Digital Image Processing

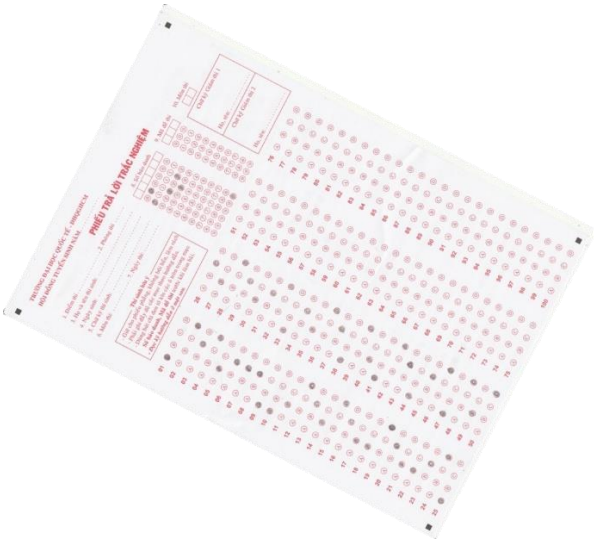
*PROJECT #1.*

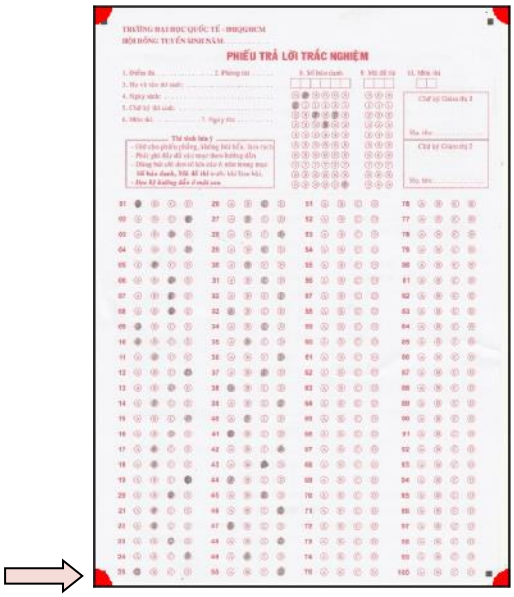
# Lab. #06 _ Grading MCQ tests

***Instructor:*** Dr. Ha Viet Uyen Synh.

***Software:*** Python 3.6.3, Numpy, OpenCV, PyTorch

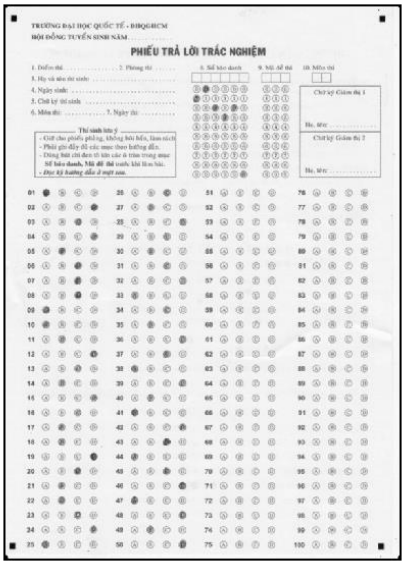
In the previous lab, we calibrated an answer sheet to upright direction using Harris edges/corners and perspective transform.

