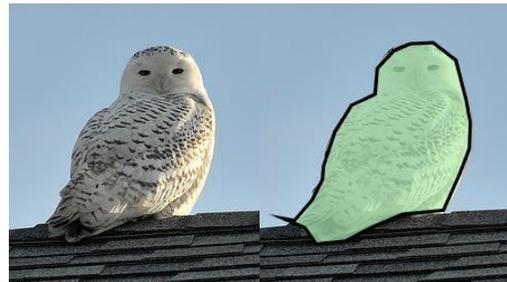
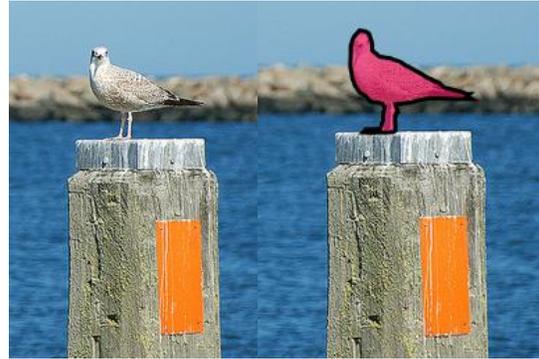
bench

Bench detection identifies seating structures in public spaces, assisting in urban planning, accessibility assessments, and security surveillance.



bird

The system detects birds based on their small size, and wings patterns. This detection supports wildlife tracking, and airport safety.



cat

Cats are recognized based on body shape, and fur texture. This detection is useful in pet monitoring, wildlife observation, and security applications.



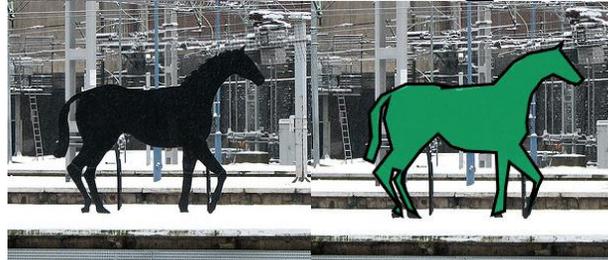
dog

Dogs are detected through their posture, tail, and facial features. Applications include pet surveillance, breed identification, and safety monitoring.



horse

Horse detection is useful for equestrian sports, wildlife tracking, and farm management by identifying body shape, and leg structure patterns.



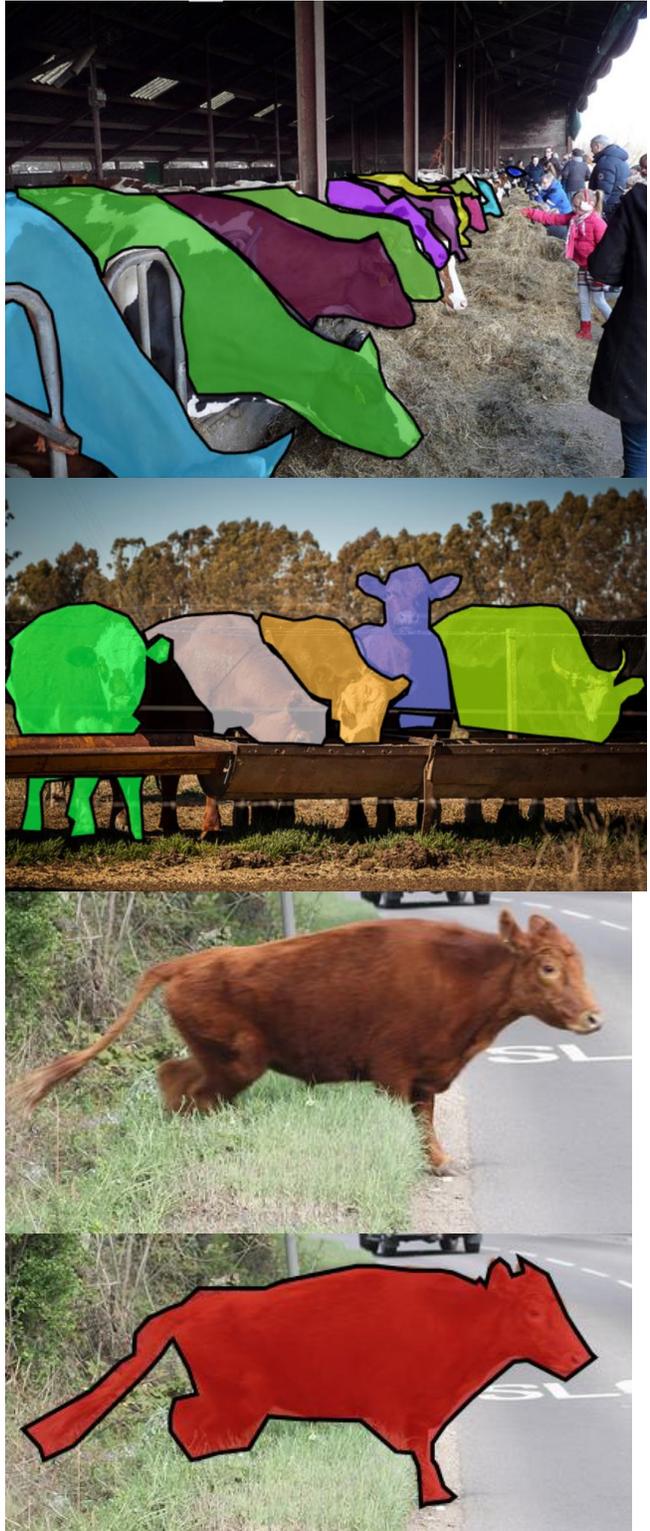
sheep

Sheep detection is essential for livestock monitoring, distinguishing these animals based on their woolly coats and grazing behavior.



