Parquery

More Space and Time with AI

What is happening in your car park?

Needs from our customers

Parquery's end-customers are parking and facility managers, who mostly have the following needs

- They wish to **display available parking spots** to their customers (e.g. retail, airports, corporate parking lots, etc.)
- They would like to **identify if a vehicle stays longer than authorized** (longer than the maximum duration, longer than what they paid for, is an electric vehicle parked but not charging?, etc.).
- They wish to **understand the usage of their parking area** (e.g. do drivers indeed use all the parking area? when?, etc.)



Results provided to parking managers

Parquery provides parking managers with **real-time results** to the following questions:

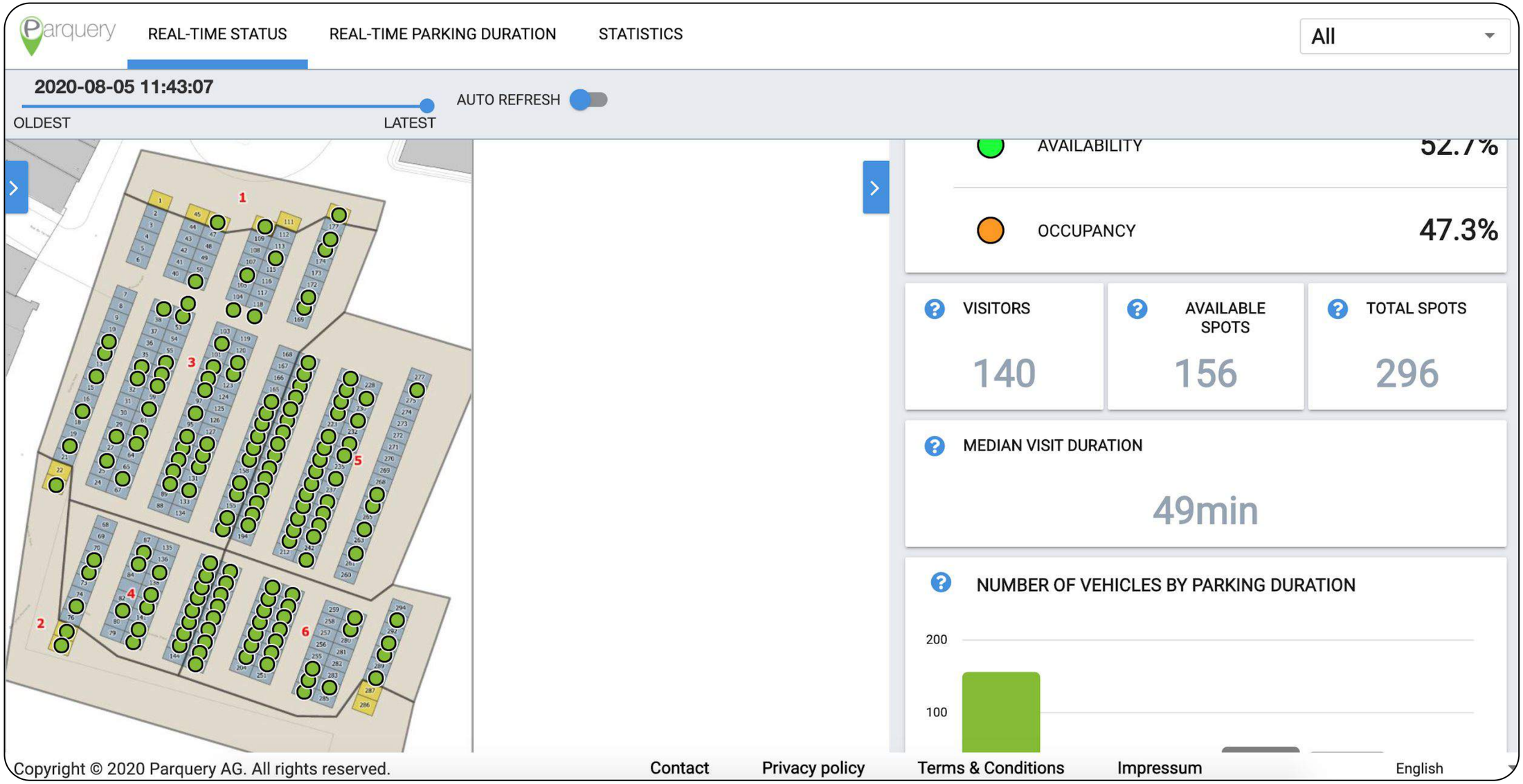
- **Where** are currently available parking spots? **Drivers can be guided to an available parking spot** on a Smartphone App or on dynamic guidance panels. Parquery's API can also be easily integrated into an existing Smartphone App.
- **How long is each vehicle currently parked for?** Are vehicles parked more than 30min? 2h? after the closing time?
- **Are reserved parking spots** (trucks, disabled, electric vehicles, taxis,...) currently used?
- **Are vehicles currently wrongly parked** (in front of emergency exits, on delivery areas, …)? **Alerts can be sent to parking managers.**
- **Which vehicle type** is currently parked? truck, van, car, motorcycle?

Parquery also provides parking managers with **structured analytics and statistics** on:

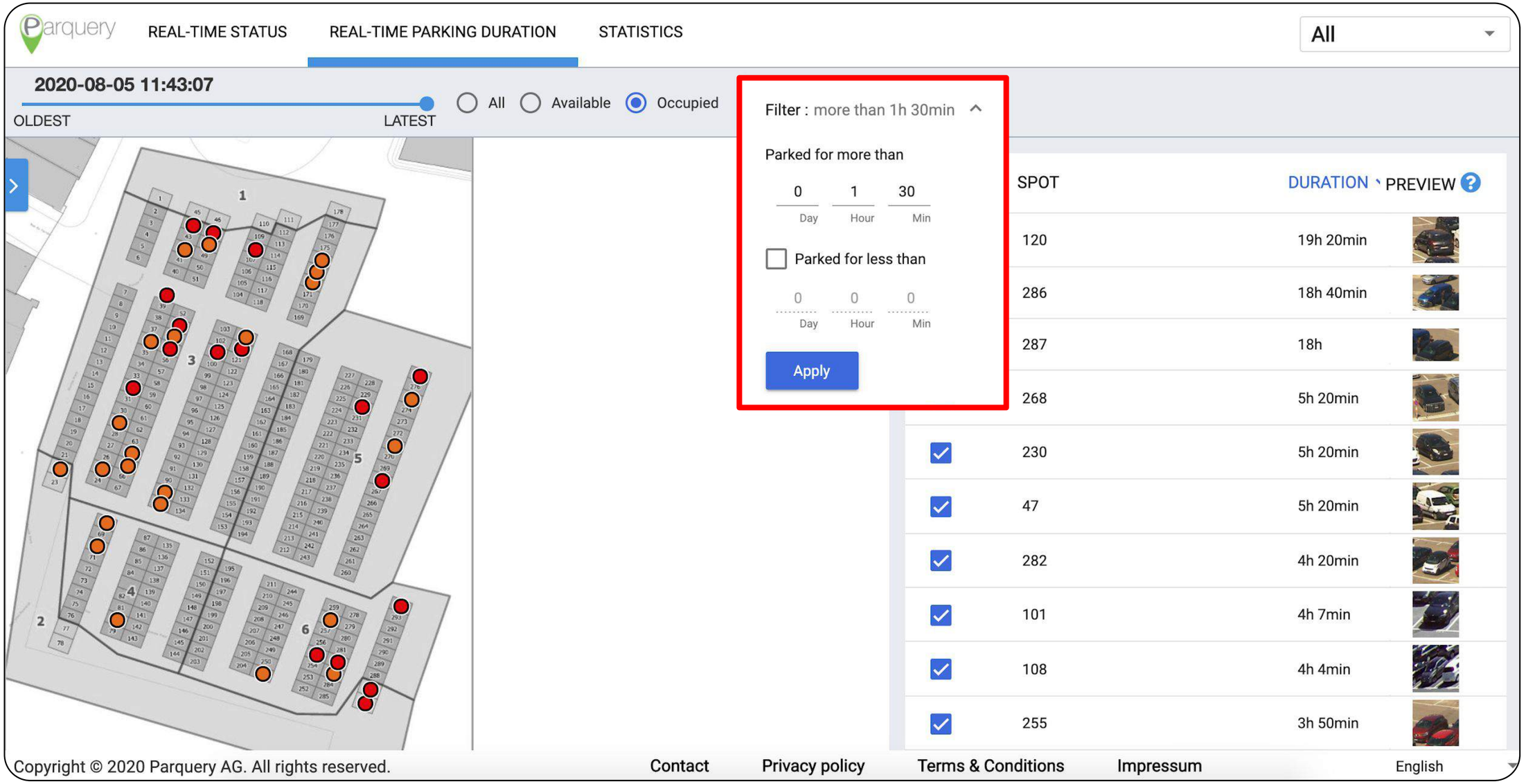
- **What is the general parking occupancy** of each parking zone? How many parking spots are used? How often? When are peak hours?
- **How long** do customers and visitors stay parked? 5min? 20min? 2h? all day? **How long do customers park on average**?
- **Which car park zones are more often used**? close to the nearby shops? closer to the city centre?
- **Are there bottlenecks / traffic jams**? Where are they principally?

