



Fish Identifier Trained Using Synthetic Datasets

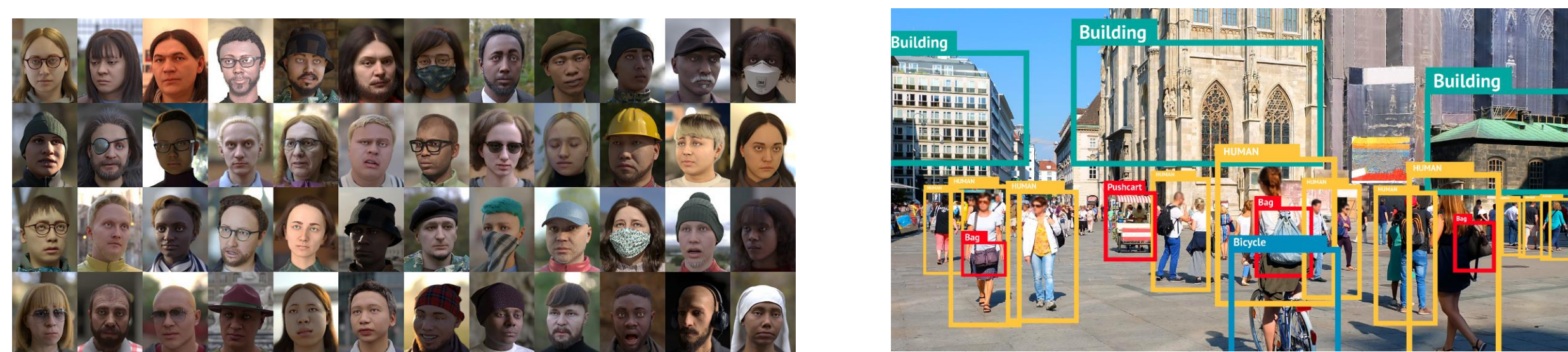
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Introduction

- Machine Learning is an AI form that allows a system learn from data instead of learning from explicit programming.
- Object detection models are computer vision tasks where objects in an image are localized and classified.
- In recent years the YOLO (You Only Look Once) object detection model has proven to have superiority in terms of efficiency over its predecessors and other state of the art models, according to Bochkovskiy and Wang (2020).
- To train a ML model, big data sets are needed (tens of thousands of images)
- Synthetic data augmentation is being used to increase the size of datasets
- Zoe Gastelum and Timothy Shean (2020), managed to conclude in their training study with synthetic images that despite obtaining better results with real images, the implementation of synthetic data is effective.
- Microsoft research Fake it till you make it (2021) used only cutting-edge VFX photorealistic datasets and showed that the effectiveness is comparable with real datasets with the benefit of consuming less resources.
- According to Siczka and Pariczek (2020), the Blender graphic tool is useful for the generation of synthetic data since it allows to generate realistic 3D models and take images from different angles and different backgrounds with noise, giving variety to the dataset.
- The project intends to create a fish identifier using only synthetic data just as efficient, if not more, than using real data.



Methods

Set Up:

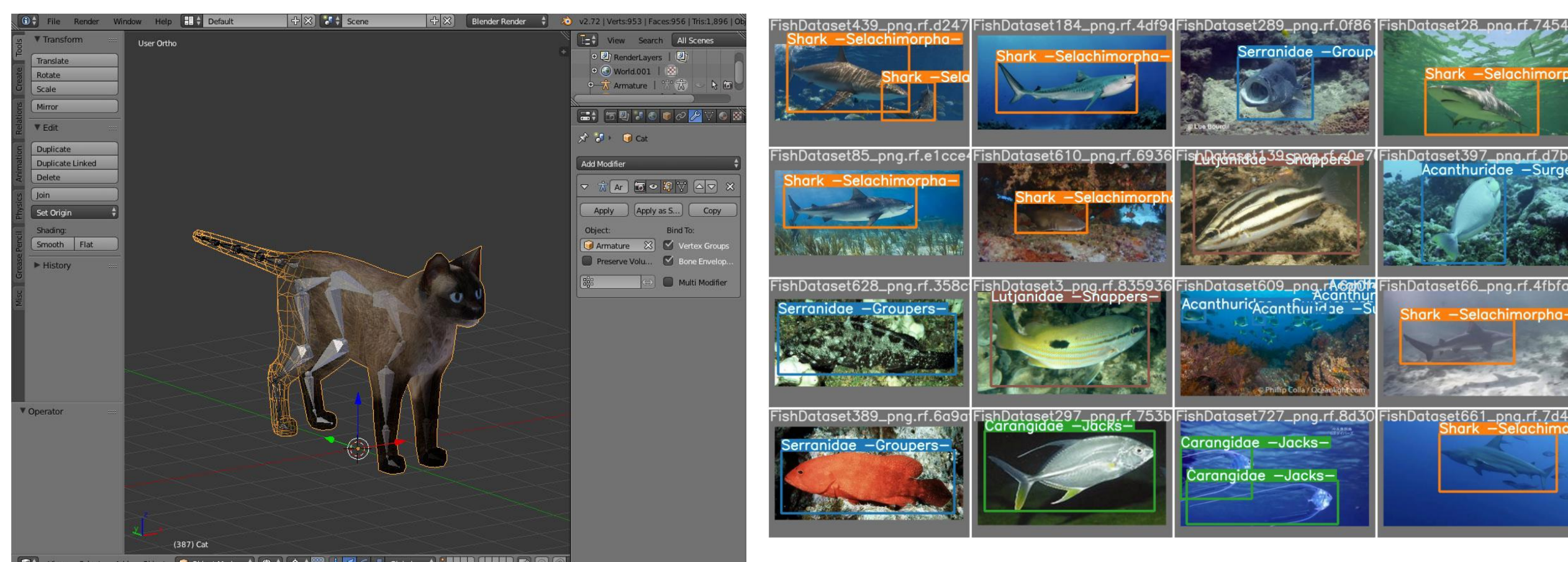
- Colossus: Intel I7-9800x processor, GeForce RTX 2080 GPU, 125.5 GB Memory, 5.5 TB HDD, Linux OS