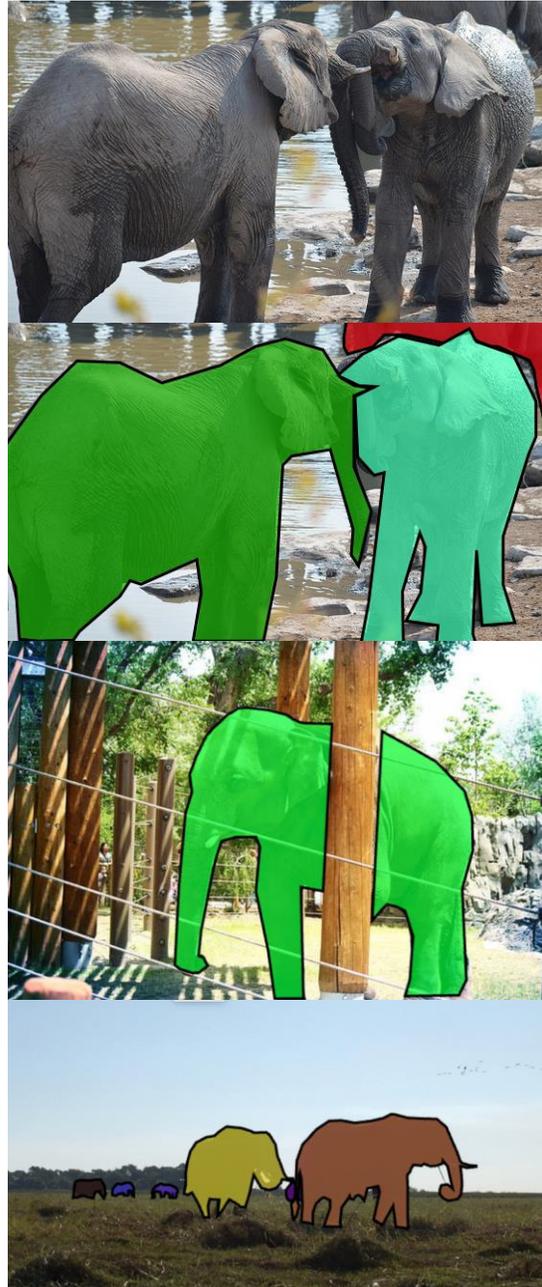
COW

The software detects cows based on their size, horns, and body features, assisting in agricultural monitoring and farm management.



elephant

Elephants are recognized by their large size, trunk, and tusks. This detection is used in wildlife conservation, zoo monitoring, and habitat studies.



bear

Bear detection identifies these large mammals through fur texture, size, and posture. This is crucial for wildlife management and human safety precautions.



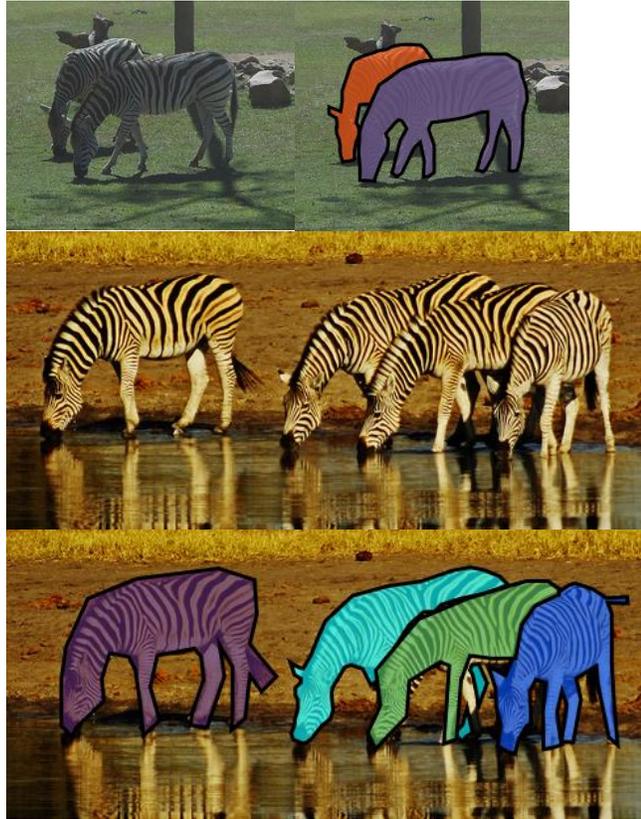
giraffe

Giraffes are recognized through their long necks and unique body structure, aiding in wildlife conservation and ecosystem research.



zebra

Zebras are detected by their distinct striped patterns and equine shape. This detection supports conservation efforts and habitat analysis.



backpack

Backpacks are detected based on shape, straps, and carrying position. This detection assists in security screening, luggage tracking, and lost item recovery.



umbrella

Umbrellas are identified by their canopy and handle, useful for crowd monitoring and personal item detection in security systems.



bag

Handbags are detected based on size, material, and carrying position. This detection helps in retail analysis and security checks.



tie

A tie is detected based on its elongated shape and positioning around the neck. This detection is useful in fashion analysis, security screening, and identity verification.



suitcase

Suitcases are detected by their rectangular shape, wheels, and handles. This detection is useful in luggage tracking, security screening at airports, and lost-and-found systems.



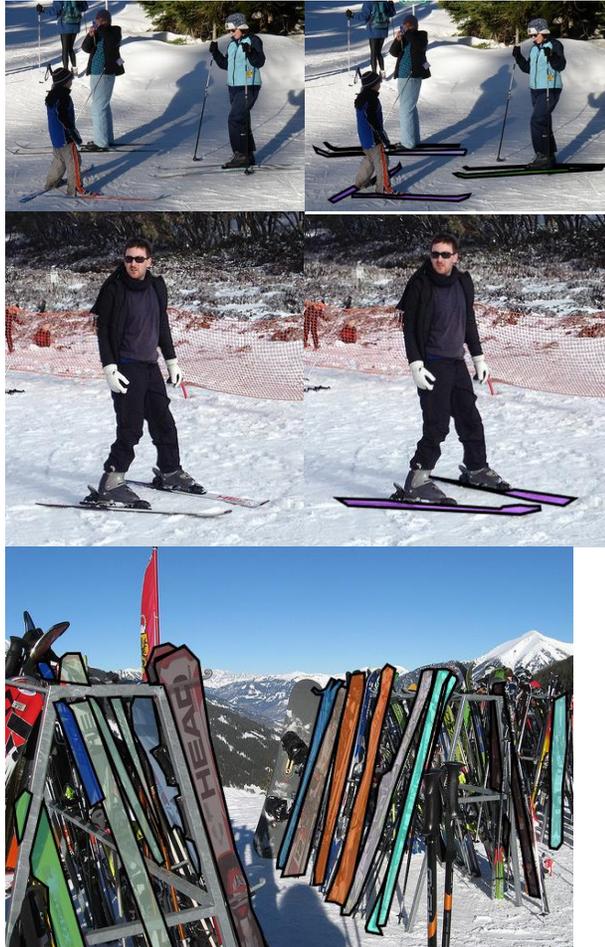
frisbee

Frisbees are recognized based on their circular shape, lightweight structure, and aerodynamic design. This detection is applied in sports analytics, motion tracking, and recreational activity monitoring.



skis

Skis are detected through their elongated, narrow shape and curved tips. This detection supports winter sports analysis, athlete tracking, and equipment management.



snowboard

Snowboards are identified by their wide, flat structure and binding attachments. This detection is beneficial for sports monitoring, performance analysis, and safety applications in winter environments.



sports ball

Sports balls are detected based on their round shape, size, and surface texture. This detection is widely used in game analysis, player performance tracking, and automated sports refereeing.



kite

Kites are identified by their geometric frame, fabric covering, and string attachment. This detection is useful for recreational activity tracking, aerial monitoring, and wind pattern analysis.



baseball bat

Baseball bats are detected through their cylindrical shape, tapered handle, and wooden or metal composition. This detection is applied in sports analytics, equipment tracking, and player performance assessments.



