2018-00558 - End-to-end face authentication from IR camera to face embeddings

Renewable contract : Oui
Level of qualifications required : Master's or equivalent
Fonction : Internship Research
Level of experience : Recently graduated

About the research centre or Inria department
The Inria Sophia Antipolis - Méditerranée center counts 37 research teams and 9 support departments. The center’s staff (about 600 people including 400 Inria employees) is composed of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrators. 1/3 of the staff are civil servants, the others are contractual. The majority of the research teams at the center are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Six teams are based in Montpellier and a team is hosted by the computer science department of the University of Bologna in Italy. The Center is a member of the University and Institution Community (ComUE) “Université Côte d’Azur (UCA)”.

Context
Blu Manta: we are a young technology start-up developing the latest state-of-the-art machine learning technologies. Our mission is to develop highly embedded softwares able to transform raw signal data into user experience. The first goal of our company is to address the 3D face authentication use case, by proposing innovative methods to reconstruct the depth map coming from optical sensors.

Level : Master Level.
Compensation : SMIC.

Assignment
Description: standard approaches for face authentication rely on methods which learns a lower-dimensional representation of the face (i.e. the embeddings), where similar ‘faces’ are close in this embedding space. These embeddings are computed with a deep convolutional network [4]. In the case of a 3D face authentication, the embeddings are extracted from a combination of IR image and depth map.

Once these embeddings are created, the face authentication just involves a similarity measure between the enrolled embedding vector and those presented during inference. The objective of this project is to study the feasibility of an end-to-end approach, from the IR camera distorted image acquisition to the face embeddings computation. This approach may involve a unified deep neural network in charge of: 1) creating a depth map 2) extracting embeddings. 3) embeddings similarity estimation. Main hypothesis to verify refers to a higher accuracy of this end-to-end system.

Bibliography
Main activities

- Producing a report on the state-of-the-art articles on this domain (3D face authentication), with a particular attention on the feasibility on this approach.
- Identifying a candidate neural network capable to extract good-quality embeddings (e.g., ResNet [5]).
- Identifying a small dataset containing: i) IR distorted images (the dot pattern) ii) the corresponding depth maps iii) the corresponding embeddings.
- Designing a full end-to-end neural network which takes as input the original and acquired dot pattern and return an embedding.
- Testing and benchmarking the embedding representation coming from this network with current state-of-the-art methods.

Skills

Basic programming, preferably in Python, MATLAB, OpenCV, C

Benefits package

- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

Remuneration

Salary: SMIC