

Convolutional Neural Network Applications: License Plate Recognition

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Automatic License Plate Recognition (ALPR) is a critical area of research in computer vision with wide-ranging applications in traffic management, law enforcement, electronic toll collection, and security.

In this exploration, we will leverage our knowledge of computer vision and machine learning to develop a Convolutional Neural Network (CNN)-based system for detecting and extracting data from Iranian license plates.

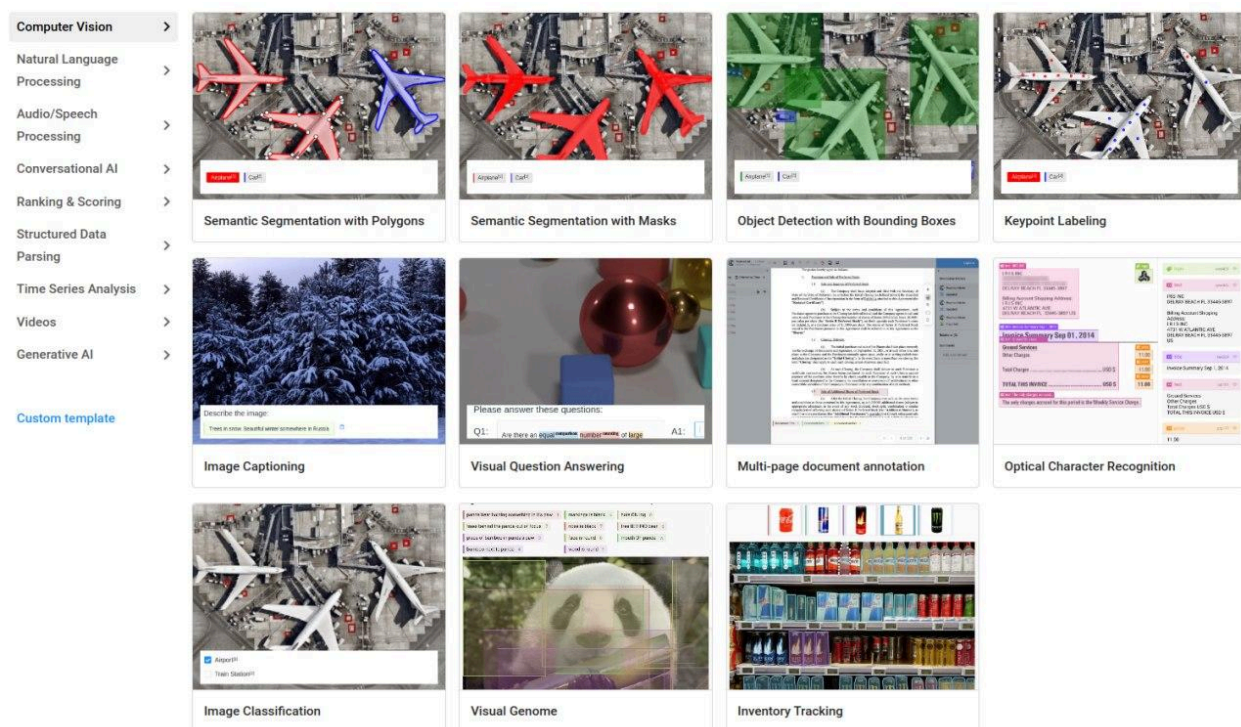
1. Preparing Dataset

We will start our journey from scratch, so we need to label and prepare our dataset.