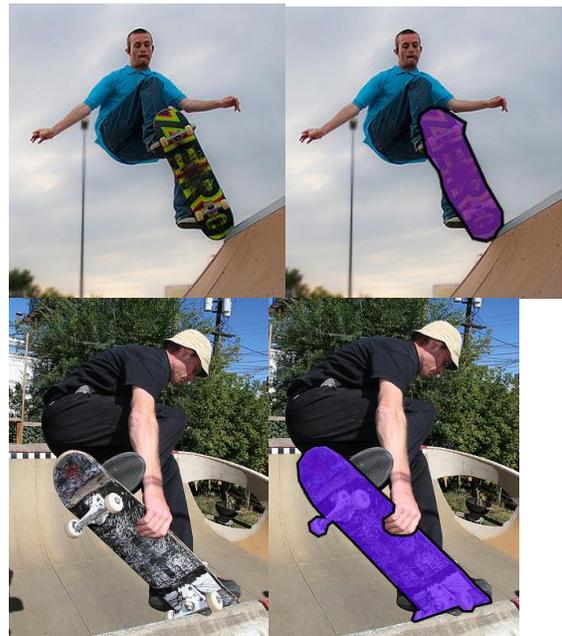
baseball glove

Baseball gloves are identified by their padded structure, finger slots, and webbing design. This detection is useful in sports analysis, automated play tracking, and equipment recognition.



skateboard

Skateboards are detected by their compact deck, four wheels, and axle system. This detection supports urban mobility tracking, skatepark monitoring, and extreme sports analysis.



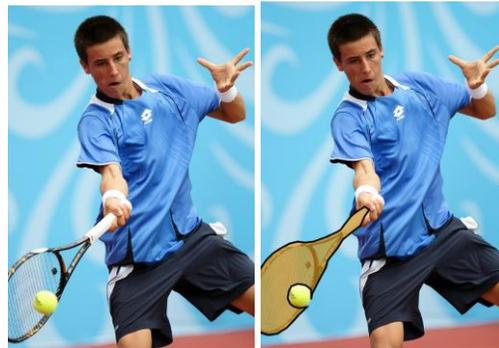
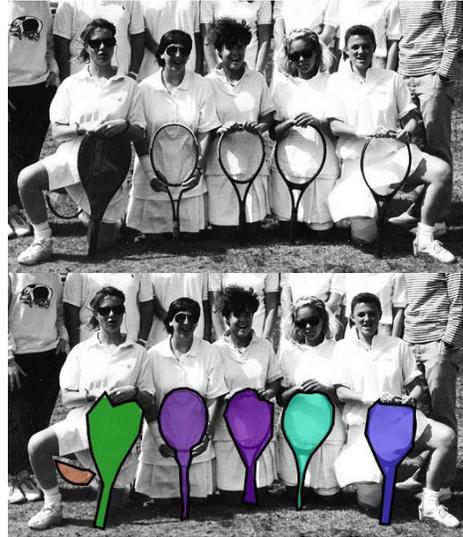
surfboard

Surfboards are recognized based on their elongated, hydrodynamic shape and fin attachments. This detection is essential for water sports tracking, and coastal safety applications.



tennis racket

Tennis rackets are detected through their oval frame, string bed, and grip handle. This detection is applied in sports performance tracking, and player analysis.



bottle

Bottles are detected based on their cylindrical shape, cap, and material properties such as plastic or glass. This detection is useful in waste management, and retail analytics.



wine glass

Wine glasses are recognized by their stemmed design, bowl shape, and transparent material. This detection is beneficial for dining analytics, event monitoring, and automated inventory management.



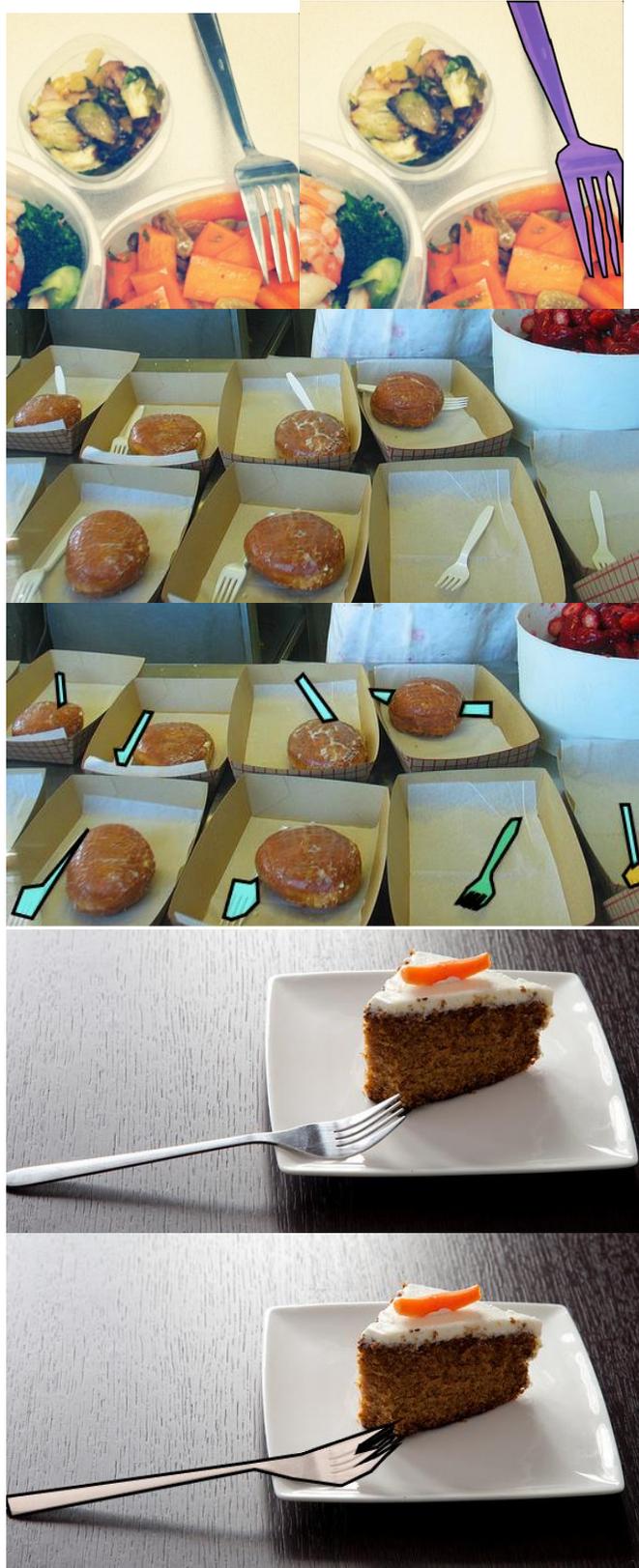
cup

Cups are detected through their cylindrical or tapered shape and open top. This detection is applied in food service automation, retail inventory tracking, and waste management.



fork

Forks are identified by their pronged structure and handle. This detection assists in dining service monitoring.



knife

Knives are detected based on their blade structure and handle. This detection supports dining automation, and utensil tracking.



spoon

Spoons are recognized by their rounded bowl and handle. This detection supports dining automation, and utensil tracking.