All analytics can be averaged on any time period (every hour, every day, every week, …) and of any size (only parking spots reserved (handicapped, electric vehicles, ...), only delivery areas, only parking close to the entrance, all parking spots next to the neighbour shop,…)

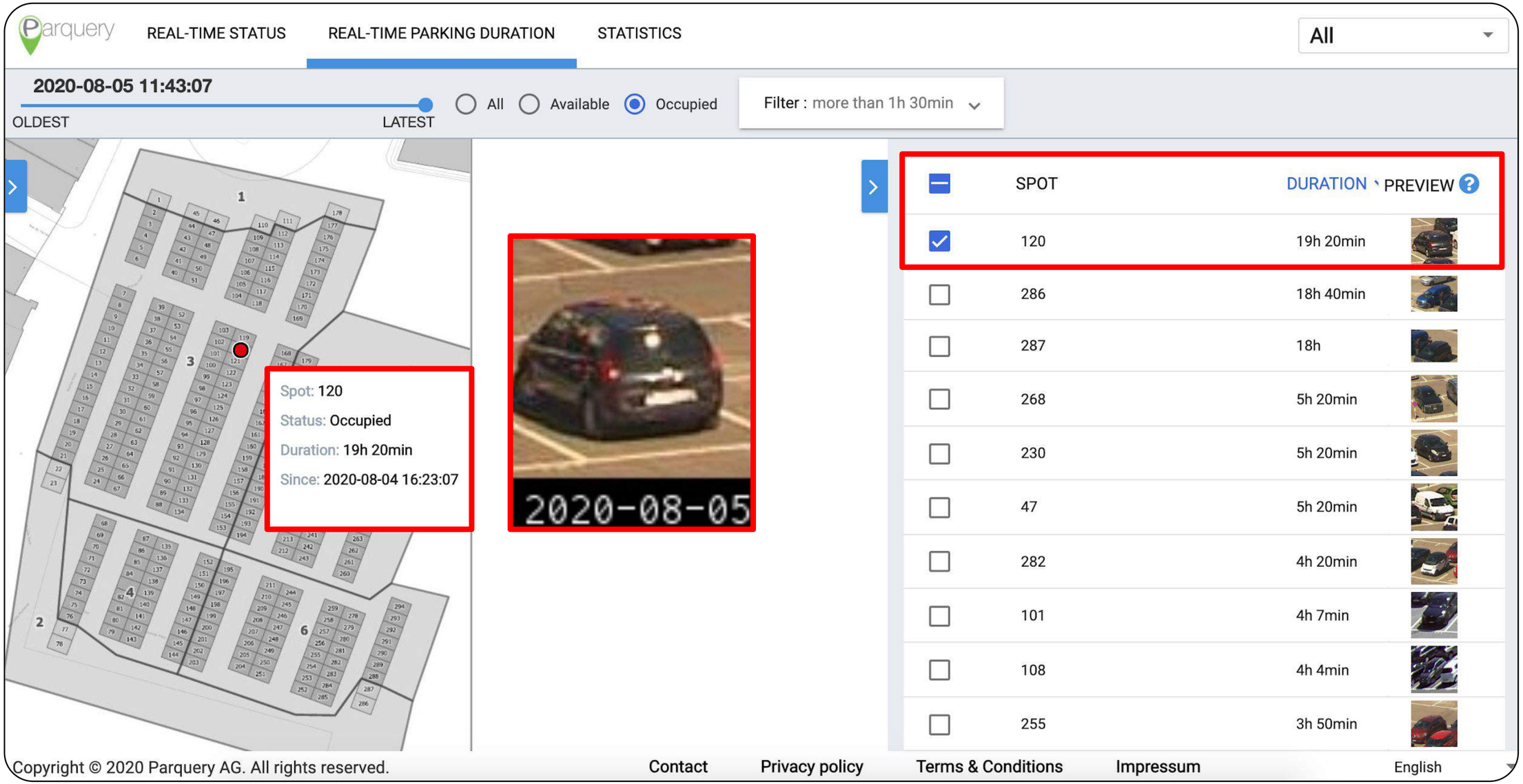
Results: Real-time availability of parking spots



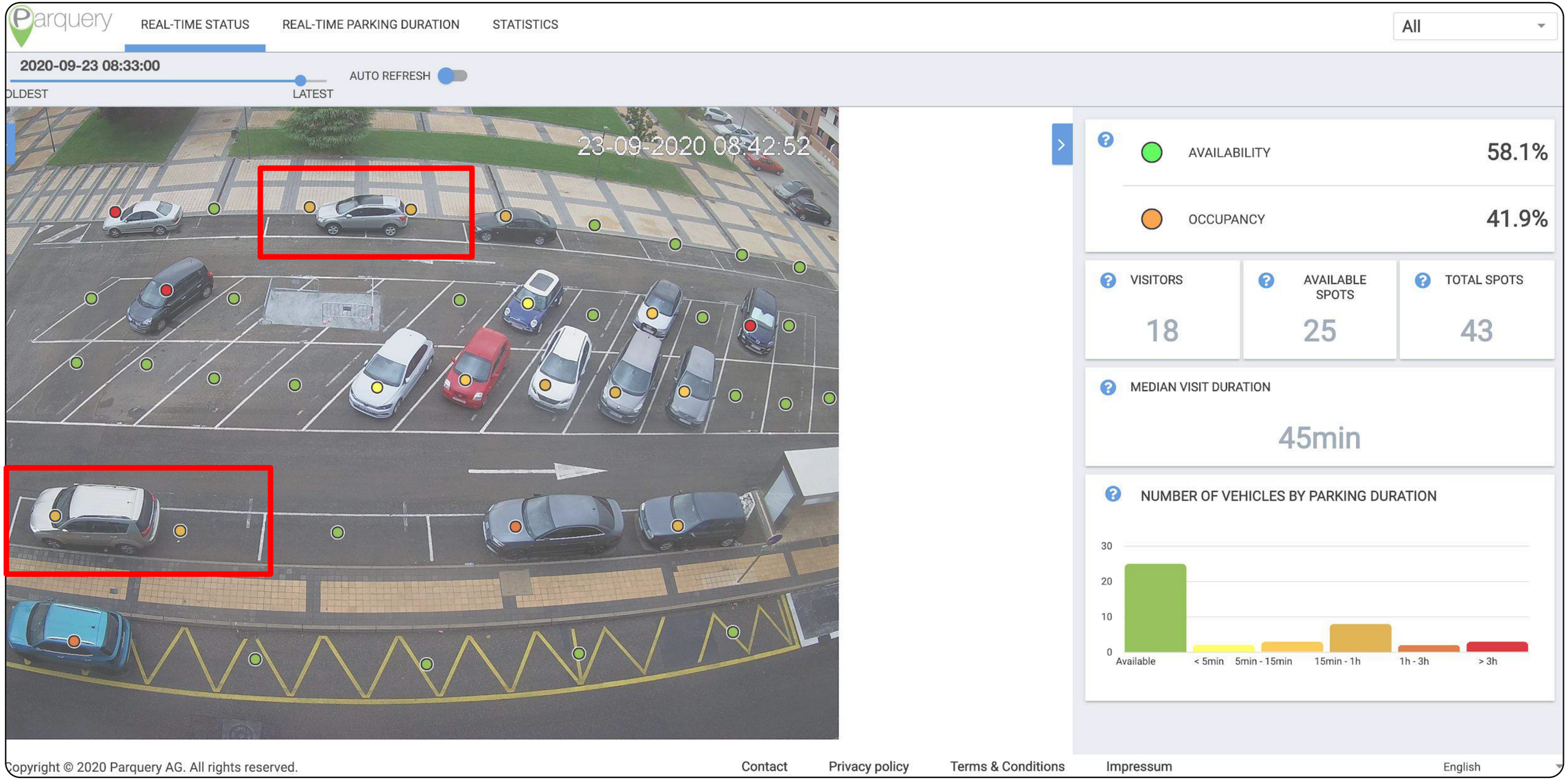
Results: How many vehicles are parked for more than 1h30?



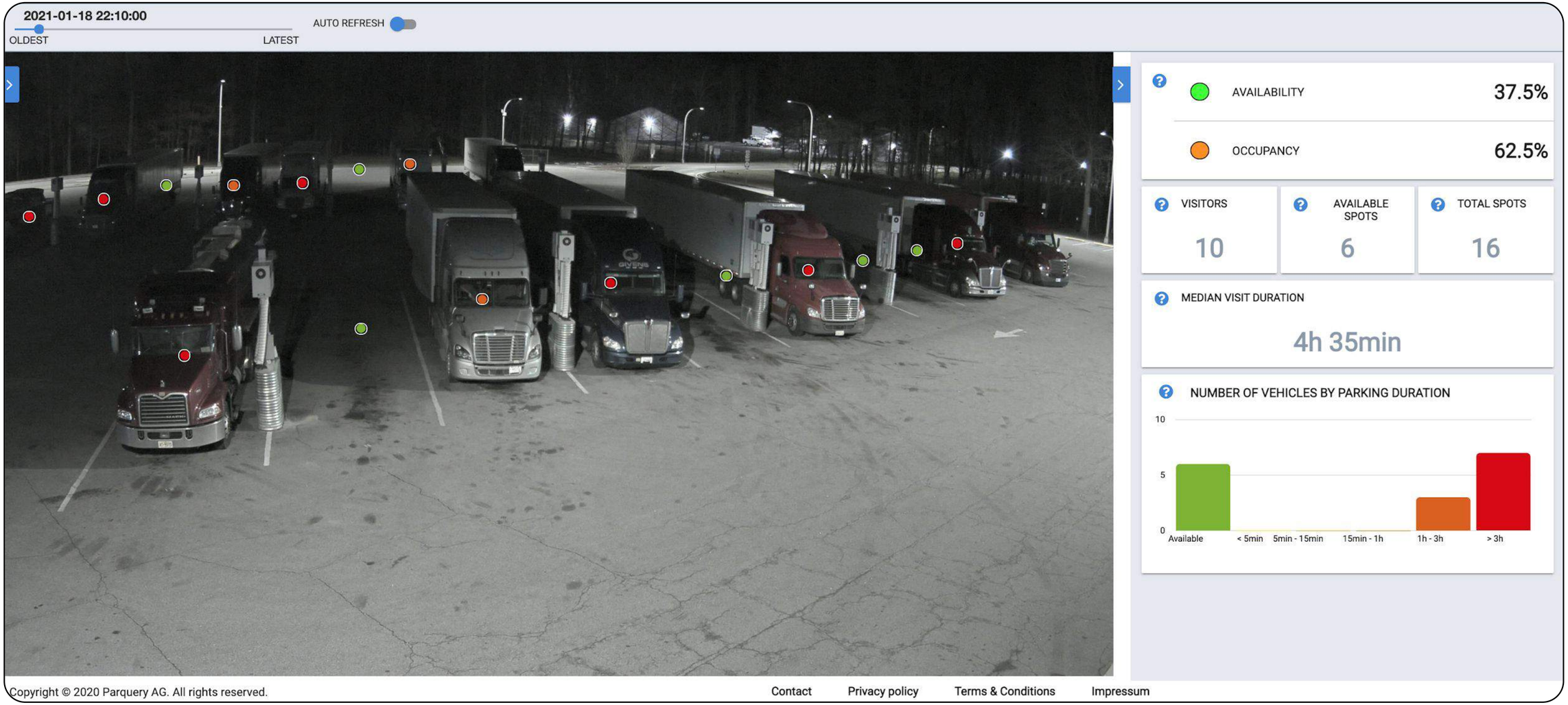
Results: Real-time alerts if a vehicle is parked for too long