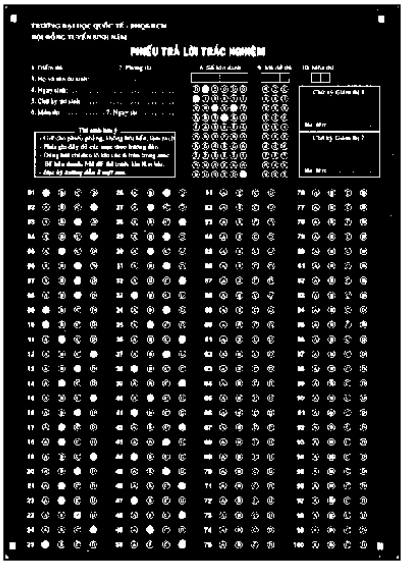




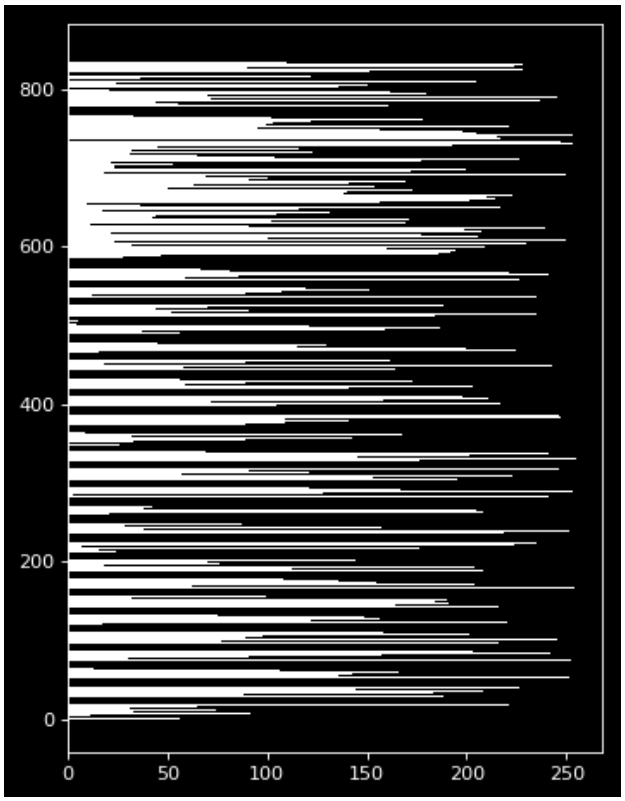

*In this lab, we aim to detect user's answers by examining histogram with respect to row and columns*.

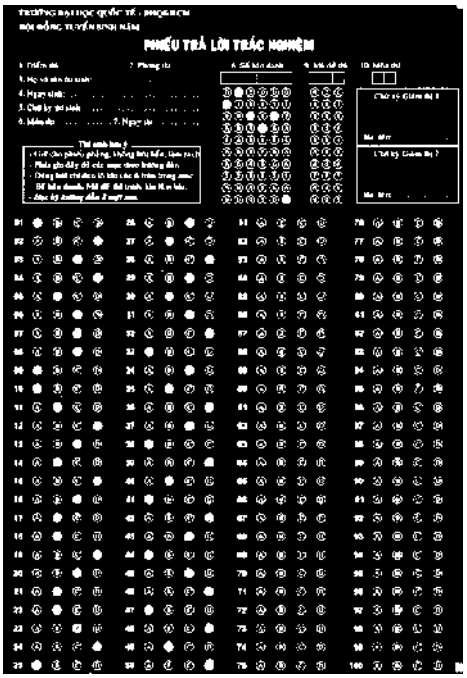
1. First, we import necessary libraries: NumPy, OpenCV, PyTorch
2. We read result image of the previous lab in gray scale mode, namely 'result-Rotation.png' (Image can be downloaded from Blackboard). Then we apply a inversed binary threshold to create a negative image which highlights content.



