The ore content estimation in the mineral processing plant with the aid of the ML proces. from classification to measurement

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INTRODUCTION

The flotation process is critical for separating valuable minerals from an ore. The rapid and on-line assessment of the metal content in the flotation froth is very important for the efficiency of the metal extraction process in the mineral processing plant. The X-ray measurement systems are commonly used for this task. However, the systems are rather expensive and the whole process is time consuming.

The various approaches were made for enhance and optimize the mineral beneficiation process. The **Artificial Intelligence (AI)** algorithms based on **Machine Learning (ML)** where the **Linear Discriminant Analysis (LDA)** is applied, were successful in this task.

The **AI** algorithm utilizes the classification process of flotation froth images recorded during the flotation process. The froth content estimation algorithms have undergone the laboratory tests and have shown that they have potential for significant improvement of the accuracy and efficiency of the flotation process
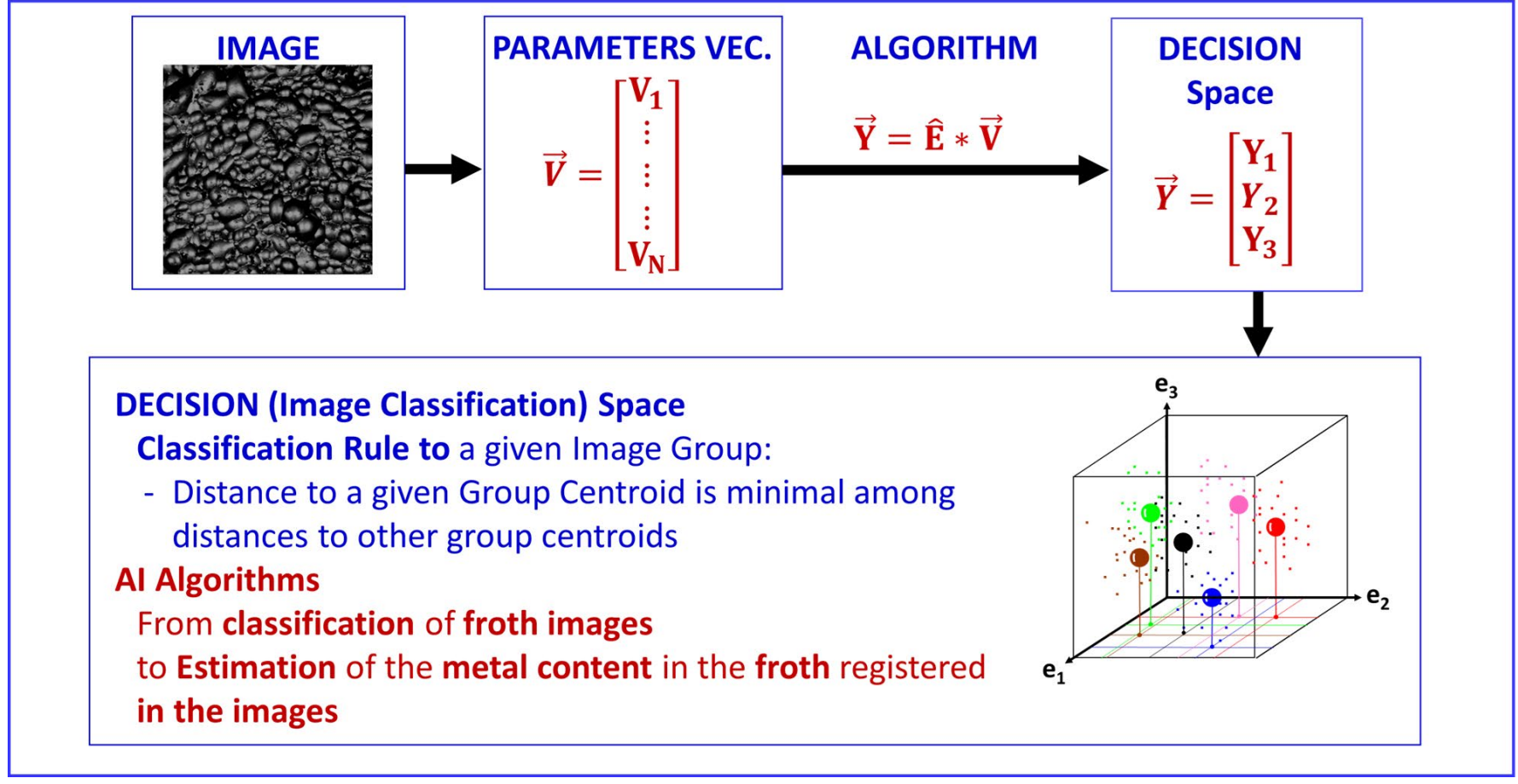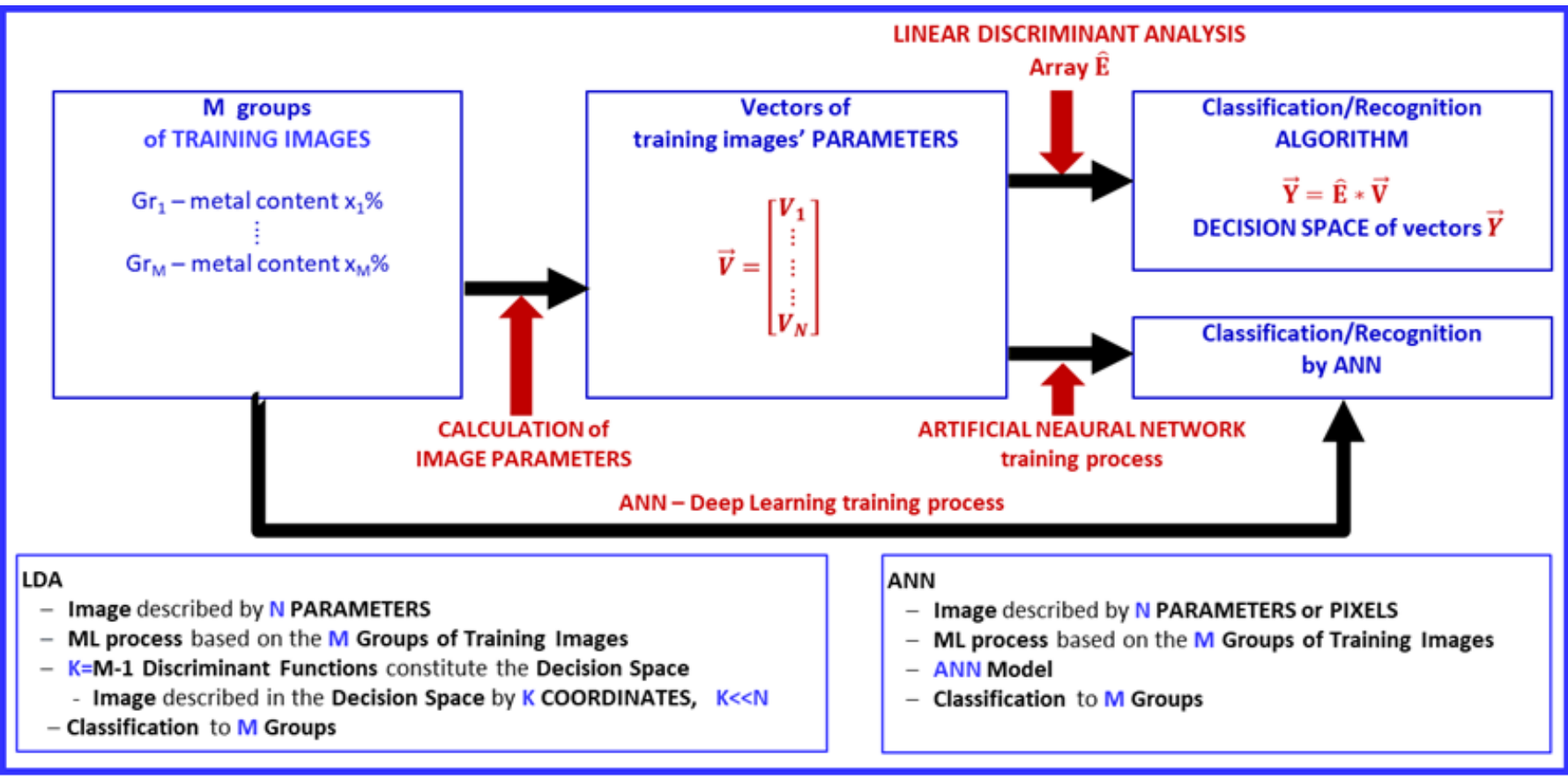
METHODS

Machine Learning process defines relations between froth content and froth image parameters.