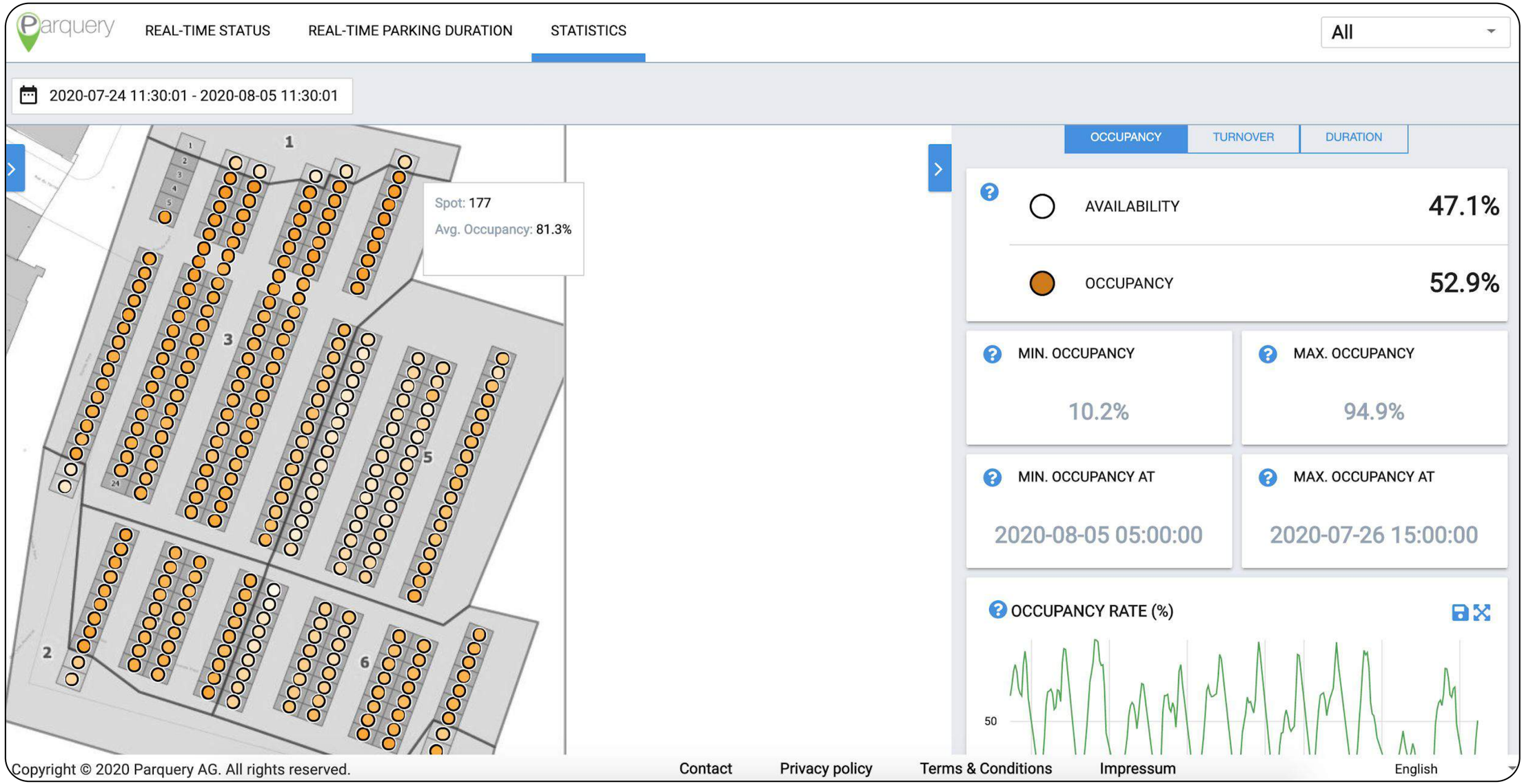
Results: Identification of vehicles wrongly parked



Results: Identification of truck parking availability



Results: Statistics and structured analytics



Results: Monthly reports on parking usage

OCCUPANCY RATE (%)

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
00:00	-	-	-	-	-	-	-
01:00	-	-	-	-	-	-	-
02:00	-	-	-	-	-	-	-
03:00	-	-	-	-	-	-	-
04:00	-	-	-	-	-	-	-
05:00	16.8	12.2	10.3	18.9	14.7	18.2	20.0
06:00	19.2	14.1	12.2	21.1	18.0	21.1	24.4
07:00	18.6	22.1	13.6	19.9	18.6	30.5	25.1
08:00	19.9	30.2	18.9	22.7	22.9	43.5	26.2
09:00	26.4	52.1	29.9	31.2	36.9	57.8	35.4
10:00	31.8	60.3	40.9	44.0	43.6	65.2	48.1
11:00	37.6	62.2	51.6	49.1	43.9	66.0	60.0
12:00	45.9	63.3	66.9	54.2	61.2	66.8	74.7
13:00	51.7	57.9	69.7	63.4	66.9	63.4	83.0
14:00	49.5	60.2	65.3	60.4	66.8	54.9	84.5
15:00	46.5	69.7	63.6	60.9	61.8	58.2	91.4
16:00	42.1	68.0	63.8	57.6	56.4	65.1	87.3
17:00	37.9	60.3	64.6	54.7	55.7	66.1	77.1
18:00	43.4	62.0	65.2	62.0	55.6	64.6	68.9
19:00	50.8	70.4	73.8	79.4	73.6	81.5	67.0
20:00	52.7	74.6	86.9	93.8	87.7	91.8	64.6
21:00	56.1	70.5	84.5	87.0	83.8	87.1	59.4
22:00	-	48.5	-	-	62.9	-	43.7
23:00	-	-	-	-	-	-	-

Occupancy rate reports
for the desired date and time

INCOMING VEHICLES OUTGOING VEHICLES

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
00:00	-	-	-	-	-	-	-
01:00	-	-	-	-	-	-	-
02:00	-	-	-	-	-	-	-
03:00	-	-	-	-	-	-	-
04:00	-	-	-	-	-	-	-
05:00	21.5	19.5	6.5	32.0	13.0	28.5	26.5
06:00	19.5	52.0	21.5	30.0	30.0	89.5	37.0
07:00	26.0	122.5	26.0	27.0	25.0	153.5	20.5
08:00	52.0	146.0	71.0	46.0	71.0	195.5	42.0
09:00	77.5	183.5	101.5	95.0	111.0	223.0	103.0
10:00	102.5	159.5	122.0	131.0	112.0	208.5	109.5
11:00	126.5	159.5	135.0	110.0	117.0	173.5	136.5
12:00	116.0	183.0	140.0	125.0	150.0	180.0	144.0
13:00	99.0	141.0	126.0	152.0	150.5	174.0	125.5
14:00	120.5	155.5	143.0	112.0	170.5	114.5	131.0
15:00	114.0	164.0	115.0	151.0	157.0	113.5	166.5
16:00	88.5	160.0	143.0	101.0	158.0	133.0	152.5
17:00	105.0	174.0	135.0	134.0	164.5	118.5	118.5
18:00	120.5	168.5	145.0	165.0	149.0	136.5	112.5
19:00	116.5	131.0	181.0	173.0	183.5	177.5	128.5
20:00	74.0	96.5	172.0	117.0	143.0	118.5	102.5
21:00	36.0	45.0	78.0	56.0	74.5	70.0	41.0
22:00	-	3.0	-	-	5.0	-	4.0
23:00	-	-	-	-	-	-	-

Reports on the total number of visitors,
cars entering, cars exiting, etc.

