

Laptop

Coffee

Spoon

# Computer Vision Projects

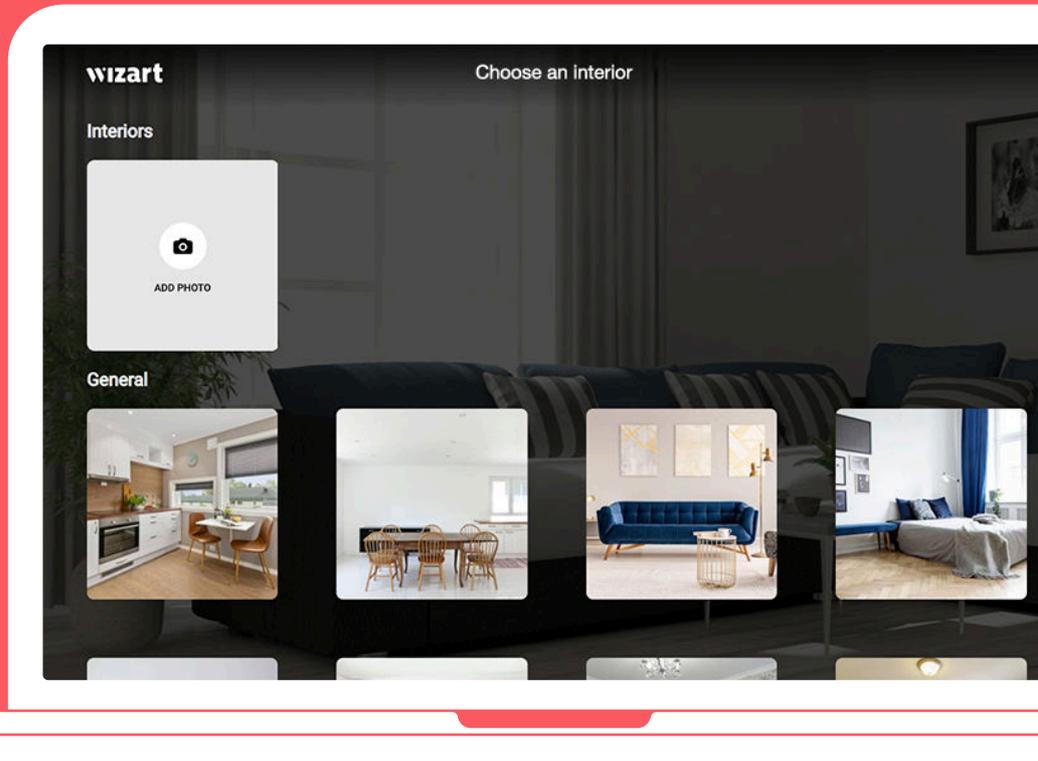
exposit

[www.exposit.com](http://www.exposit.com)

\*Projects' links are not provided due to NDA restrictions

# Wizart

Computer Vision app for visualizing finishing materials and creating interior designs.



## Description

Wizart is a neural network-based computer vision and augmented reality solution for visualizing finishing materials and creating interior designs. The product provides customers with a unique opportunity of trying out wallpapers, painting and flooring in your own home before buying. You can instantly see the new materials in your own interior with the help of simple photo: you just turn on a phone camera, select a suitable type and material and get a photorealistic result preserving the perspectives, scale, and shadows. Wizart supports clear and really good business model – selling people the real stuff, once they've seen it virtually in their room.

## Task

Most people just don't know how a given roll of wallpaper or a can of paint will look like in their homes before purchase; whether it will match other materials, decor, furniture and so on. That is why we've created a Computer Vision Interior Assistant that addresses the imagination gap challenge making customers satisfied with their choice.

## Solution

Exposit developers with enhanced Machine Learning experience took part in the development of the own product Wizart including AI-driven iOS application and Web application that can be easily integrated with an E-Commerce website. Together we created a solution that uses a neural network to show customers new interior design ideas in just a few clicks. After receiving a photo, the application recognizes the ceiling, floor, furnishings and decorations. Then, users have a chance to apply their favorite finishing materials options on the photo and the existing materials are replaced by a new choice. Users can try different types and colours until they satisfied with the results and finished the room repair. We also added an Augmented Reality mode designed for more accurate overlay.