1st step:
Registration of Froth Images & Froth Sampling
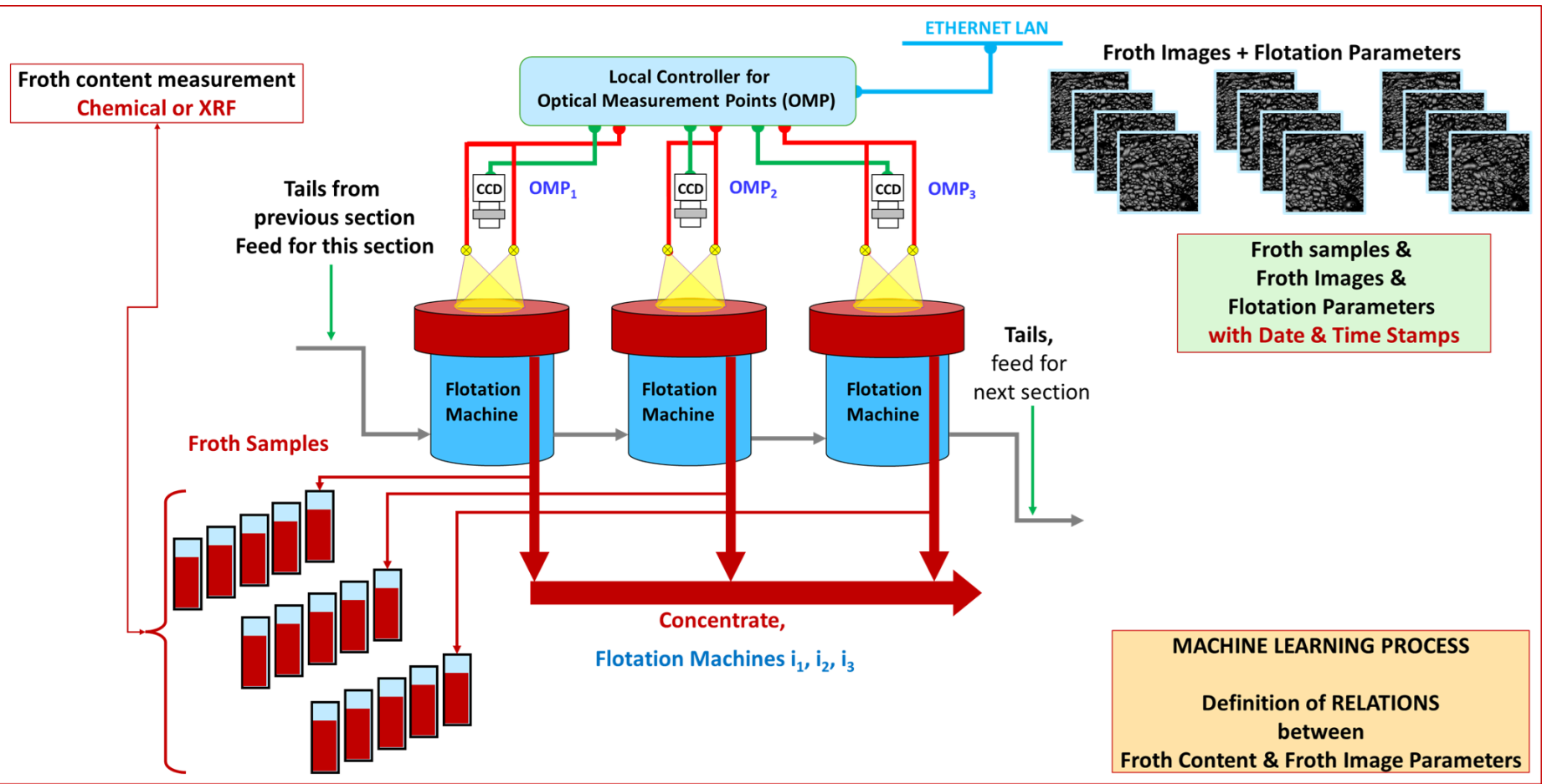
2nd step:
Statistical Data Processing & Analysis

