

## Screening candidates of unicellular organisms in microscopic images using machine learning

\*園家 俊<sup>1</sup>、出村 裕英<sup>1</sup>、吉村 義隆<sup>2</sup>、奥平 恭子<sup>1</sup>

\*Takashi Sonoke<sup>1</sup>, Hirohide Demura<sup>1</sup>, Yoshitaka Yoshimura<sup>2</sup>, Kyoko Okudaira<sup>1</sup>

1. 会津大学、2. 玉川大学

1. University of Aizu, 2. Tamagawa University

Characteristic classification of cells in microscopic images is an important technique in the fields of biotechnology, medical, space etc. In the above technique, it is important to extract only the focused cells from the microscopic image. Examples are the space missions Tanpopo [1] and STARDUST [2]. A large number of images are continuously captured in the depth direction by mechanically setting a constant reference. Manual searching by humans for a target object from a large amount of image group requires much labor. In this study, screening a single microscopic image. Automatic screening of a target object from a group of microscope images is very important in reducing labor.

This study uses the microscopic images of Life Detection Microscope (LDM) [3] as experimental data. The microscopic images of LDM are subjected to fluorescent dyeing treatment. The microscopic image is *E.coli* with reference to the density of microbes in Atacama Desert [4]. There are sparsely populated cells in the image, thus it is suitable to recognize each cell. Since cells are subjected to fluorescent staining treatment, it is easy to distinguish cells from others.

As a screening approach, machine learning using Convolutional Neural Network (CNN) [5], which is generally considered effective for image recognition, is used.

The CNN in this study is made in order to classify the cell in LDM's microscopic image. The development language is Python [6], since Python has abundant machine learning frameworks. This study uses TensorFlow [7] as a framework. TensorFlow is a license-free machine learning library provided by Google. Consequently, CNN was a valid approach in identification of the cell, but it cannot classify the focused cell or not.

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