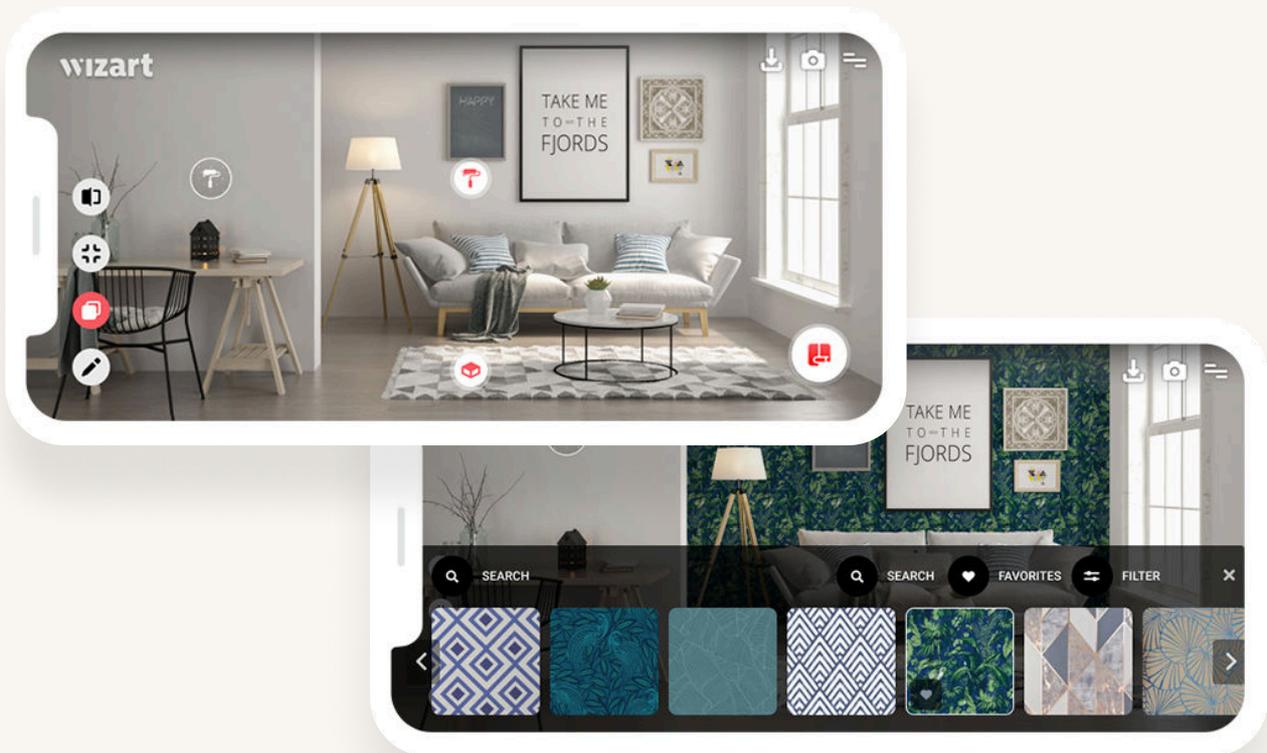
To make the application run according to the algorithm, the following features were implemented:

- Visualization tool for previewing how rooms look in different designs;
- Preserving the shadows, scale and perspectives of the room;
- Distinguishing elements like pillars, wall niches, arches etc.
- The ability to work with design templates;
- A set of finishing materials options available including colours, textures and geometric patterns;
- Eventually, the ability to save the final design for future reference and share it with friends.

Integration options:

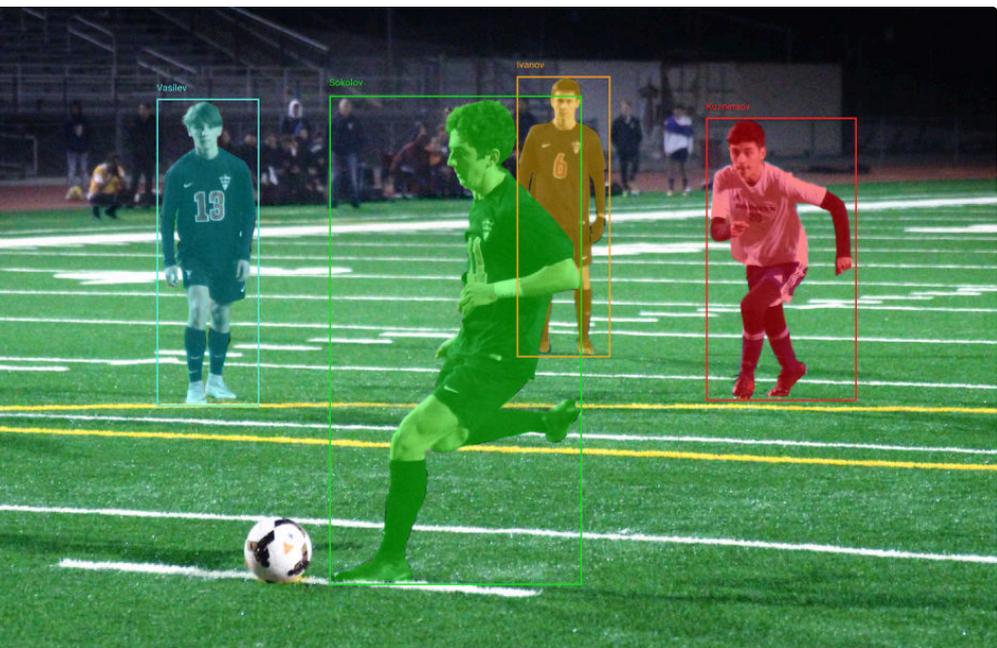
- A plug-in for E-Commerce websites that allows working with app as a with regular online store;
- A workspace or self-service terminal for the offline store.