ML Process defines the **RELATIONS** between the **Froth Content** and **Froth Image Parameters**
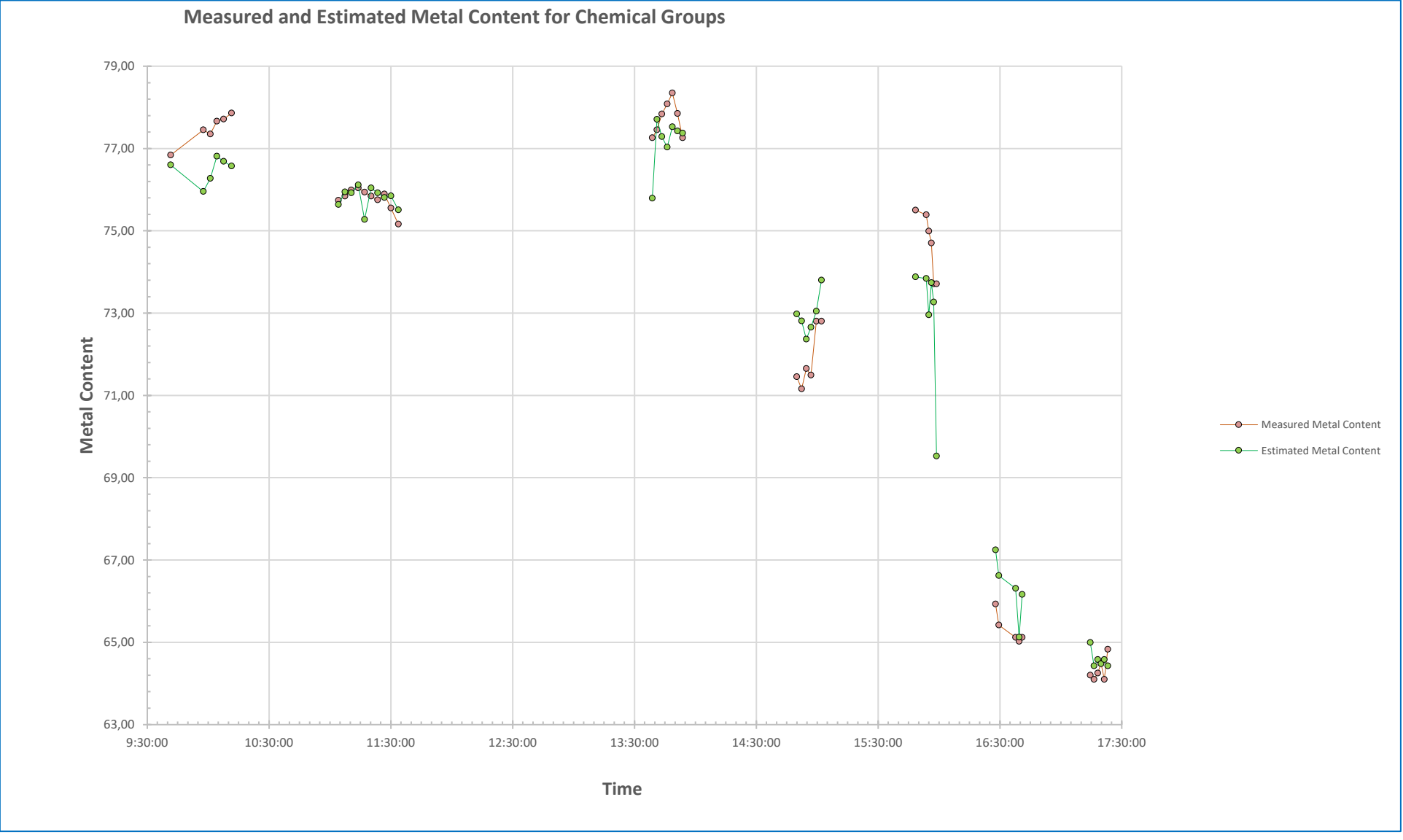

RESULTS

ML process in KGHM

The estimation algorithm of the metal content in the flotation froth allowed us to estimate the average metal content for groups of images. The estimation results are presented in the figure above.

The standard deviation of the relative error for the metal content estimation is equal to 1.42% for the groups of images.

CONCLUSIONS

The oobtained results show that it is possible to build the estimation algorithm of the metal content in the froth on the base of the froth images registered during the flotation process and then processed and analyzed. This algorithm was based on the results of the classification process built during the ML process. The relative estimation error is on the level acceptable for monitoring and control of the flotation machine in real time.

REFERENCES

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