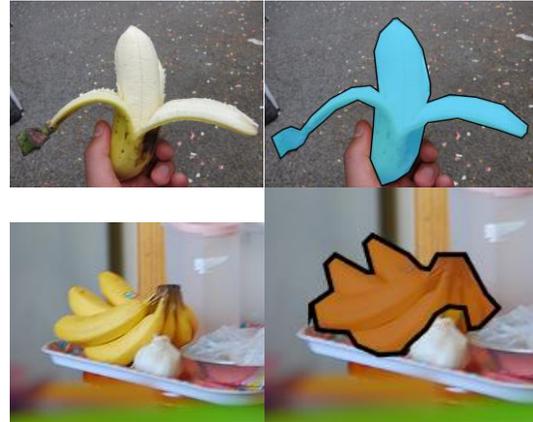
bowl

Bowls are detected through their curved, open-top design and varying depth. This detection supports dining automation, and inventory tracking.



banana

Bananas are identified by their curved shape, peel texture, and yellow coloration. This detection is applied in food recognition, and retail analytics.



apple

Apples are detected based on their round shape, smooth surface, and stem attachment. This detection is applied in food recognition, and retail analytics.



sandwich

Sandwiches are recognized by their layered structure, bread components, and fillings. This detection is applied in food recognition.





orange

Oranges are detected through their spherical shape, textured peel, and color. This detection is beneficial for fruit quality assessment, agricultural monitoring, and retail categorization.



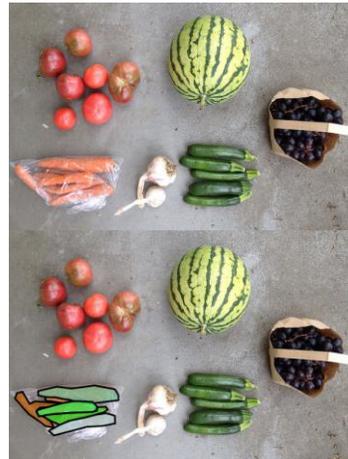
broccoli

Broccoli is identified by its branching structure, green florets, and stem. This detection is used in food sorting, and applied in food recognition



carrot

Carrots are detected based on their elongated shape, tapered ends, and bright orange color. This detection is applied in food recognition and retail classification.



hot dog

Hot dogs are recognized by their elongated bun and sausage combination. This detection is useful in menu categorization, applied in food recognition and retail classification.



pizza

Pizza is identified by its circular or triangular slices, crust, and toppings. This detection is applied in food recognition and retail classification.



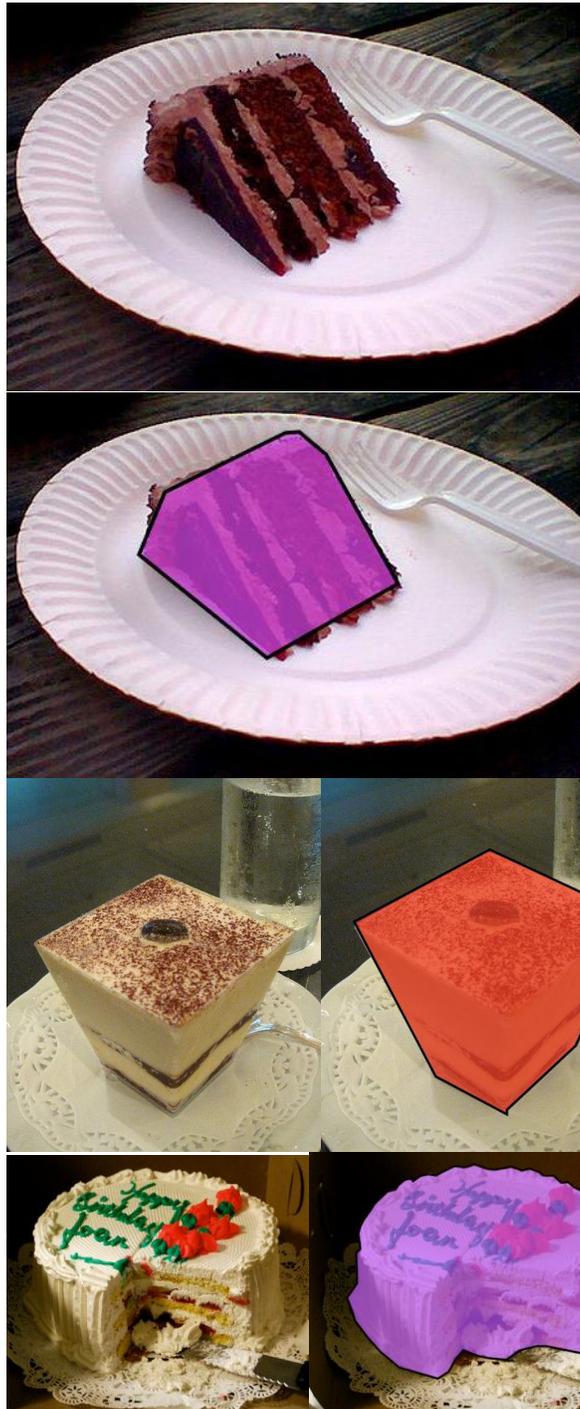
donut

Donuts are detected through their ring shape, glazed or powdered surface, and texture. This detection is applied in food recognition and retail classification.



cake

Cakes are recognized based on their layered structure, frosting, and decorative elements. This detection is applied in food recognition and retail classification.



chair

Chairs are detected through their seat, backrest, and leg structure. This detection is applied in furniture recognition.



couch

Couches are identified by their cushioned design, armrests, and seating capacity. This detection supports furniture arrangement, retail analytics, and interior design planning.