DURATION

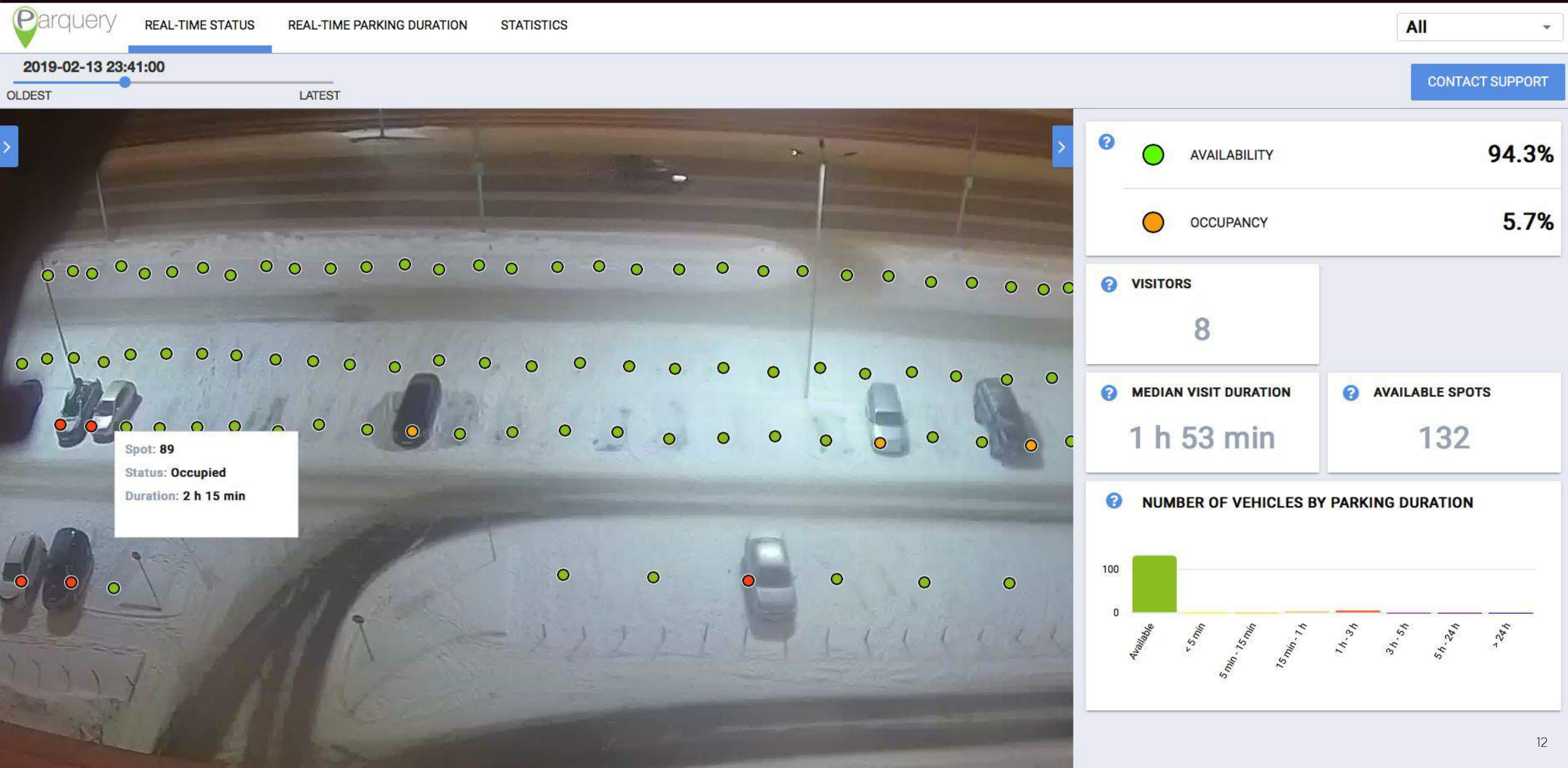
	Mon	Tue	Wed	Thu	Fri	Sat	Sun
00:00	-	-	-	-	-	-	-
01:00	-	-	-	-	-	-	-
02:00	-	-	-	-	-	-	-
03:00	-	-	-	-	-	-	-
04:00	-	-	-	-	-	-	-
05:00	1h 59min	49min	2h 53min	1h 1min	2h 36min	3h 1min	5h 19min
06:00	1h 50min	1h 1min	1h 52min	1h 29min	2h 5min	47min	3h 5min
07:00	52min	24min	55min	46min	55min	30min	57min
08:00	50min	45min	50min	57min	56min	40min	30min
09:00	46min	52min	42min	55min	55min	49min	1h 7min
10:00	45min	55min	46min	58min	44min	1h	1h 10min
11:00	59min	55min	1h 5min	1h 10min	58min	1h 2min	1h 25min
12:00	1h 25min	1h 7min	1h 7min	1h 10min	1h 14min	1h 5min	1h 26min
13:00	1h 15min	1h 14min	1h 20min	1h 23min	58min	50min	1h 46min
14:00	50min	1h 23min	1h 32min	55min	1h 1min	1h 20min	1h 35min
15:00	58min	57min	1h 5min	1h 10min	40min	1h 38min	1h 10min
16:00	55min	55min	1h 17min	50min	52min	1h 7min	1h 17min
17:00	56min	1h 4min	1h 23min	1h 35min	1h 5min	1h 25min	1h 10min
18:00	1h 26min	1h 38min	1h 32min	2h 5min	1h 35min	1h 44min	1h 19min
19:00	1h 27min	1h 18min	1h 28min	1h 21min	1h 31min	1h 20min	1h 7min
20:00	42min	43min	42min	51min	33min	41min	31min
21:00	18min	21min	15min	24min	21min	15min	24min
22:00	-	0min	-	-	0min	-	6h 59min
23:00	-	-	-	-	-	-	-

Reports on parking duration
for the selected date and time

Example of detection in Switzerland - Night conditions



Example of detection in Siberia - Snow conditions



Example of API delivered

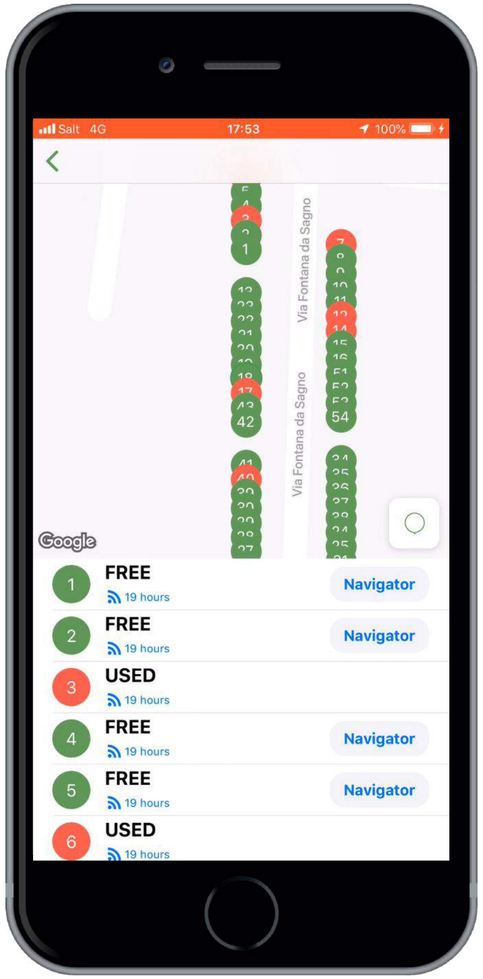

```
[
   {
      "attributes" : [
         {
            "name" : "state",
            "value" : {
               "label" : "0",
               "started" : "2018-01-08T12:46:49.000Z",
               "updated" : "2018-01-08T16:35:09.000Z"
            }
         },
         {
            "name" : "location",
            "value" : "+45.461453+10.485009/"
         }
      ],
      "id" : "17000",
      "type" : "Spot"
   },
   {
      "attributes" : [
         {
            "name" : "state",
            "value" : {
               "label" : "1",
               "started" : "2018-01-08T12:05:50.000Z",
               "updated" : "2018-01-08T16:35:09.000Z"
            }
         },
         {
            "name" : "location",
            "value" : "+45.461472+10.484995/"
         }
      ],
      "id" : "17001",
      "type" : "Spot"
   },
   {
      "attributes" : [
         {
            "name" : "state",
            "value" : {
               "label" : "1",
               "started" : "2018-01-08T14:46:08.000Z",
               "updated" : "2018-01-08T16:35:09.000Z"
            }
         },
         {
            "name" : "location",
            "value" : "+45.461476+10.484992/"
         }
      ],
      "id" : "17002",
      "type" : "Spot"
   },
```


- Occupancy (“label” ‘1’ is occupied, ‘0’ is available)
- Time of analysis (“updated”)
- Duration of analysis (difference between “updated” and “started”)
- GPS Coordinates (“value”)
- Parking spot ID (“id”)

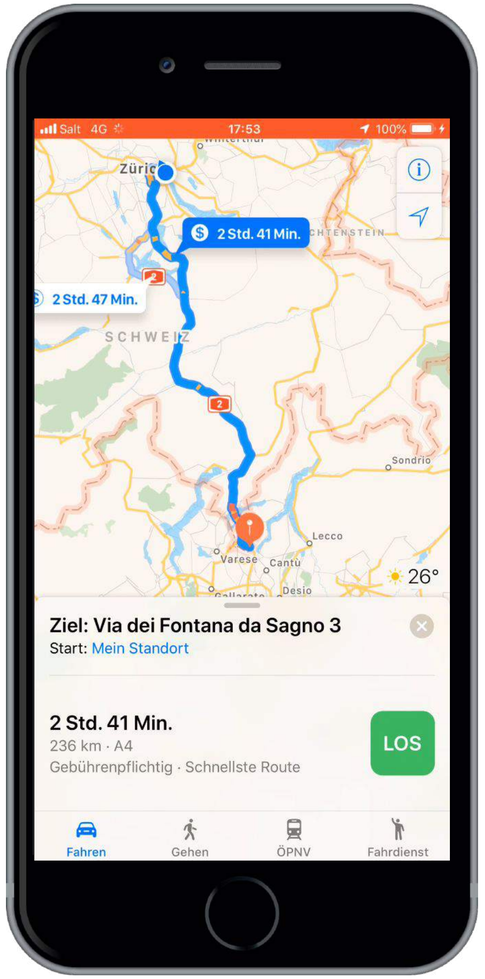
Drivers are guided to an available parking spot via their Smartphones



