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# Introduction

This contribution introduces a new use case for data augmentation.

### -----------------------Start of change 1-------------------------------------------

## 7.2 Use case #x – Data Augmentation for AI/ML services

*Editor’s Note: The section introduces a AI/ML use case that uses IoT data.*

### 7.2.1 Description

Image recognition generally use data augmentation methods. Such as; Medical imaging domain utilizes data augmentation to apply transformations on images and create diversity into the datasets. For example, combining pre-trained deep network architectures with multiple augmentation techniques enabled accurate detection of breast cancer from a very small set of histology images with less than 100 images per class [paper: “Deep convolutional neural networks for breast cancer histology image analysis]. The reasons of data augmentation interest in healthcare are

* Small dataset for medical images
* The use of medical image augmentations helped to improve the results of segmentation of hand radiographs and bone age assessment etc.
* Sharing data is not easy due to patient data privacy regulations
* There are only a few patients whose data can be used as training data in the diagnosis of rare diseases

### 7.2.2 Source

### 7.2.3 Actors

* AI/ML management application: an application managing AI/ML image data
* AI-enabled IoT platform: An IoT platform collects image data from various sources

### 7.2.4 Pre-conditions

* The AI-enabled IoT platform holds a set of good quality image data for AI/ML
* The AI-enabled IoT platform provides features to handle requested image augment techniques
* The amount of collected source images to build a model is not enough.

### 7.2.5 Triggers

* AI/ML management application requests to augment data to build AI/ML model

### 7.2.6 Normal Flow

Figure 7.x.6 illusrates the high-level flows of data augmentation for AI/ML use case, which consists of the following steps:

* Step 1: The AI/ML management application sends a request to the AI-enabled IoT platform to augment source images. The request may include the following information:
  + Source images
  + Data augmentation techniques to apply
  + Additional information for a selected data augmentation technique, for example, the number of images to generate after applying the data augmentation technique.
* Step 2: The AI-enabled IoT platform analyses the received request and stores retrieved information internally
* Step 3: The AI-enabled IoT platform applies the selected data augmentation technique and generates a set of augmented images. The IoT platform stores generated images with their own identifiers.
* Step 4: The AI-enabled IoT platform returns the result to the AI/ML management application. The results may include a summary of the requested data augmentation, for example, the number of generated images, links to access such augmented imanges

### 7.2.7 Alternative Flow

None

### 7.2.8 Post-conditions

The AI-enabled IoT platform has data set for the source images and augmented images from the source.

### 7.2.9 High Level Illustration

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### 7.2.10 Potential Requirements

1. The oneM2M System shall be able to handle data augmentation requests for AI/ML purposes.
2. The oneM2M System shall be able to generate augmented data resources from a given source data and data augmentation technique.

### -----------------------End of change 1-------------------------------------------