

## ASSIGNMENT 2

### Introduction

RR Mechatronics B.V. is an international company having their offices at Hoorn and Zwaag. They are passionate about the invention and development of highly precise analytic instruments. RR Mechatronics, established in The Netherlands in 1986, focuses on medical analytics laboratory instruments. They serve IVD laboratory customers and OEM-partners all over the world.

RR Mechatronics is the world leader in automated Erythrocyte Sedimentation Rate (ESR) instruments. Tens of millions of ESR tests are performed every year with RR Mechatronics instruments, the only ones fully complying with the gold standard Westergren Method. In addition to ESR solutions, RR Mechatronics has developed a unique and highly specialized red blood cell (RBC) analysis platform to evaluate the rheology of blood. It measures, among others, RBC deformability and aggregation and is used in the diagnosis and treatment of malaria, sickle cell disease, and RBC membrane disorders. In addition to the hematology related instruments, RR Mechatronics develops very specific environment related high technology instruments. To complement their instruments, they offer diluents, cleaning-agents, control, and specific reagents.

### Assignment Statement

On the manufacturing side, they prepare state-of-the-art test tubes which are used for the collection of blood, plasma, urine and other samples. So, there are different categories of test tubes depending on the sample they collect and the structure they have. RR mechatronics have installed Robots which are intended to place test tubes into its respective category shelf. For that, there is a need to write a deep learning algorithm to make the robot understand the correct class or label of the test tube. The test tubes, they use can be categorized into approximately 8 classes as shown in the image below.

- BD-Vacutainer
- EDTA(K2)
- Monovette
- PLAIN
- SGS
- Vacurette
- Vacutest
- Venosafe

For deep learning, there is a need to have a big dataset but the images provided by them are fewer i.e. 72 images, check the test tube folder. The files are heavy, so you have to apply shrink function (shared on the Moodle).

After shrinking, you have to augment (expand) the dataset, for each category keeping in mind to apply those operations which are viable. You have to develop a Multiclass Classifier with accuracy of above 85%. You can go for transfer learning as well for better performance. You can get help from this link to see the implementation of VGG16 (Pre-trained Model)

[How to Classify Photos of Dogs and Cats \(with 97% accuracy\) \(machinelearningmastery.com\)](https://machinelearningmastery.com/how-to-classify-photos-of-dogs-and-cats-with-97%-accuracy/)

### Output Format

Code file is not required, a pdf report with your model-development journey will work with important outputs (graphs+ images) you displayed, while running the code. You can add some chunks of code in that file as well to highlight what parameters did you use and how did it affect your model performance.

**Level 1:** Data Augmentation 2 (Points)

**Level 2:** Model designing, compiling and fitting (with parameters adjustments) +  
Diagnostics plots (7 Points)

**Level 3:** Model Testing and Confusion Matrix to show the model performance (2 Points)

Confusion Matrix is used to represent the testing results of a classification problem i.e. what are the actual labels of the tested images and how many are correctly or incorrectly classified?

[for confusion matrix, check this link for help [\[sklearn.metrics.confusion\\_matrix — scikit-learn 0.24.2 documentation\]](https://scikit-learn.org/stable/modules/generated/sklearn.metrics.confusion_matrix.html)