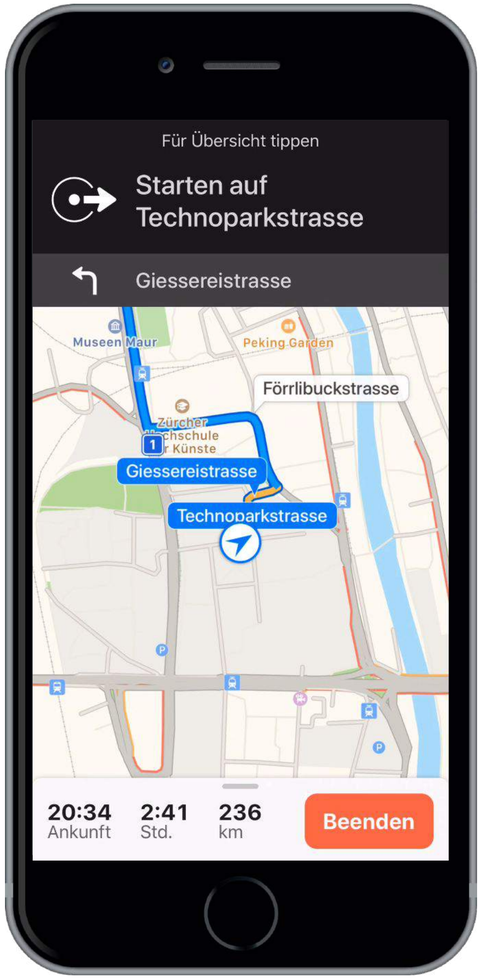
Write down where you want to park



Display of the available parking spots



Display of the route to the car park



Dynamic guidance to the car park

Drivers are guided to an available parking spot with dynamic panels



Outdoor display of available parking spots

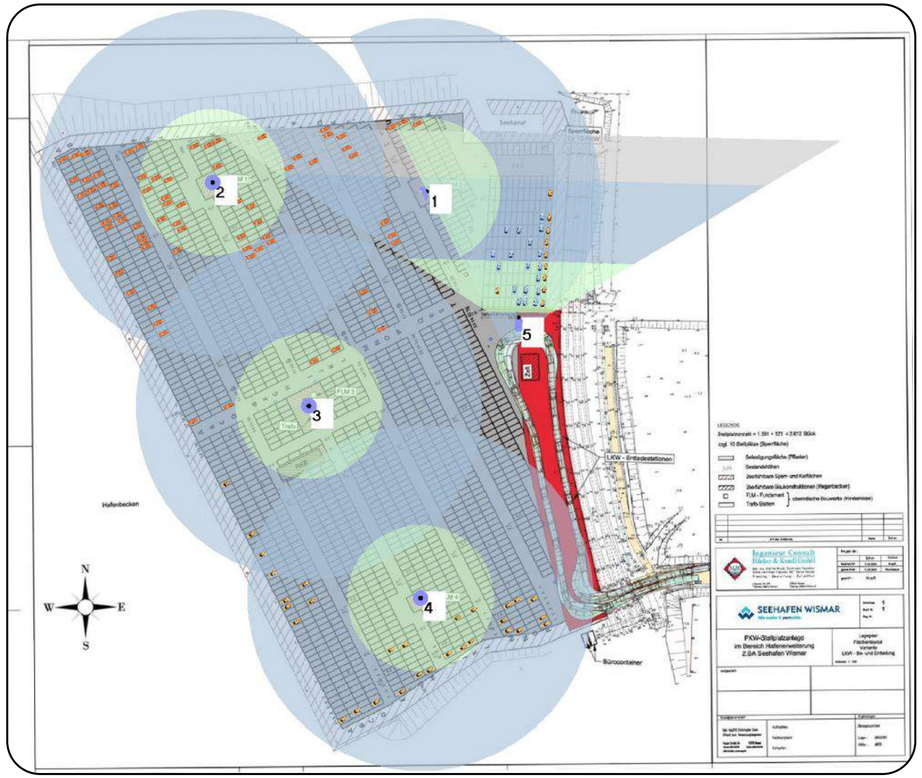


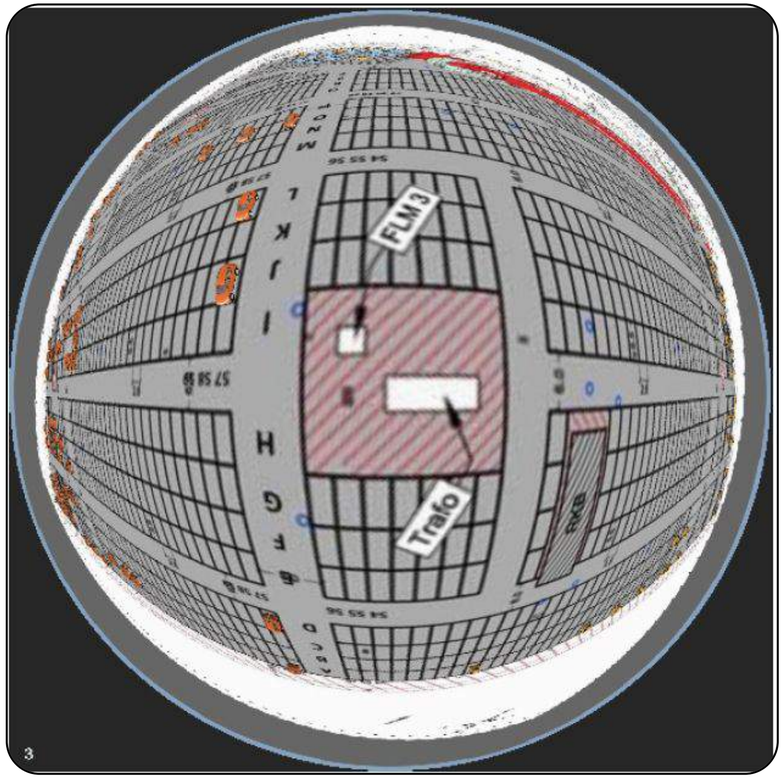
Indoor display of available parking spots

Installation of dynamic guidance panels outdoor or indoor by local partners

Ideal Camera Positioning

Parquery's software can use existing cameras installed in the customer's location. In case additional cameras have to be installed, Parquery supports customers with a proposition of the ideal camera installation point.





Simulation of camera views, and proposition of ideal camera location for a customer in Germany.

Results delivered - Example of project timeline

Project task	Company	Jan. 21		Feb. 21		Mar. 21		...		...		...	
Images sent to Parquery	Customer												
Calibration of each parking spot	Parquery												
Delivery of real-time results	Parquery												
Delivery of Statistics and Structured Analytics	Parquery												
Integration of Parquery's results in a Smartphone App. e.g. drivers are guided to an available parking spot or an electric charging point	Customer												
	Parquery												

Timeline

- Any camera can be used, even already-installed cameras.
- Results are provided immediately with 95% accuracy.
- Maximum 1 month of calibration to guarantee 99% accuracy.

About Parquery

Who we are

- Spin-off from ETH Zürich, Switzerland:
  - Location: Zurich, Switzerland
  - Creation: Sept. 2014
- Expert in image analysis
- Real-time data provider for mobility stakeholders
- More than 80 projects worldwide