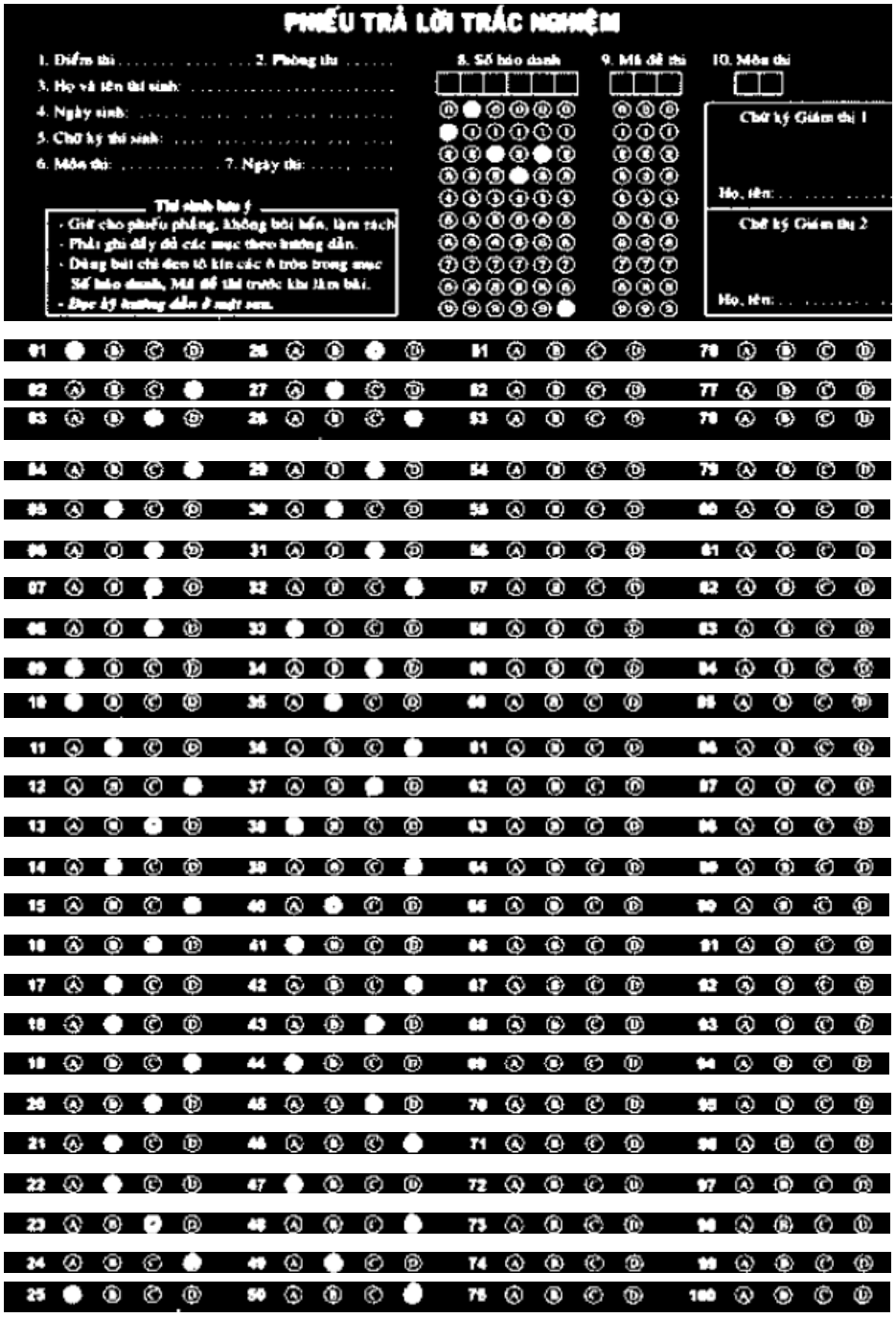




3. Calculate white pixel of each row to create a statistical image such as the figure following

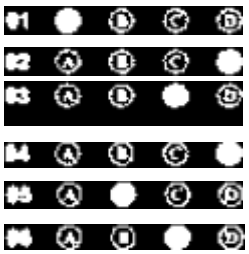


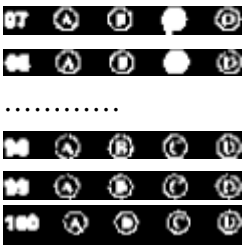




4. Based on the statistical image, point out those sections containing answers




5. For each section, calculate white pixel of each column to determine questions.





6. Extract the answer in each question by evaluating white pixel density at each column

Here are 10 examples of our final output

```
**********************************************************
Question 001 : A
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**********************************************************
Question 002 : D
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**********************************************************
Question 003 : C
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```
**********************************************************
Question 004 : D
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```
**********************************************************
Question 005 : B
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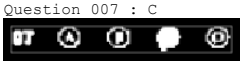
```
**********************************************************
Question 006 : C
```


```
**********************************************************
Question 007 : C
```


```
**********************************************************
Question 008 : C
```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**********************************************************
Question 009 : A
```


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**********************************************************
Question 010 : A
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