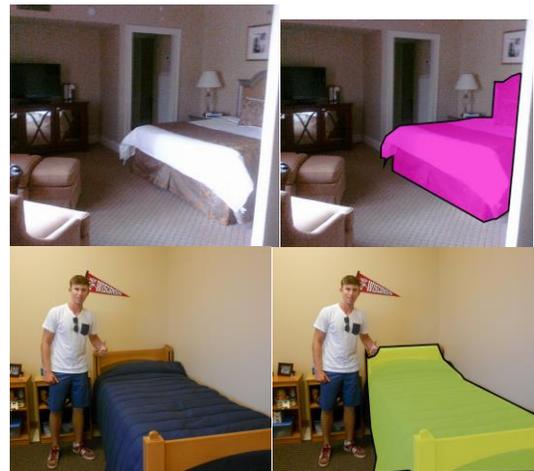
pottedplant

Potted plants are detected based on their foliage, pot container, and soil base. This detection is useful, plant care tracking, and greenhouse monitoring.



bed

Beds are recognized by their frame. This detection is beneficial for furniture classification, and sleep environment analysis.



diningtable

Dining tables are detected through their flat surface, leg structure, and seating arrangement. This detection is applied in space planning, and interior design.



toilet

Toilets are identified by their bowl shape, tank, and flushing mechanism. This detection is useful for smart bathroom automation.



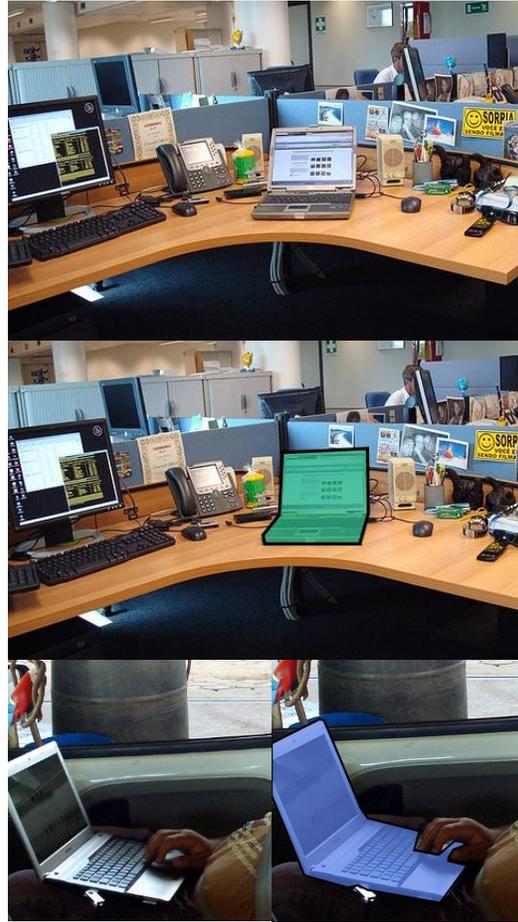
tvmonitor

Televisions are detected based on their rectangular screen, stand, and frame design. This detection supports, media monitoring, and electronic inventory tracking.



laptop

Laptops are recognized by their folding screen, keyboard, and touchpad. This detection is useful in office automation, and workspace monitoring.



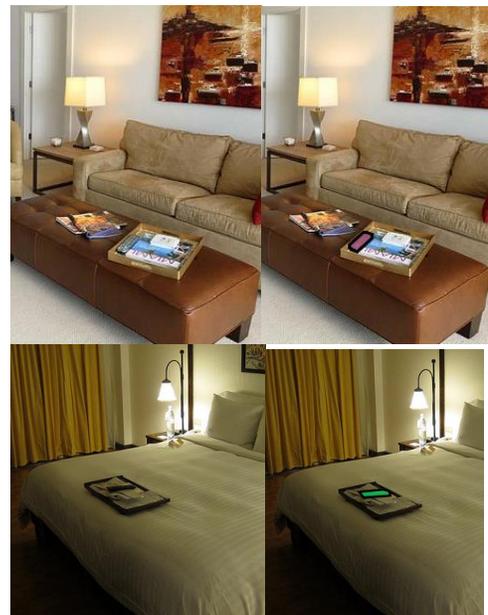
mouse

Computer mice are detected based on their compact design, buttons, and movement sensor. This detection is applied in user interaction tracking, office automation, and electronic classification.



remote

Remotes are identified by their compact size and button layout. This detection supports smart home integration and device control tracking.



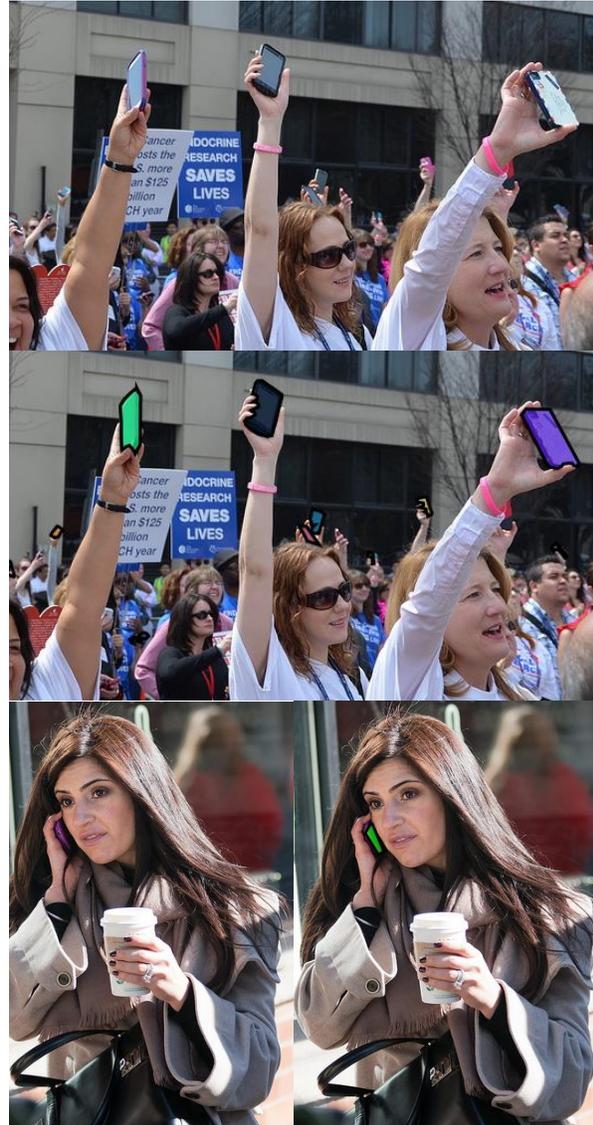
keyboard

Keyboards are detected through their key layout and rectangular shape. This detection is beneficial in workstation automation, and office equipment tracking.



cell phone

Cell phones are recognized by their screen, camera, and slim design. This detection is used in security monitoring, and lost item recovery.



microwave

Microwaves are detected based on their rectangular shape, control panel, and door handle. This detection is useful in kitchen automation and appliance monitoring.



oven

Ovens are identified by their front door, control knobs, and internal heating elements. This detection supports kitchen automation, cooking analytics, and home appliance categorization.