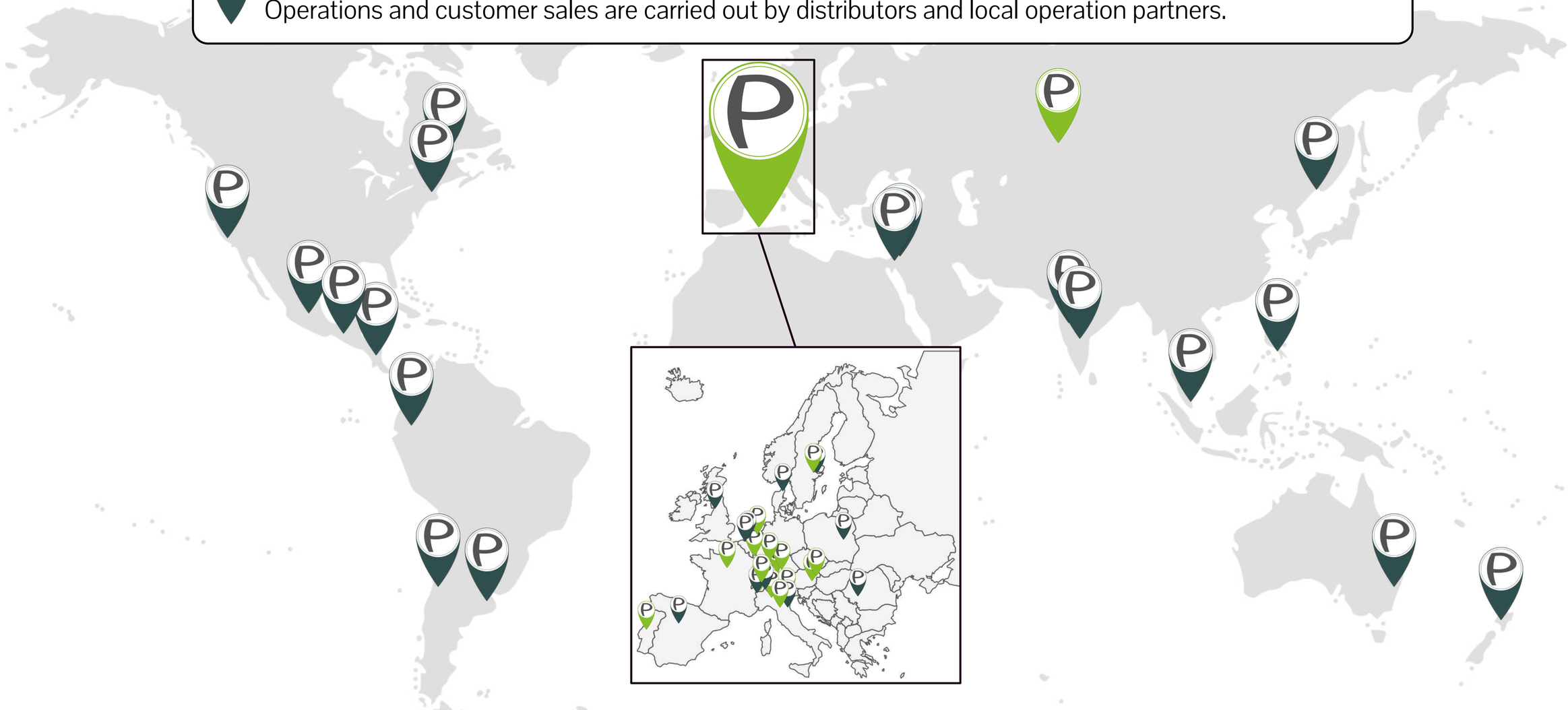
Our mission

- Provide real-time, reliable and precise information to mobility operators, retail, airports, leisure parks and city car park managers on:
  - Parking availability,
  - Parking duration for every parked vehicle,
  - Distinction by vehicle type,
  - Flow analysis.

More than 80 projects in 30+ countries worldwide

Direct Sales: Over 20 customers -> Operations and customer sales are carried out by Parquery.

Distributors channel: 50+ PoC -> Parquery detects vehicles in a car park at the distributor's premises: Operations and customer sales are carried out by distributors and local operation partners.



Competition and USPs

Parquery's AI technology



Customers send pictures from **any camera.**





Parquery has built innovative **computer vision algorithms** to detect any object on images.





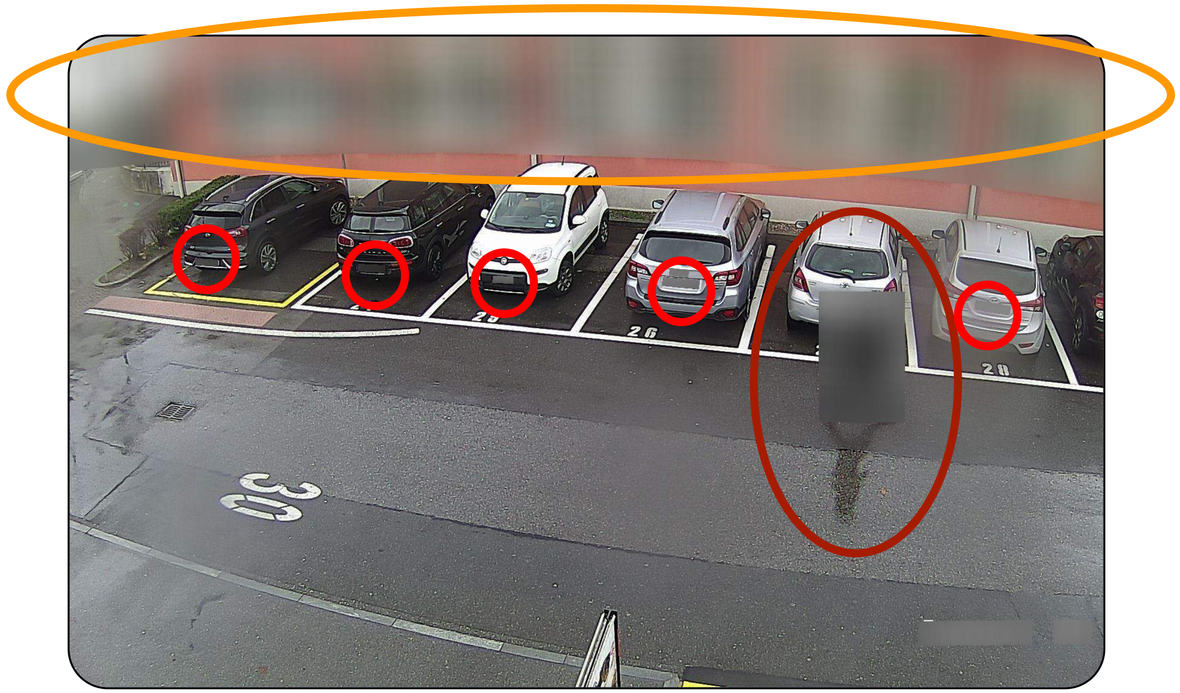
Real-time knowledge on **parking availability** and **parking duration.**

Parquery's competition and USPs

Solution	**PARQUERY**	*Video analysis with embedded cameras*	*Magnetic and infrared sensors*
Description	Any camera	Software in cameras	Sensors
Coverage	Over 300 spots	1 camera -> 50 spots	1 sensor -> 1 spot
Accuracy	Above 99%	85 - 90%	70 - 80%
Flexibility	Any object or silhouette	Only vehicles	Only vehicles
Infrastructure required	Low / inexistant	High	High

Parquery is compliant with privacy laws

Parquery takes very seriously the preservation of people's privacy.
The techniques we have developed comply with Swiss and European privacy laws (GDPR). **There is no privacy violation.**



Example of Parquery's blurring module implemented on pedestrians ( ), vehicle number plates ( ), and also on windows of the nearby building ( ).

- **No image is stored.**
- **Images are automatically deleted** after processing.
- **Detection can be carried out at the customer's premises.**
  There is no privacy violation.

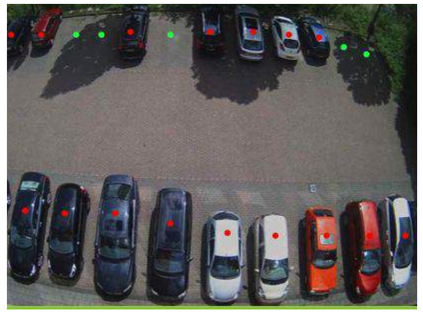


Some parking managers also inform their customers on the presence of cameras. Written on the board:
"Parking duration: max. 1 hour. The parking duration is monitored via cameras"

Results are 99% accurate, and verifiable



Intense sun ✓



Extreme shadow ✓



Glare ✓



Rain ✓



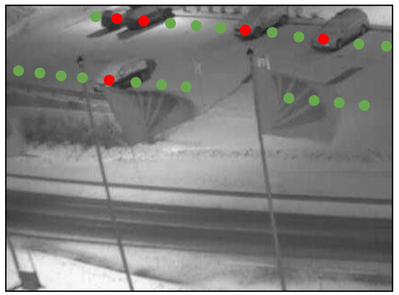
Fog ✓



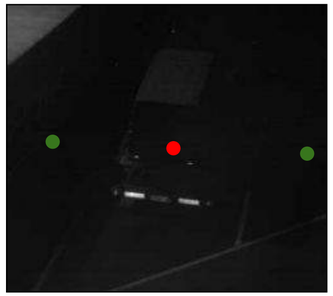
Snow ✓



Wrongly parked ✓



Occlusion ✓

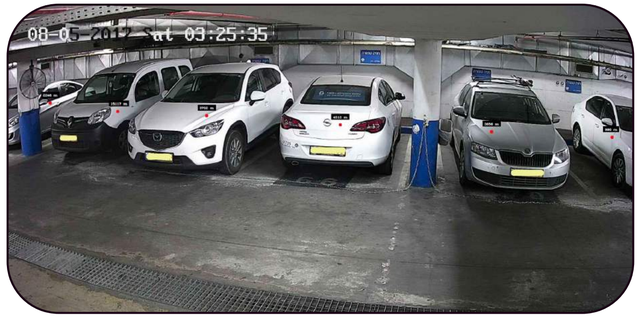


Night - Vehicle visible ✓

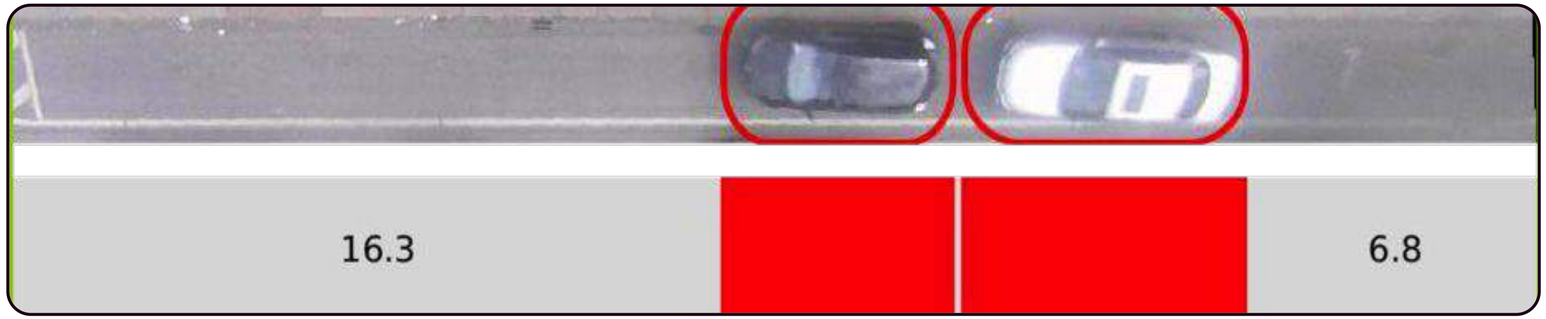


Night - Vehicle invisible ✗

Real-time alerts for specific situations



Vehicles parked frontwards / backwards



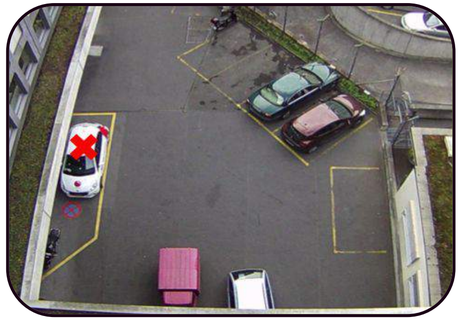
Space left to park (in meters)