At the end of the project, we developed an [iOS mobile application](#) with a working algorithm and a web application embedded in E-Commerce websites. After the project completion, [Wizart](#) became a separated company bringing competitive advantages to retailers and unleashing customer's creativity.



### Technologies used

Swift	CoreML	ARKit
Python	Numpy	Docker
Keras	cv2	
Tensorflow	OpenCV	



# Football Analytics

An automated video analytics system designed for football schools.

## Description

A computer vision system for Meteor football schools designed to improve the quality of training analytics and in-club competitions.

Initially, the client monitored and kept records on all the progress and training of students manually. Given that this data pool is constantly growing and needs a lot of resources to analyze, we needed to create a solution that could collect and process various types of data. This way, our client could create individual training programs and increase the involvement of students' parents using the exact statistics and measurements.

## Task

1. Analyze the overall feasibility of a computer vision system to improve the quality of training analysis and in-club competitions.
2. Development of a software solution solving specific tasks of offline football schools:
  - Collecting and processing various types of data;
  - Measuring the dynamics of football players' skills development;
  - Creating individual training programs.

## Solution

The Exposit team worked on a soft-and-hardware solution that allows users to track the movement of football players and balls on the field using cameras and use the collected data to create individual training programs. During the development, we took into account such criteria as cost optimization in terms of equipment, processes automation and a large amount of video data: the client needs to process more than 150 football grounds of various sizes, coverage, layout and lighting at the same time.

Our team reviewed the existing options for sports games analytics to create a solution that meets all the requirements:

- Optical tracking systems, which include the installation of expensive high-tech cameras around the entire perimeter of the football field, as well as a separate paid subscription for the manual annotation of key match events. Such systems provide greater accuracy and allow you to describe the tactical component of the match, but do not contain accurate individual indicators of the players.
- Wearable tracking systems, which involve the use of budget individual GPS-trackers to build analytics, but do not provide high accuracy results. Such systems are used to collect and process data like speed, respiration, the number of jerks and accelerations, etc.

During the research, we found that wearable and optical tracking systems are often used in conjunction for greater accuracy of football analytics. Thus, we needed to create a solution that combines the capabilities of wearable and optical systems to collect and process various types of data without using expensive equipment. This solution turned out to be a computer vision system. Since object detection and tracking is a standard task for machine learning algorithms, we suggested that it is also possible to train a neural network to "understand" actions such as dribbling, passing, intercepting, jumping, tackling, etc.

To test the effectiveness of this solution, our team developed a prototype of football analytics based on computer vision technologies, as well as an operating algorithm - from setting up / calibrating cameras and ground marking to receiving a statistical report. The prototype can detect the player's position on the football field during a match or training session and identify a specific player using the "reference" histograms. Histograms graphically illustrate the number of pixels at each color intensity level creating a unique graph for each player. The result of the system is a file containing data on the coordinates of the players.

Dmitry Kibkalo, Co-Founder of the Meteor Football Schools shared a review for the services provided — please read the full feedback [by the link](#).