Software:

- Scaled YOLO v4 (Most efficient version): Object detection model
- Blender: Graphic design software with access to python commands that generates 3D rendered images

Data:

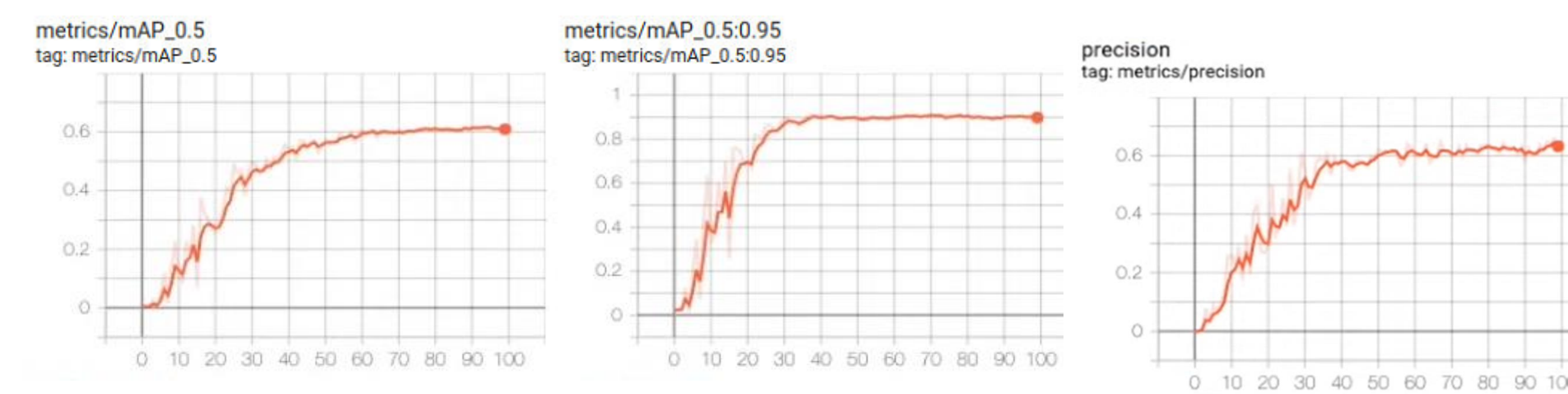
- Blender generated synthetic dataset
- 3D graphic models of fish



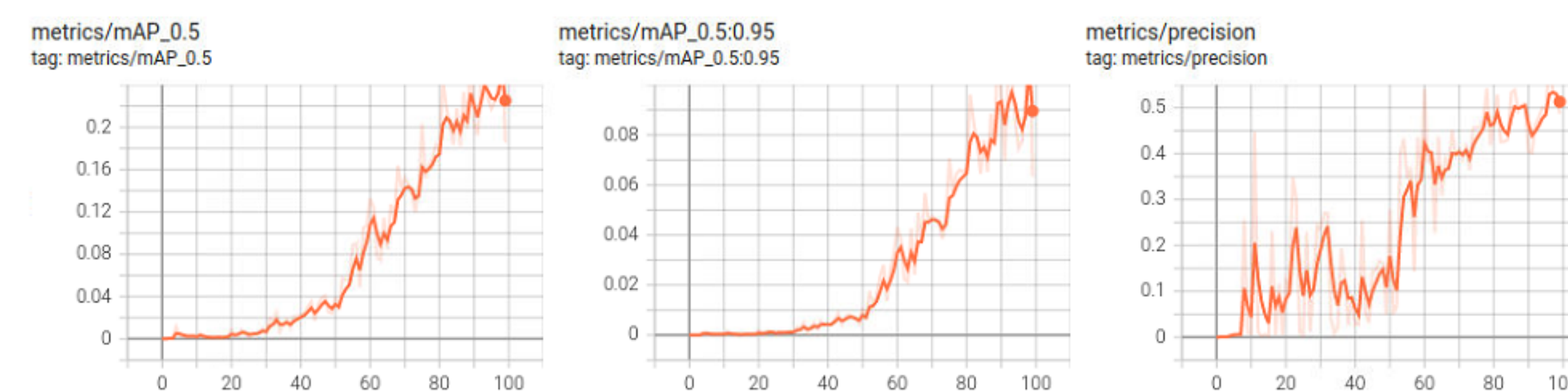
Discussion

This project is still ongoing, and throughout its development, different limitations have emerged. Colossus is a computer where other research projects are being carried out. These projects require the installation of libraries, drivers, frameworks, among others. Anaconda3 is used to create virtual spaces or environments the installations can be made without being at risk of having compatibility issues and putting the base (root) at risk. For our project, it is necessary to install drivers to run YOLO; such as Cuda or CuDNN; that provide greater access to the GPU. In the meanwhile, a Google Collab (Notebook) assembled by RoboFlow with a version of YOLO is used. Tests have been carried out with testing datasets and fish datasets found in the RoboFlow database.

Testing dataset:



Fish dataset:



The training with the testing dataset showed a top of Mean Precision Average of 0.9, while the fish dataset barely reached 0.3.

The following steps in the project are the correct installation of YOLO to take advantage of the power of the Colossus GPU; implementing the Blender script for the synthetic dataset generation; and finally, training YOLO.

References

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Acknowledgements

- John Sutor, for being of great help with understanding Convolutional Neural Networks, and figuring how to properly use Blender with Python
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