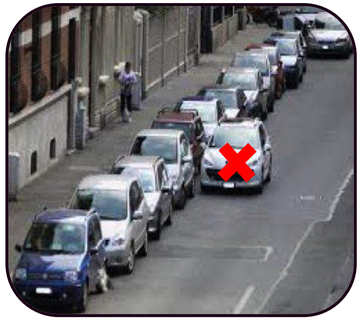
Vehicle identification number



Identification of vehicle type: truck, van, car, motorcycle...

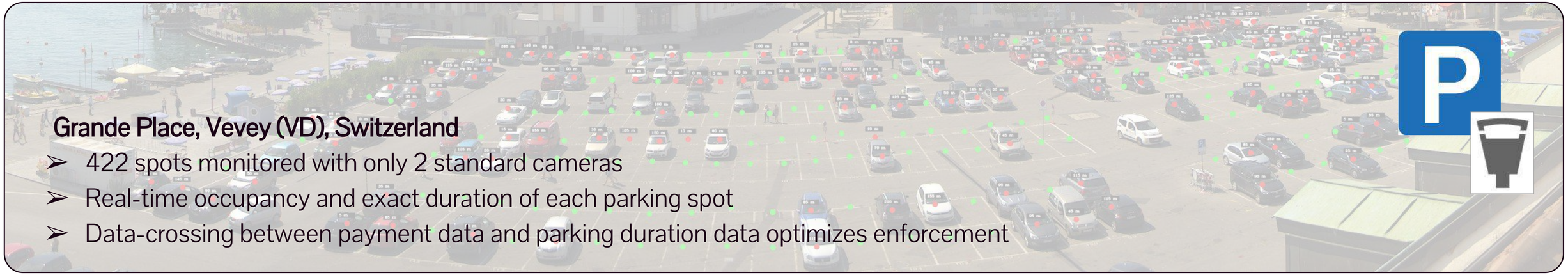


Violation (delivery areas)



Violation (double parking)

Example 1: Monitoring and enforcement (Vevey, Switzerland)



Grande Place, Vevey (VD), Switzerland

- 422 spots monitored with only 2 standard cameras
- Real-time occupancy and exact duration of each parking spot
- Data-crossing between payment data and parking duration data optimizes enforcement

Monitoring and statistics



Information display



Overview of parking area for enforcement

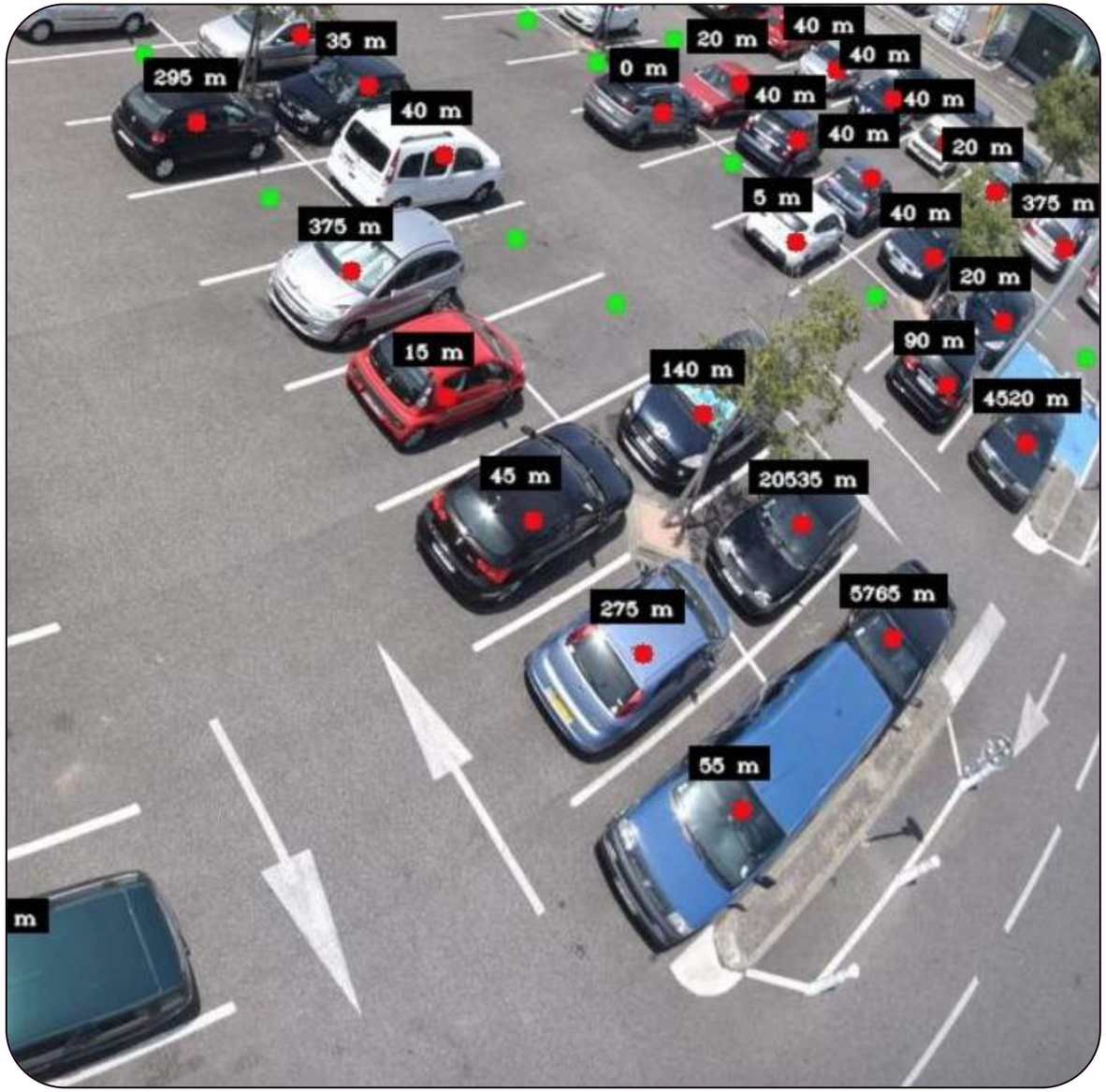


Example 2: What answers do parking managers get?

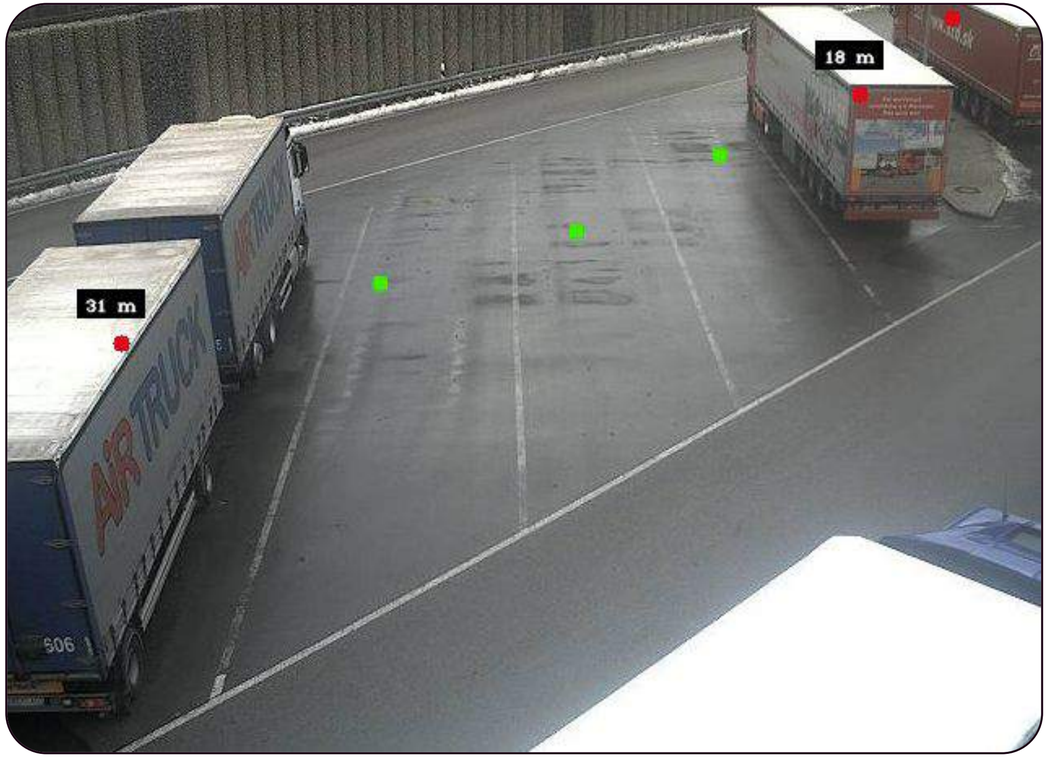
Example: Parquery's results after monitoring
1100 parking spots **with** 9 cameras