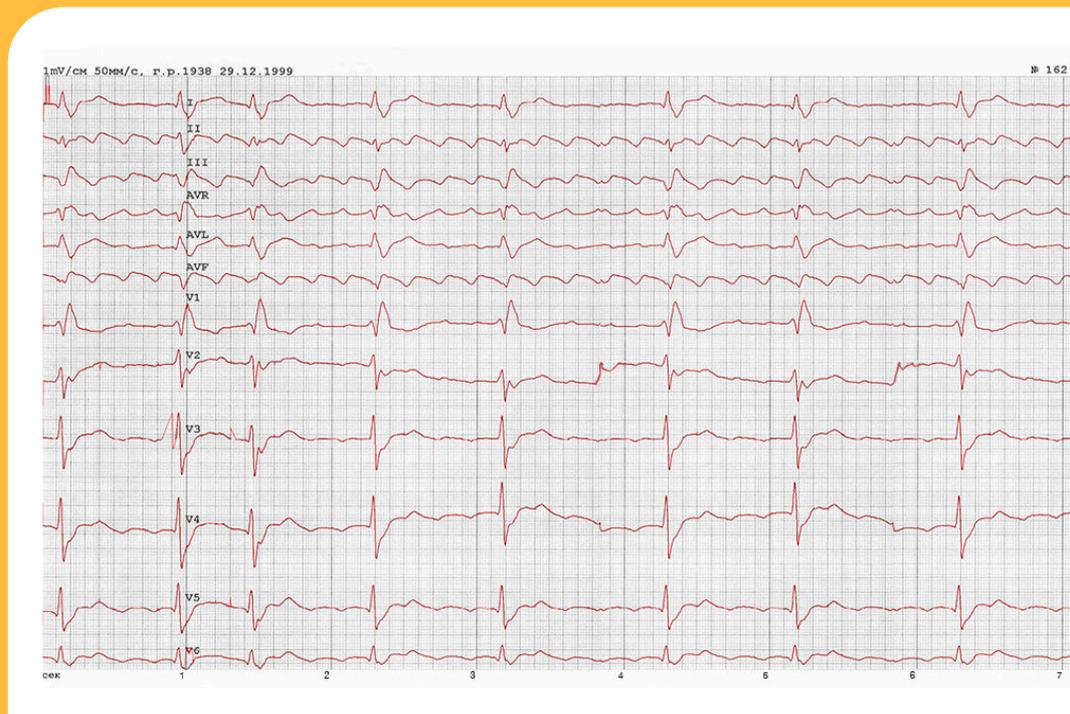


#### Technologies used

OpenCV	Mask R-CNN
Tensorflow	Deep SORT
Keras	Open Pose

# Digital ECG Solution

Computer vision system for ECG digitization designed for cardiologists.



## Description

Computer vision system for ECG digitization designed for cardiologists.

With the help of the Machine Learning algorithm, the software solution digitalizes a graphical scanned ECG image printed from an electrocardiograph into a digital data storage format EDF without losing any diagnostic information. This way doctors can easily exchange information about the heart examinations in case of need for recommendations from colleagues, additional automatic or manual data analysis.

## Task

Young professionals in the field of cardiology often face complex and controversial cases in their medical practice. Many of them don't have the opportunity to get expert opinions or advice from more experienced colleagues in their workplace. Doctors have to use standard communication tools like messengers and a smartphone camera to exchange the results of cardiac examinations and collaborate on a deeper study of particular cases.

Counselling by phone and sending photos of cardiograms cannot provide high-quality visualization for evaluating the results that can badly affect the accuracy of the diagnosis and correctness of further treatment. In order to avoid inaccuracies that could affect the quality of medical care and professional development, cardiologists need a software solution for digitizing and transferring data without losing diagnostic information. The most effective solution for digitalizing medical images is a Computer Vision system, so we created a neural network-based software solution to provide a convenient exchange of information and professional experience between cardiologists.

## Solution

The Exposit team started the development of solution with the research and testing the effectiveness of the idea in case of ECG data digitalization. We created an algorithm that can process one type of ECG image that contains one ECG window, horizontal channels and a visible grid. The algorithm detects the grid and horizontal channels in the image, then separates them, removes visual noise and digitizes as a graph in the EDF (European Data Format) format. The EDF format is the standard for storing and exchanging medical time series that allows doctors and patients to send, receive and analyze data effortlessly using any independent software.

ECG digitalization solution improves interoperability between health organizations and allows cardiologists to remotely receive recommendations from colleagues, improve their skills and, accordingly, the quality of medical care.



## Technologies used

Python	Scipy	scikit-image
Numpy	PyEDFlib	XlsxWriter
OpenCV	Matplotlib	



# Dairy Farm

Computer Vision solution for tracking cows on a dairy farm.

## Description

Dairy Farm is a Computer Vision solution designed to monitor animal health on a dairy farm. The application identifies and tracks cows using a neural network that allows workers to see how often cows come to feed and how much they eat. This way they can understand whether animals are healthy or need care.

## Task

Implementation of the identification algorithm in the client's application to track specific cows and their coordinates.

## Solution

Our customer contacted us to solve the particular challenge: the client's application for dairy farms couldn't track specific cows and their coordinates. The issue was in the absence of the identification functionality. We have set neural network to solve the existed problem and allow system to identify cows by their unique features like animal color, shape, size and so on. How it works?

A neural network processes a set of images and reads unique signs repeated from frame to frame. Such functionality allowed our customer to track cow's movements and see how often cows come to feed and how much they eat. This way he understands whether they are healthy or need care.

## Technologies used

Inception ResNet v1