

# GBRAS\_SW

Software for steganalysis in the spatial domain

User manual

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# GBRAS-Net

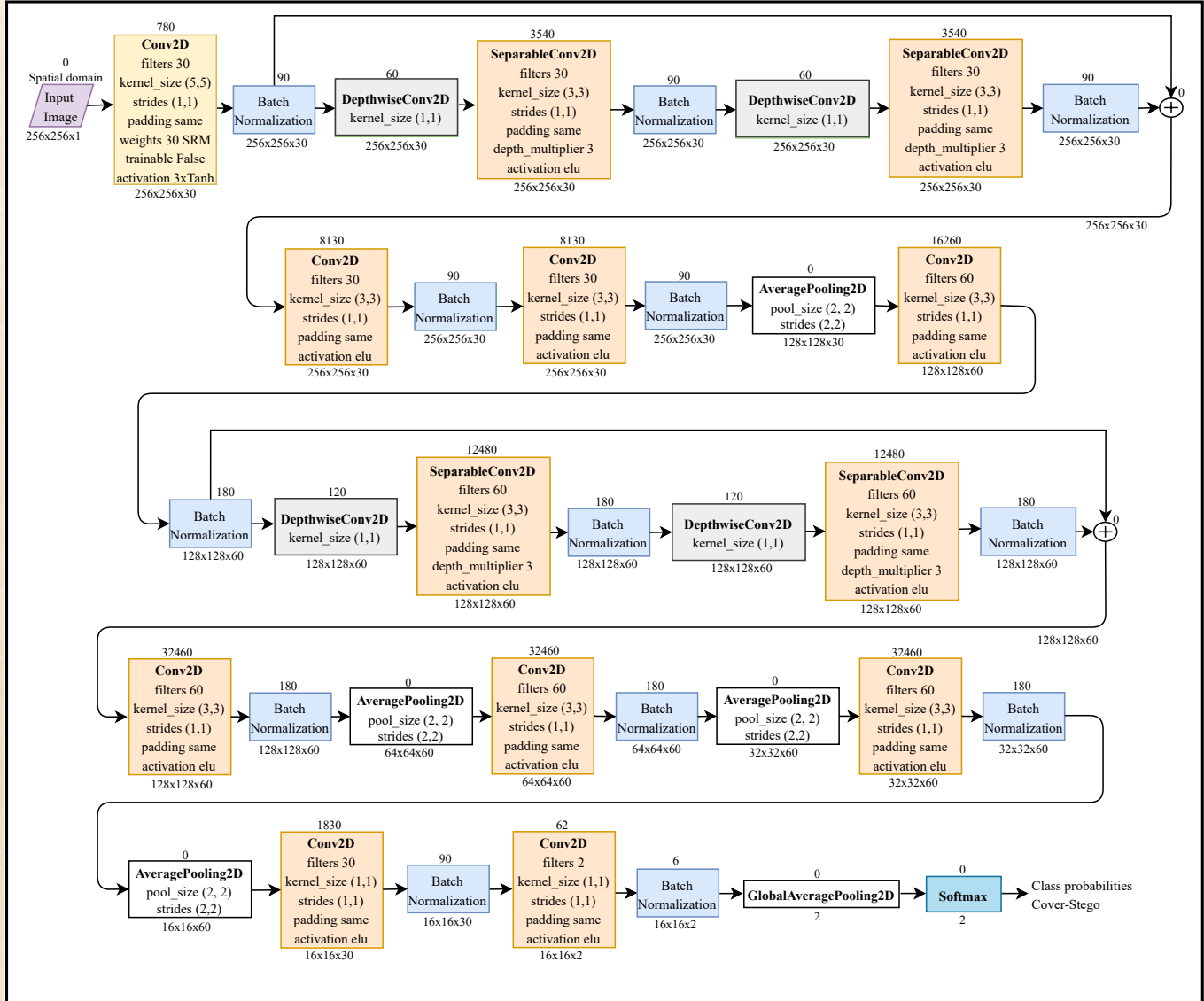


Figure 1: GBRAS-Net convolutional neural network based on [1]

## GBRAS\_SW

GBRAS\_SW is a software for the detection of steganographic images in the spatial domain. An in-depth explanation of GBRAS\_SW can be found in [1]. The convolutional neural network of this software is shown in **Figure 1**. This software for preprocessing stage maintain the 30 SRM filters (see **Figure 2**) and has a 3xTanH activation function. GBRAS\_SW uses the ELU activation function in all feature extraction convolutions. GBRAS\_SW uses shortcuts for feature extraction and separable and depthwise convolutions. This software does not use fully connected layers; the network uses a softmax directly after global average pooling.