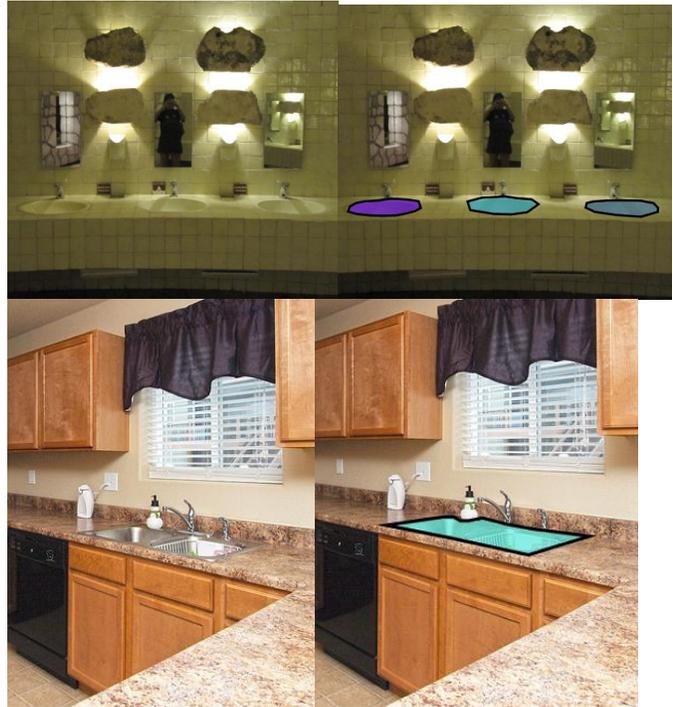
toaster

Toasters are detected through their slot openings, lever mechanism, and heating elements. This detection is applied in kitchen automation, food preparation tracking, and home appliance monitoring.



sink

Sinks are recognized by their basin structure, faucets, and drainage points. This detection is beneficial for hygiene monitoring, and public restroom management.



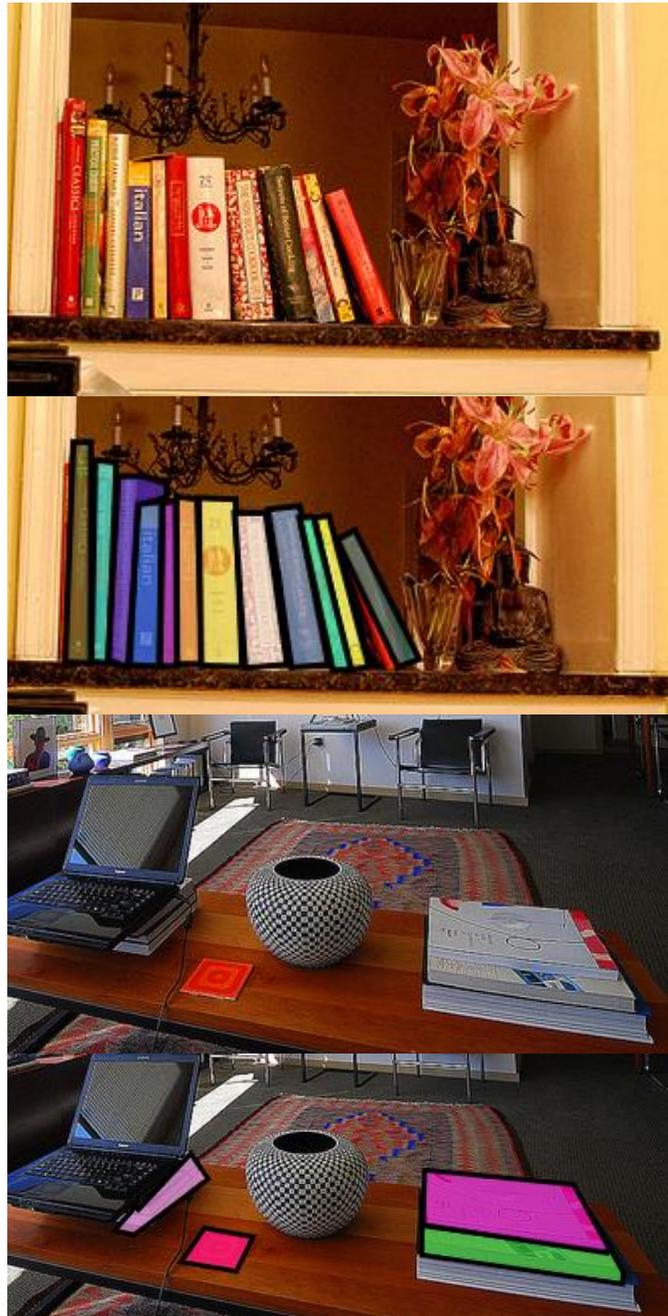
refrigerator

Refrigerators are detected based on their box-like structure, cooling vents, and door handles. This is essential for inventory management.



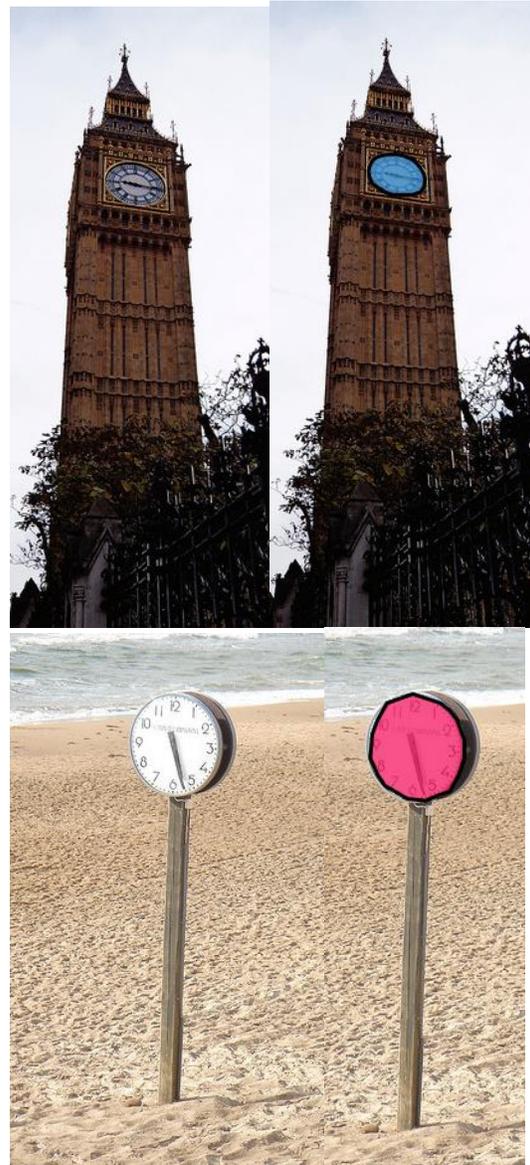
book

Books are identified by their rectangular shape, pages, and cover. This detection is useful in library management, digital archiving, and automated sorting systems.



