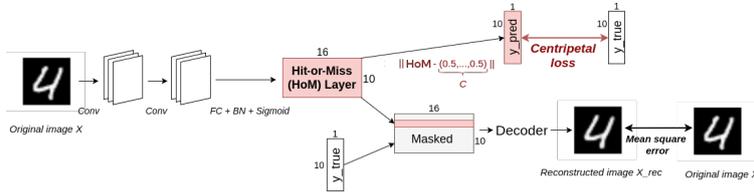


## HitNet, a neural network learning faster and augmenting learning data set



Graphical representation of the structure of our new network, named HitNet. Our contributions are highlighted in red, and comprise a new Hit-or-Miss layer, a centripetal loss, prototypes that can be built with the decoder, and ghost capsules that can be embedded in the HoM layer.

HitNet was developed by Deliège Adrien, Anthony Cioppa and Prof. M. Van Droogenbroeck from the Telecommunications and Imaging Laboratory (ULiège, Montefiore Institute, Department of Electrical Engineering and Computer Science).

HitNet can be used in a wide range of applications where deep learning can be applied such as:

- Video Processing
- Automotive Imaging applications
- Text detection
- Object recognition classification
- Object segmentation
- Detection in Photographs
- Machine Vision systems
- (3D) Medical Imaging / Medical visualization systems

Demo available on: [www.telecom.ulg.ac.be/hitnet](http://www.telecom.ulg.ac.be/hitnet)

### INTELLECTUAL PROPERTY

HitNet is under a patent application process (patent track: Priority number(s) EP3438929A1)

The technology is available at the market condition except in applications of interpretation of audio and video flux from live or semi-live events acquired by multiples sources (fixed or mobile cameras).



### KEY ACHIEVEMENTS

- HitNet is a redesign of a simple network to reach excellent performances where the output layer is replaced by a Hit-or-Miss (HoM) layer.
- This layer contains activated vectors, called capsules, that we train to hit or miss a central capsule by tailoring a specific centripetal loss function. We also show how our network, named HitNet, is capable of synthesizing a representative sample of the images of a given class by including a reconstruction network. This possibility allows to develop a data augmentation step combining information from the data space and the feature space, resulting in a hybrid data augmentation process. In addition, we introduce the possibility for HitNet, to adopt an alternative to the true target when needed by using the new concept of ghost capsules, which is used here to detect potentially mislabeled images in the training data.

### KEY COMPETITIVE ADVANTAGES

- Tool to check the quality of annotations in training data
- Better convergence and stability of the learning from a smaller dataset in artificial intelligence methods
- Data set augmentation combining information from the data space and the feature space

### PARTNERSHIP SOUGHT

- Research cooperation agreement
- Licensing agreement