## PREREQUISITES

The GBRAS\_SW requires the following libraries and frameworks:

- **GIT**
- **Python 3.10 (64-bit)**
- **Windows 11**
- **VSC (Visual Studio Code)**

## INSTALLATION

Create a folder, and inside it, clone the repository:

```
git clone https://github.com/BioAITeam/GBRAS_SW.git
```

In the terminal, create a virtual environment using Python 3.10:



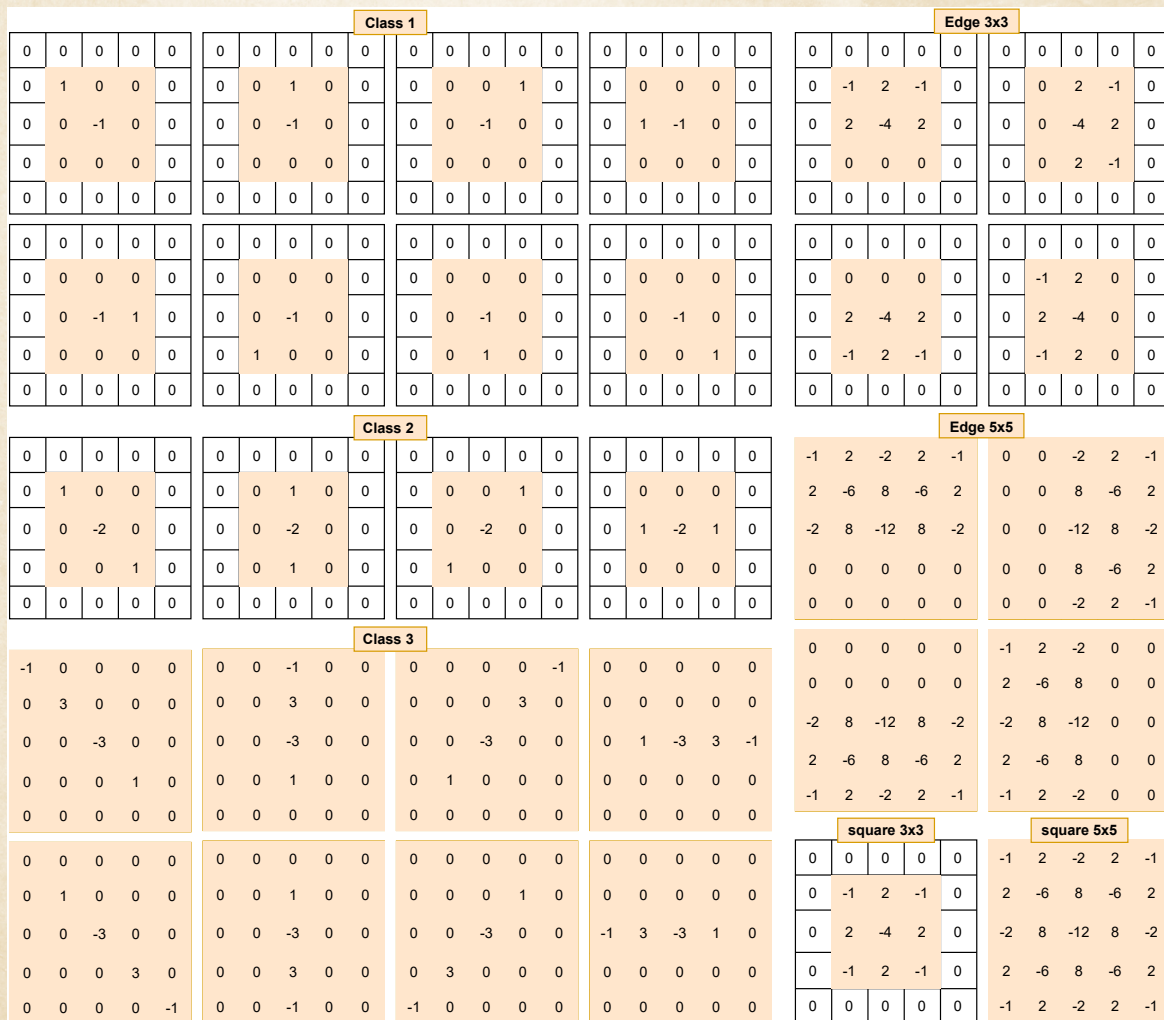


Figure 2: 30 SRM based on [1]

**py -3.10 -m venv venv**

Activate it:

**venv\scripts\activate**

Install the dependencies:

**pip install -r requirements.txt**

The `requirements.txt` file will install:

- **tensorflow==2.8.0**
- **opencv-python==4.10.0.84**
- **scikit-image==0.24.0**
- **xlsxwriter==3.2.0**
- **protobuf==3.20.3**
- **numpy==1.23.5**

In the case of TensorFlow 2.8.0, ensure that you have Python 3.10. You can verify the version at: <https://pypi.org/project/tensorflow-gpu/2.8.0/#files>.

## GBRAS\_SW EXECUTION

In the repository, there are two folders: one with images and the other with models. The images

folder contains eighty cover and stego images for testing the software. You can add more images to this folder to test the software's accuracy in detecting cover and stego images in the spatial domain. The image format is Portable Gray Map (PGM).

In the `models` folder, there are four models: `S_UNIWARD` and `WOW`, with two payloads, 0.4 and 0.2 bpp, respectively. You can choose any of the four models to perform a cover or stego image prediction. For example:

Run the command as follows:

```
python GBRAS_SW.py -i ./images -m
./models/S-UNIWARD_0.4bpp.hdf5
```

```
python GBRAS_SW.py -i ./images -m
./models/WOW_0.4bpp.hdf5
```

```
python GBRAS_SW.py -i ./images -m
./models/S-UNIWARD_0.2bpp.hdf5
```

```
python GBRAS_SW.py -i ./images -m
./models/WOW_0.2bpp.hdf5
```