clock

Clocks are recognized by their circular or rectangular faces, hands, and number markings. This detection supports timekeeping systems, and workplace efficiency analysis.



vase

Vases are detected based on their cylindrical or bulbous shape, often with a narrow opening. This detection is relevant for home decor applications, retail inventory, and object.



scissors

Scissors are identified by their intersecting blades and handle structure. This detection is useful in workplace safety monitoring, tool tracking, and automated manufacturing processes.



teddy bear

Teddy bears are detected by their plush texture, rounded limbs, and facial features. This detection supports toy recognition, child safety systems, and lost-and-found applications.



hair drier

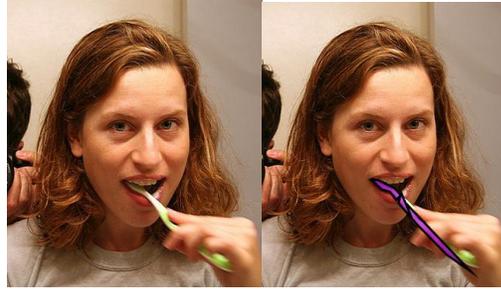
Hair dryers are recognized based on their handle, nozzle, and venting design. This detection is beneficial in appliance tracking, and personal care monitoring.



toothbrush

Toothbrushes are identified by their bristles, handle, and compact size. This detection is useful in hygiene tracking, smart bathroom systems, and automated inventory management.





Minimum Recommended Sizes for Detection

A common question is about the position where the camera should be installed for optimal detection. It is difficult to say with complete certainty because cameras can have different lenses, angles, and zoom levels. The most important factors are the size of the object in the image and its visibility. The table below indicates the minimum recommended object size in the image as a percentage. The percentage refers to the relative size of the object, as there may be various types of resolutions and resizing. So, when we say an object is 1% in size, we are indicating that, for example, in a 512x512 image, the object would be 5.12 pixels by 5.12 pixels. See the next chapter for instructions on how to check the object's size directly in IPXAnalytics.

Object	Minimum percentage size for identification	Camera Height
person	1%	1-3 meters
bicycle	1%	2-5 meters
car	1%	2-7 meters
motorbike	1%	2-5 meters
aeroplane	1%	10-50 meters
bus	1%	3-10 meters
train	1%	3-10 meters
truck	1%	3-10 meters
boat	1%	5-20 meters
traffic light	5%	3-10 meters
fire hydrant	5%	1-3 meters
stop sign	5%	2-5 meters
parking meter	5%	2-5 meters
bench	5%	1-3 meters
bird	5%	1-5 meters
cat	5%	1-3 meters
dog	5%	1-3 meters
horse	5%	2-5 meters
sheep	5%	2-5 meters
cow	5%	2-5 meters
elephant	5%	5-10 meters
bear	5%	3-7 meters
zebra	5%	2-5 meters
giraffe	5%	5-12 meters
backpack	5%	1-3 meters
umbrella	5%	1-3 meters
handbag	5%	1-3 meters

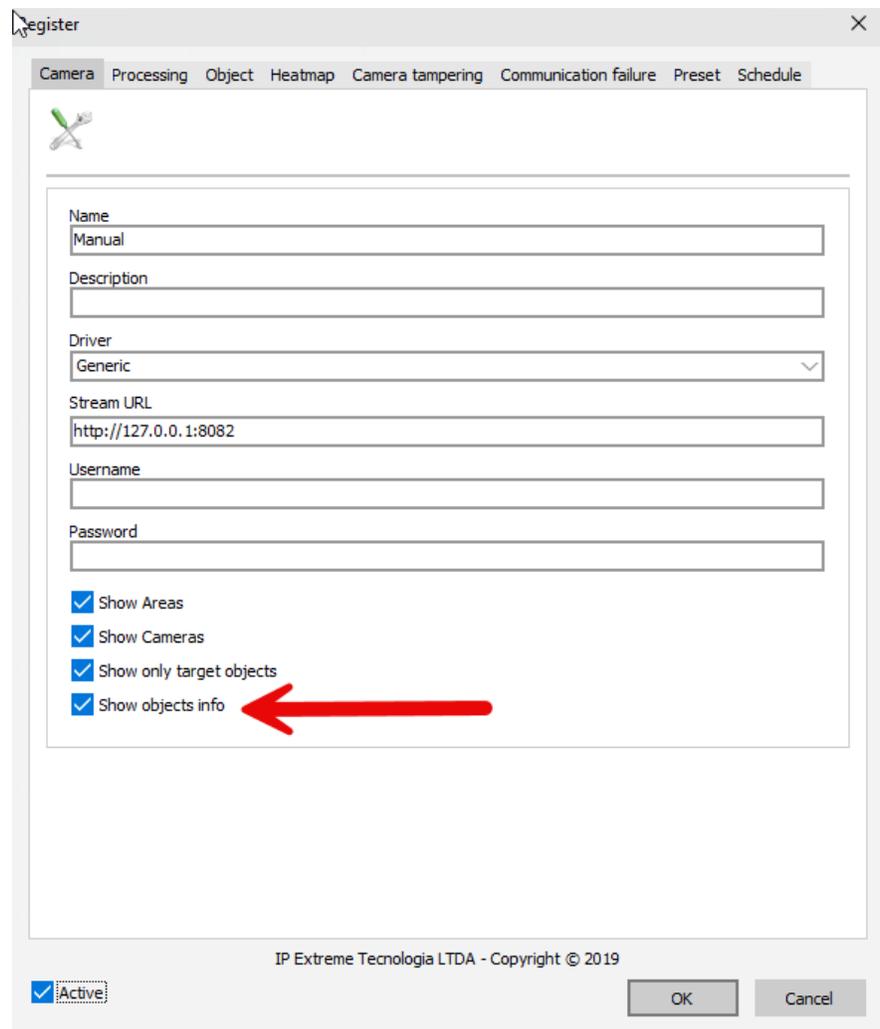
tie	5%	1-2 meters
suitcase	5%	1-3 meters
frisbee	5%	1-5 meters
skis	5%	1-3 meters
snowboard	5%	1-3 meters
sports ball	5%	1-3 meters
kite	5%	3-10 meters
baseball bat	5%	1-3 meters
baseball glove	5%	1-3 meters
skateboard	5%	1-3 meters
surfboard	5%	1-3 meters
tennis racket	5%	1-3 meters
bottle	5%	1-2 meters
wine glass	5%	1-2 meters
cup	5%	1-2 meters
fork	5%	1-2 meters
knife	5%	1-2 meters
spoon	5%	1-2 meters
bowl	5%	1-2 meters
banana	5%	1-2 meters
apple	5%	1-2 meters
sandwich	5%	1-2 meters
orange	5%	1-2 meters
broccoli	5%	1-2 meters
carrot	5%	1-2 meters
hot dog	5%	1-2 meters
pizza	5%	1-2 meters
donut	5%	1-2 meters
cake	5%	1-2 meters
chair	5%	1-3 meters
sofa	5%	1-3 meters
pottedplant	5%	1-3 meters
bed	5%	1-3 meters
diningtable	5%	1-3 meters
toilet	5%	1-3 meters
tvmonitor	5%	1-3 meters
laptop	5%	1-2 meters
mouse	5%	1-2 meters
remote	5%	1-2 meters
keyboard	5%	1-2 meters
cell phone	1%	1-2 meters
microwave	5%	1-3 meters

