Cloud-Based Image Processing

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# Introduction

The aim of this exercise is to get acquainted with the basics of programming using cloud-based image processing software. The exercise will be performed in the Python programming environment. Utilizing it, we will call remote Clarifai (cloud-based image processing software) functions.

# Setup

Please boot the computer into **Windows** and log in. Below are instructions for setting up an environment for computer vision applications (Python + image processing libraries).

**Python** is a general-purpose high-level programming language with an extensive standard library package, whose guiding principle is the readability and clarity of the source code. Its syntax is characterized by transparency and brevity.

**Clarifai** is an Artificial Intelligence (AI) cloud service that specializes in computer vision and uses machine learning and deep neural networks to identify and analyze images and videos. The cloud service offers its solutions via API, mobile SDK, and on-premises solutions.

Unfortunately, the Python environment, along with the OpenCV library, is not configured by default on the computers in the lab. Therefore, the easiest way to start working in this environment is to download a VirtualBox computer program, serving as the second type of hypervisor (<https://www.virtualbox.org/wiki/Downloads>). Then, please check the Download folder for an image of a Deep Learning Virtual Machine (VM). Most probably the VM is already there. In case it is not, please download it using this local mirror[[1]](#footnote-1): (<http://www.kt.agh.edu.pl/~miklesz/DeepLearningVM_for_VirtualBox.tar.gz>). If the mirror does not work, please ask the tutor for assistance.

Having the VM image, you can start the environment. Please find and launch VirtualBox (seek for the icon shown in [Figure 1](#9qpt8y9sij0k)), Having VirtualBox running before you start the VM, first change its settings. Dedicate it around 1.9 GB of RAM, 128 MB of video memory and allow it to use 2 CPUs. Having done that, please start the virtual machine. After it boots, you should see a desktop like the one in [Figure 2](#vbjl9onuysaq).

More detailed instructions for launching the Deep Learning VM can be found at: (<https://medium.com/@ageitgey/try-deep-learning-in-python-now-with-a-fully-pre-configured-vm-1d97d4c3e9b>).

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| **Figure 1.** VirtualBox’s launcher icon |

**Tip 1**: If you feel that the virtual machine’s graphics are working too slowly, enable: Settings/Display/3D Acceleration (in settings of the virtual machine - available in VirtualBox). Additionally, choose *VMSVG* as the renderer (see the drop-down list above the checkbox enabling 3D Acceleration).

**Tip 2**: Please note that if you use Python, there might be two independently configured versions installed on the machine: Python 2 (**python**) and Python 3 (**python3**). The two versions are not always compatible. We advise to use Python 3 as Python 2 support officially ends in January 2020.

**Tip 3**: To install Clarifai for Python, you must execute the following command (the ‘$’ symbol means you do not need administrative privileges to run this command):

**$ pip install clarifai-grpc**

Please keep in mind that *the pip* command on this virtual machine installs packages only for Python 3.

**Tip 4**: In case of error messages saying that the **pip** version is too old, you must upgrade it by executing the following command (**it can be noted that this should not be necessary and may break your virtual machine configuration**):

**$ pip install --upgrade pip**

**Tip 5**: In case of error messages saying that you do not have sufficient permissions, you can use the root (administrator) account. **Before you do so, please first consult with the tutor.** The password for the root account is *deeplearning.*

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| **Figure 2.** An exemplary computer vision application started in the “Deep Learning VM - Ubuntu 16.04 - 64-Bit VirtualBox” virtual machine |

# Tasks

Please perform the following tasks (in the order of their appearance).

## Tags Extraction on Images via URL

Please perform automatic extraction of machine markers (tags), using Clarifai and Python (the script should be written in Python 3).

Start by creating a free Clarifai account (see the lecture slides for details).

After creating a free account, the next steps are: (i) create a new application and (ii) generate the application key (the key should be put in the script; see the lecture slides for details).

The script should point the Clarifai API to a URL path to an image (see the lecture slides for details).

Finally, please print the output data. As the response is formatted using JSON (JavaScript Object Notation), it is better to use **pprint** (data pretty printer) instead of the regular **print**. To use **pprint**, please import it using:

**from pprint import, pprint**

## Classifying Image Content with Images Sent as Binary Data

Send the binary payload of an image and receive back predictions from the **general** model.

**Please note that for this exercise you do not find the appropriate functions in the lecture slides. Independent studying of the documentation is necessary.**

## (Optional) Classifying Video Content

Please send a binary payload to a video through the Clarifai API. You should receive back tags for each second of a video.

Please note that similarly to the previous exercise, you must look through the documentation to find appropriate API functions.

**If you manage to make this exercise, please send your source code to the tutor.**

**The additional exercise is worth 5 points.**

# Additional References

1. “Getting Started Guide | Clarifai Developer” (link to the documentation),  
   <https://www.clarifai.com/developer/guide/>
2. “Sign Up | Clarifai Developer” (setting up a free account),  
   <https://clarifai.com/developer/account/signup>
3. “Applications | Clarifai Developer” (creating a new application),  
   <https://clarifai.com/developer/account/applications>
4. “API Keys | Clarifai Developer” (generation of the application key),  
   <https://www.clarifai.com/developer/account/keys>

1. Note that the file has the \*.tar.gz extension. This is a compressed archive. To extract its contents please use the 7zip software. Specifically, open the downloaded file with 7zip and navigate into the file having the \*.tar extension (7zip now decompresses the first “layer” of compression). Now, extract the contents of this \*.tar file (1 folder with 3 files; 7zip now decompresses the second “layer” of compression). [↑](#footnote-ref-1)