## AUTHORS

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**Harold Brayan Arteaga Arteaga** is an undergraduate student in electronic engineering at Universidad Autónoma de Manizales since 2017. He has received highest honor roll and top-class distinctions and was valedictorian in 2016. He has been a member of the research group on Bioinformatics and Artificial Intelligence since 2018. He has participated as speaker in research meetings with RREDSI network and the first Congress of Biomedical Engineering and Bioengineering in 2019. He was accepted as a young researcher for 2021 by Minciencias, Colombia. He is co-author of chapter 12 of Digital Media Steganography (Mahmoud Hassaballah, 2020). His current research interests include the application of convolutional neural networks to steganalysis, the classification of flow patterns in gas-liquid systems, estimating petrophysical properties from seismic data using machine learning, glioblastoma identification, detecting cancer through deep learning, detecting respiratory system diseases from chest X-Ray imaging, and bioinformatics.

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**Gustavo Isaza** received a B.S. degree in system and computing engineering from Universidad Autónoma de Manizales, Colombia, in 1997. He obtained a master's degree in networking software development from Universidad de los Andes, Colombia, in 1998, and M.Sc./DEA and Ph.D. degrees from Universidad Pontificia de



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## REFERENCES

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[1] T. -S. Reinel et al., "GBRAS-Net: A Convolutional Neural Network Architecture for Spatial Image Steganalysis," in IEEE Access, vol. 9, pp. 14340-14350, 2021, doi: 10.1109/ACCESS.2021.3052494.

## CITATION

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If you used GBRAS\_SW in your research, please cite our paper: T. -S. Reinel et al., "GBRAS-Net: A Convolutional Neural Network Architecture for Spatial Image Steganalysis," in IEEE Access, vol. 9, pp. 14340-14350, 2021, doi: 10.1109/ACCESS.2021.3052494.