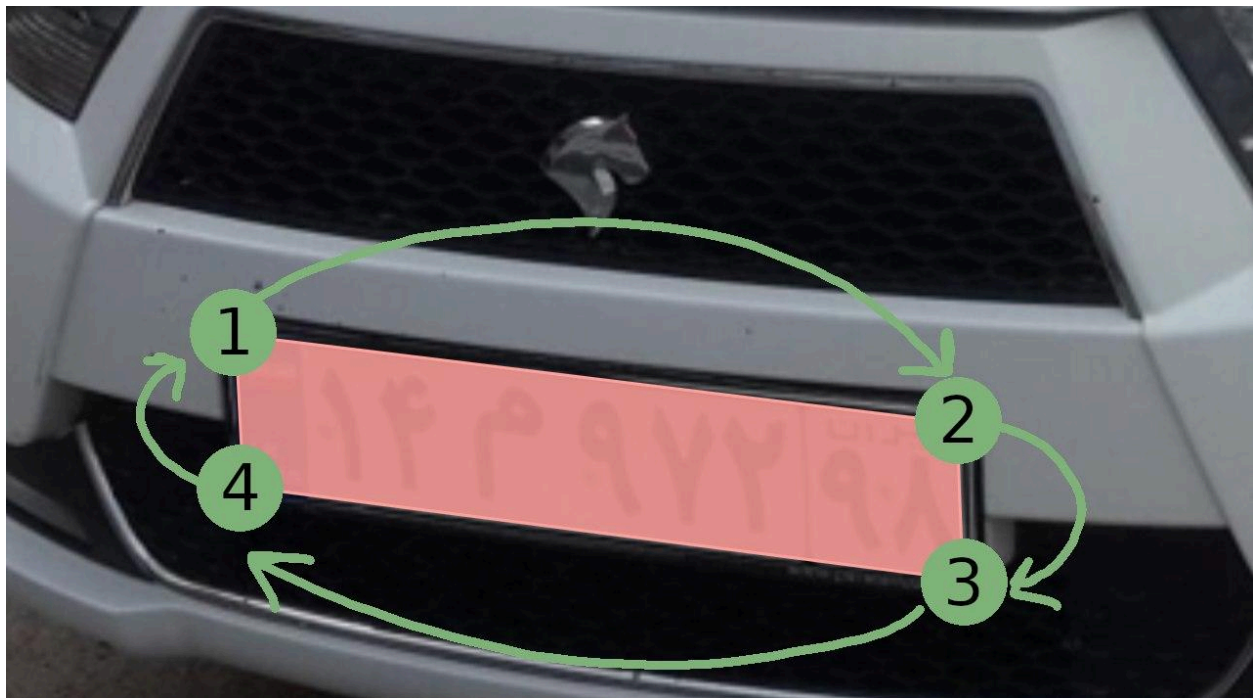
1.1. Label your dataset

Dataset labeling is a crucial step in supervised learning tasks. Many tools are available for labeling datasets, such as CVAT, Labellmg, and Label Studio. These tools support a variety of dataset types and labeling tasks.

For labeling the four corners of the license plates, we will use the "Semantic Segmentation with Polygons" interface in Label Studio



To label an image, navigate to the relevant project and choose the image. If you're labeling multiple images, utilize the "Label All Tasks" option for batch labeling. Once you've opened the annotation tab, select the label category you want to annotate (e.g., Plate) and begin annotating from the top left corner of the plate, continuing clockwise until you return to the starting point.



Ensure you identify exactly four corner points and return to the starting point from the last one.

1.2. Application: Car plate masking

Now that we have identified the four corners of the license plate within the image, let's delve into some exciting applications!

You might have come across websites like Divar (a platform for advertisements) that conceal car license plates in vehicle listings for security purposes.

In this task, we will leverage our knowledge of geometric transformations to obscure the license plate area in our labeled images with the logo of KNTU University!





To accomplish this, we'll create a function in the `masking.py` file that takes the original image, the coordinates of the four corners of the license plate along with a cover image, and returns a new image where the license plate is seamlessly covered by the cover image.

You can export some labeled samples from Label Studio and use `kntu.jpg` for testing your function.



2. Extract the Plate Image

Let's advance our game with the four corners! Our next move involves extracting the plate image.

2.1. Transform the plate

Use your knowledge of geometric transformations to complete the function in the `extract.py` file. This function should take an image and the four corner points of a license plate as inputs, and return the license plate image with a corrected perspective and an aspect ratio of 4.5 (the aspect ratio of Iranian license plates).





2.2. Application: Car plate blurring

Referring back to part 1.2, there are other approaches to conceal the license plate such as blurring. In this task, you need to use the previous parts in the [blurring.py](#) file to blur the license plate in an image.



3. Design a Regression CNN ...

References & Resources

- <https://labelstud.io/guide/install>
- https://youtu.be/A0cob_f5BmM?si=50bU4e8ejCqUdrMy
- Lab 8