

# Utilização de “*Generative Adversarial Networks*” (GANs) na Construção de Sistemas de Reconhecimento Inteligentes e Interpretáveis

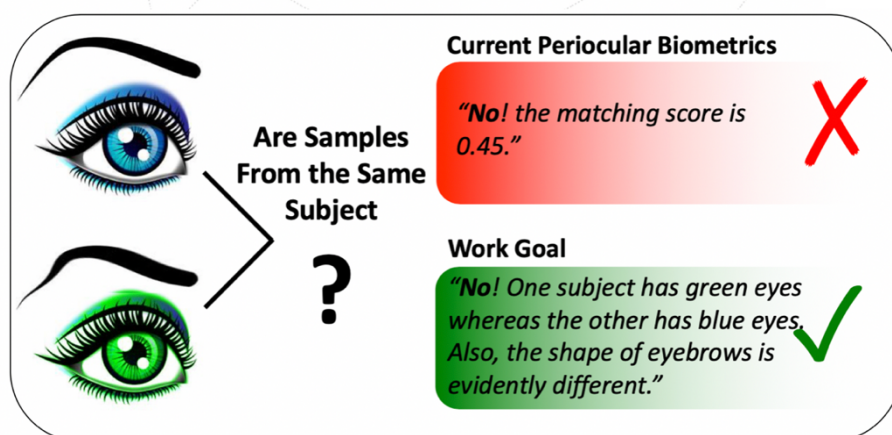
*Proposta de Projeto*

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## 1 Objectives

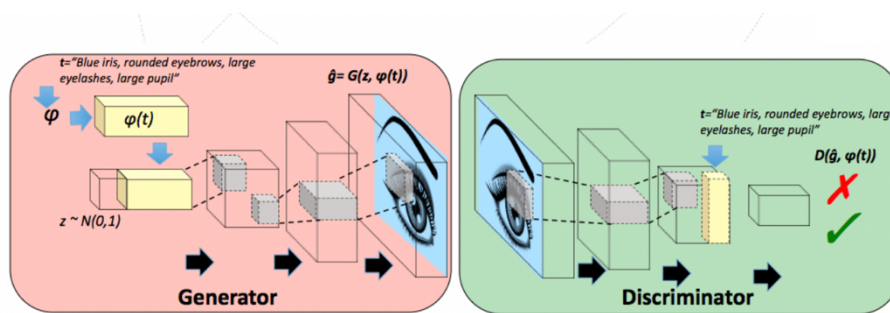
“**Interpretability**” is the key concept in this work proposal. Having interpretable systems is of maximum importance for many fields, which has been motivating growing concerns in the research community. Also, the increasingly larger quantities of data available lead to models of increasingly higher complexity, which responses are extremely hard to be interpreted by humans. In this context, neural-based methods are considered a special case of interest, due to this lack of interpretability.

Henceforth, **this work proposal aims at designing/developing one solution for interpretable biometric recognition**, which will make easier the application of biometrics to forensics, by allowing to explain the reasons that sustain a *match/non-match* response. This way, the work lays at the intersection of two important scientific research topics: 1) biometric recognition; and 2) human-machine interaction.



**Figure 1:** Illustration of the main goal in this Project: develop one system able to “explain” the reasons that justify one recognition response, for a biometric recognizer.

In particular, **the work considers to use Generative Adversarial Frameworks (GANs)** as the main framework for producing interpretable responses. As biometric source, **we consider the periocular region**, in order to obtain understandable text descriptions of: 1) the eyebrows (shape); 2) the eyelids (shape); 3) the iris (color) and 4) the skin (color and texture).



**Figure 2: Schematic perspective of a the framework designed for this work proposal:** Generative Adversarial Network-based solution for developing interpretable periocular recognition systems. A generator  $\mathbf{G}$  receives human-understandable descriptions of a biometric sample and is responsible for generating synthetic samples that accord such descriptions. The discriminator  $\mathbf{D}$  analyzes pairs of biometric samples and human-understandable descriptions and should discriminate between the genuine samples with according descriptions and the remaining types of data (either synthetic samples or genuine samples with wrong descriptions).

## 2 Workplan

**T1:** Study of Generative Adversarial Networks (GANs) for image labelling;

**T2:** Implementation of the solution designed;

**T3:** Tests and optimization;

**T4:** Report writing.

## 3 Academic Prerequisites

- Interest about Artificial Intelligence and Machine Learning domains
- Interest in learning *Python + Tensorflow*.

## 4 Expected Results

- 1 computational prototype
- 1 report

## 5 Contacts

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