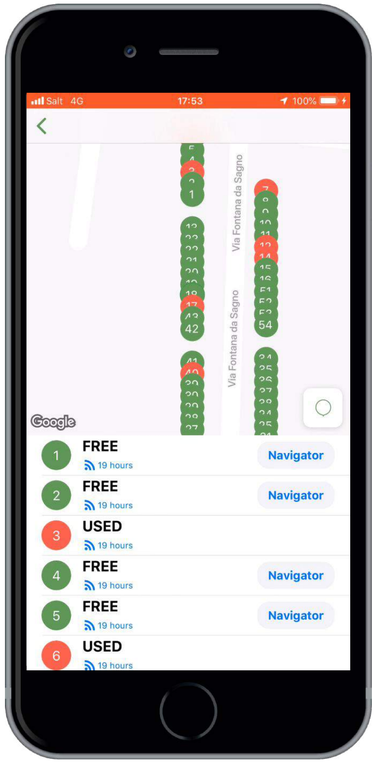
- **Where** are available parking spots in real-time?
- **Who** leaves his vehicle more than 2h? 3h? all day long?
- **When** are peak hours / off-peak hours?
- **Where** are the parking spots taken by the staff?
- **What** is the use of drop-off zones, taxi lanes?
- **Where** do people park? Optimisation of **advertisement** and **dynamic pricing** policies.
- **Where** to install dynamic guidance panels?
- **Analysis of flows** and identification of **bottlenecks**.





Example 3: Truck drivers are guided to an available parking spot on highways





Highway truck parkings are currently very busy as truck drivers do not know beforehand where is an available parking spot.
Integrating Parquery's results on a Smartphone App directs drivers to the closest rest area where a parking spot is available.

Example 4: Detection of any object (Aargau, Switzerland)

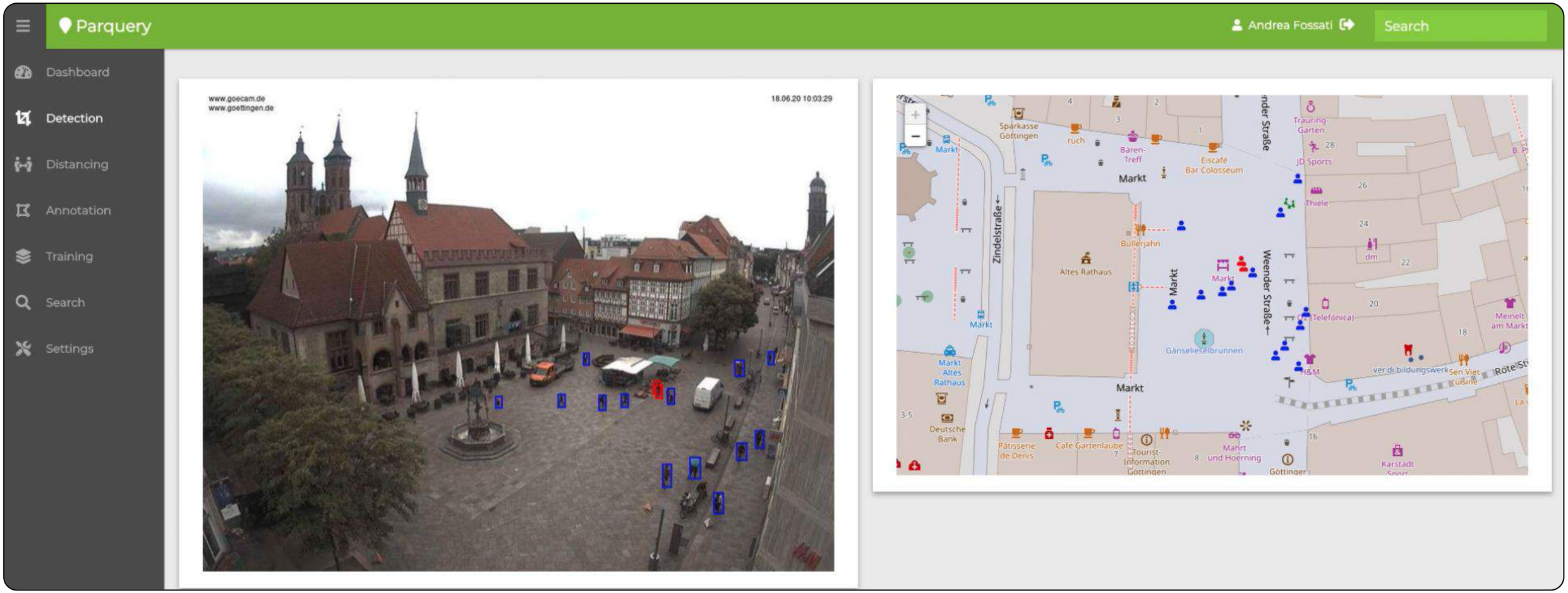


The same **object detection technology** can be used for many uses cases, in different markets. One of them is the **optimization of goods in warehouses**.

Results

- **Where** are specific products in real-time?
- **Where** are empty spots on shelves?
- Detection of storage capacity
- Automatized alert system to managers

Example 5: Detection of any silhouette



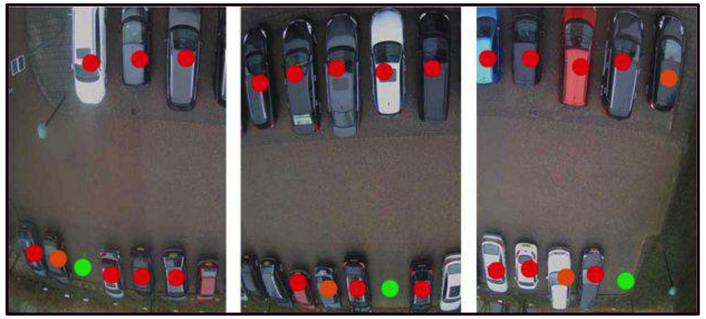
- Silhouettes are detected and shown on a map (in blue)
- Silhouettes too close to each other (e.g. less than 1.5 meter in this picture) are also detected (in red)

Example 6: Vehicle counting and tracking (Gelderland, the Netherlands)



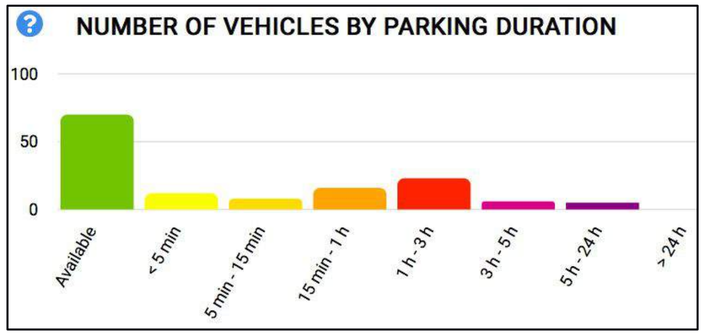
- Count of how many vehicles are currently crossing an intersection (e.g. Carsheenweg and Terugweg in this example)
- Count of how many vehicles entered a specific area (e.g. Bushalte and Ventstraat in this example)

Parquery: One technology enables many applications



Smart Parking: Real-Time Results





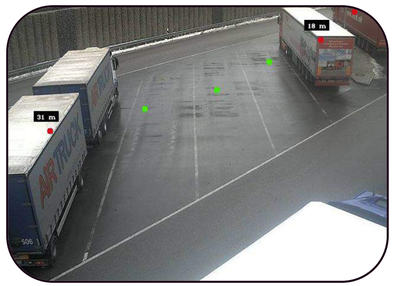
Smart Parking: Structured Analytics



Boat parking in marinas



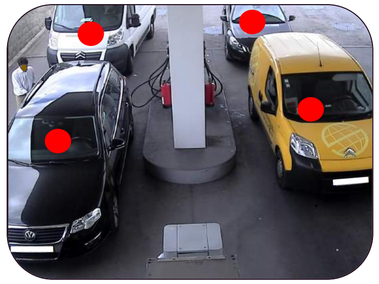
Plane Arrival / Departure



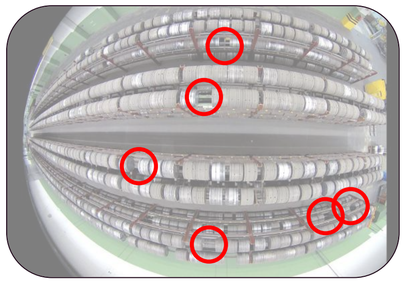
Highways



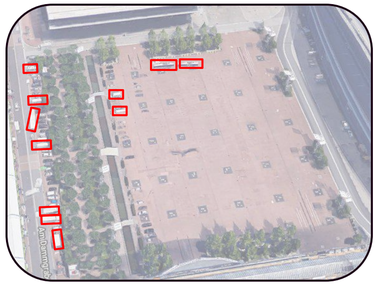
Silhouette Detection



Petrol Stations



Shelf optimization



Any Object Detection

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