Paper 1:

Paper: Serkan Ozbay, and Ergun Ercelebi. Automatic Vehicle Identification by Plate Recognition. *World Academy of Science, Engineering and Technology 9 2005*.
https://static.scaytrase.ru/cnr/article-cnr-eng.pdf

Summary: The authors demonstrate how to locate the plate on a car image and how to recognize the characters. The algorithm starts from converting the original RGB image into a binary image based on luminance and then locates the plate by examining the number of white pixels in each row and column. It then cuts the plate area into character pieces and uses a statistical correlation approach to recognize each character.

Applicability: Our project is to extract the plate information from a car image, which involves recognizing the car, recognizing the plate, and recognizing the characters on the plate, so this paper can be used as the second step of our project. It can also be used for the last step but we are thinking of using a convolutional network to do so, which we expect to have higher accuracy.

Issue: This algorithm converts images into binary images based on luminance. The authors assume that all characters on the plate are black so that it is easy to separate them from the plate background. However, characters can be different colors in the real world and can therefore affect the conversion result.

Paper 2:

Paper: Gabriel Resende Gonçalves, Sirlene Pio Gomes da Silva, David Menotti, William Robson Schwartz (2016). Benchmark for License Plate Character Segmentation. *Journal of Electronic Imaging, 25 (5), pp. 1-5, 2016, ISBN: 1017-9909*.
http://www.ssig.dcc.ufmg.br/ssig-segplate-database/

Summary: The paper shares their way of recognizing the license plates from the images. Instead of first recognizing the cars first, they skip this step and focus on recognizing the characters. They give more details about segmenting the characters than the recognition itself. However, the paper still provides some useful methods and ideas for some steps of our project.

Applicability: The group provides a database for license plates, which contains about 2000 images, and we are going to apply for it. The database can be a resource for training the computers to segment the characters after we extract the plates from the images. We can also use the ideas to recognize the characters.

Issue: Though the paper mentioned CNN, it did not talk much about how to train the computers by CNN, which means we need to figure out how to do that by ourselves. We need to either come up with our one own ideas on that or look for other papers talking about that.

Paper 3:

Paper: Rizvi, S.T., Patti, D., Björklund, T., Cabodi, G., & Francini, G. (2017). Deep Classifiers-Based License Plate Detection, Localization and Recognition on GPU-Powered Mobile Platform. *Future Internet, 9, 66*.
https://www.semanticscholar.org/paper/Deep-Classifiers-Based-License-Plate-Detection%2C-and-Rizvi-Patti/d2e013b64925502e7de6f6c72a508d6c3fd6c114

Summary: This paper presents an embedded platform-based Italian license plate detection and recognition system using deep neural classifiers. The authors simplified the workflow to perform plate recognition on the mobile platform. This paper also presents a heuristic approach for character detection and localization. It generates 21 partly overlapping classifications and chooses the one with the highest confidence every 3 of them.

Applicability: Both of the original and the simplified approaches may be applicable to our project. Though we are not considering applying our project to a mobile platform, the timing is always an issue. We can use the simplified approach to reduce our runtime.

Issue: The heuristic approach for character detection and localization is based on the fact that the Italian license plates have 7 characters. However, in other countries, the number of characters in a plate is not fixed. College and university plates may have from 4 to 7 characters. It also proposes an error correction method to correct the result based on the fact that the Italian plates all have two letters, three digits, and then two letters format, but it is also not true for plates in other countries.