oven	5%	1-3 meters
toaster	5%	1-3 meters
sink	5%	1-3 meters
refrigerator	5%	1-3 meters
book	5%	1-2 meters
clock	5%	1-3 meters
vase	5%	1-3 meters
scissors	5%	1-2 meters
teddy bear	5%	1-3 meters
hair drier	5%	1-2 meters
toothbrush	5%	1-2 meters

How to identify an object size

In IPXAnalytics, it is possible to view the live image in two ways: by using Debug mode or by clicking on Preview in the admin client.

When registering a camera, on the first tab, check the option "show objects info." This option will display the size of each detected object in the image and its orientation (vertical or horizontal).



The screenshot shows the 'Register' dialog box with the following fields and options:

- Name: Manual
- Description: (empty)
- Driver: Generic
- Stream URL: http://127.0.0.1:8082
- Username: (empty)
- Password: (empty)
- Options:
 - Show Areas
 - Show Cameras
 - Show only target objects
 - Show objects info (highlighted with a red arrow)

At the bottom, there is an 'Active' checkbox (checked), 'OK' and 'Cancel' buttons, and the text 'IP Extreme Tecnologia LTDA - Copyright © 2019'.

Examples:

A person detected in the image with a total size of 4.0%.

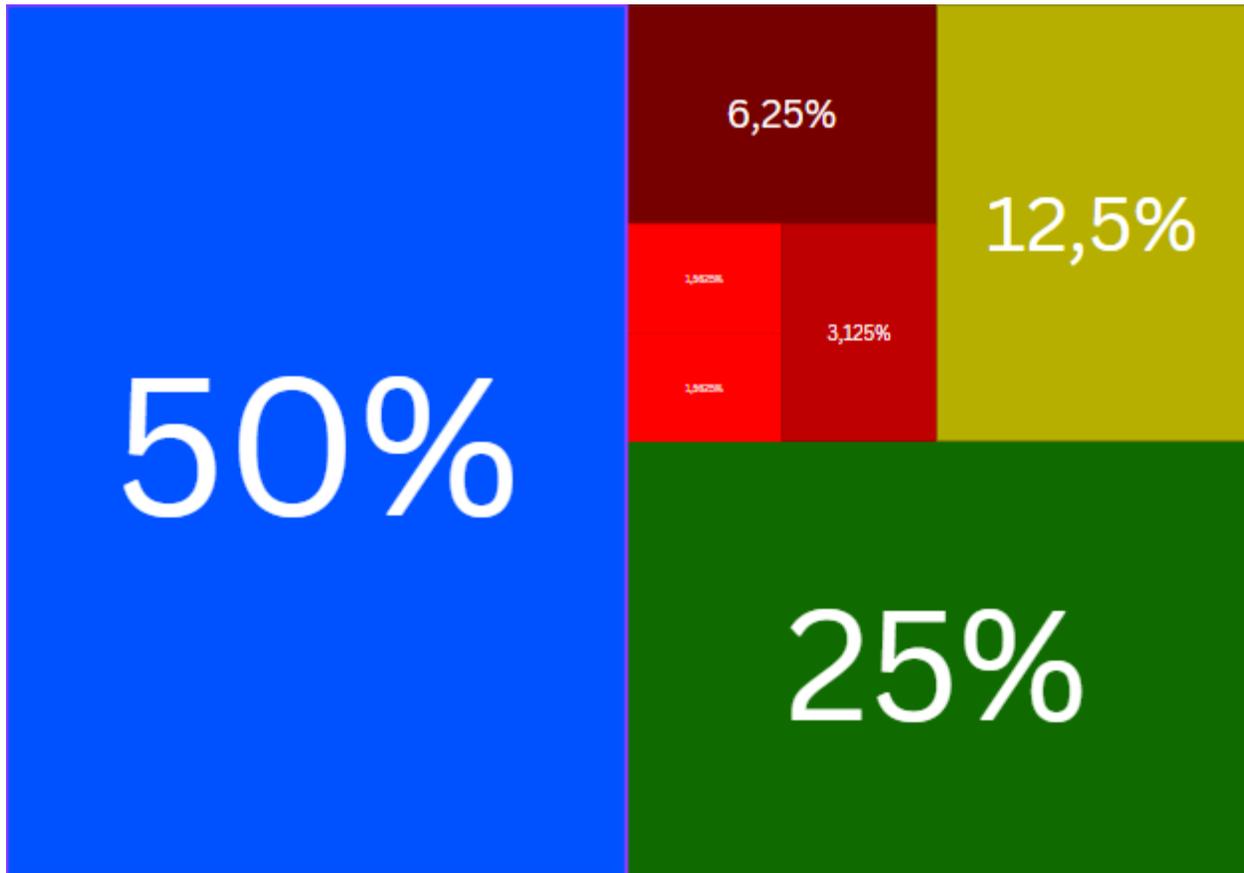


Cell phone detected in the image with a size of 0.09%.



The image was created to visually illustrate the proportion of an object in relation to the total screen. It divides the space into different percentage areas, making it easier to understand the minimum size required for computer vision software to accurately recognize an object.

Each rectangle represents a specific fraction of the total screen, starting at 50% and successively subdividing each area into halves. This way, the user can intuitively understand how different sizes impact detection and what minimum dimensions are recommended for effective recognition.



Ideal Camera Resolution for Object Recognition

For effective object recognition, camera resolution is essential. The minimum recommended resolution for optimal performance is **512x512**. This resolution provides enough detail for accurate detection and classification while balancing computational efficiency. Higher resolutions, like 1080p or 4K, require more processing power without significantly improving accuracy, and may lead to diminishing returns. On the other hand, lower resolutions can result in blurred or distorted images, making object recognition difficult. Therefore, 512x512 resolution is the minimum ideal for reliable and efficient object detection.

Low resolution vs High resolution comparison:

