LABORATOIRE BORDELAIS DE RECHERCHE EN INFORMATIQUE LaBRI

université de BORDEAUX

Internship Offer: Explainable Evaluation of Biometrics for Bias Discovery

Supervision: Romain Giot (Associate Professor, Université de Bordeaux), Boyu Zhu (PhD Student, Université de Bordeaux)
Location: LaBRI, University of Bordeaux, Talence, France
Start date: From February 2026 (negotiable)
Duration: 6 months
Compensation: The compensation is not yet acquired and will be obtained by the supervisor based on the application profile

Context

Biometric verification systems are widely deployed in daily life, yet they are not perfect. Misclassifications often concentrate on a subset of users, and hidden biases such as demographic imbalance can compromise fairness. Several visualization methods have been proposed to evaluate these systems, including the *ZooPlot* and *ZooGraph*. More recent approaches such as the *Inter ZooPlot (IZP)* and the *Biometric Confusion Matrix (BCM)* provide improved explainability and accuracy.

Challenges remain:

- Limited exploration of their potential to uncover hidden dataset biases
- Scalability when visualizations are applied to large datasets
- Lack of a systematic comparison across different biometric evaluation visualizations

This internship addresses these challenges by combining biometric evaluation, explainable AI, and visualization techniques. The focus will include face recognition and keystroke dynamics, but other biometric modalities can also be considered.

Objectives

- Explore explainable visualization methods to uncover potential biases in biometric datasets
- Investigate how IZP and BCM can be adapted for large scale dataset visualization
- Conduct a comparative study of the effectiveness and limitations of different biometric visualizations such as ZooGraph, IZP, and BCM
- Develop a web tool that transforms score datasets into visual explainable evaluations

Tasks

Visualization Development

- Explore visual analytics strategies to improve existing static visualizations for large datasets such as zooming, grouping, and sampling
- Develop a web interface that turns score datasets into interactive explainable evaluations

Comparative Studies and Dataset Evaluation

- Comparative analysis of ZooGraph, IZP, and BCM
- Generate verification score datasets from biased and unbiased biometric datasets using state of the art models
- Apply BCM to analyze biased and unbiased datasets, studying how matrix reordering highlights potential biases
- Explore new matrix reordering strategies beyond VAT for bias discovery

Candidate Profile

- Master level student (Bac+5, final year internship) in Computer Science, Applied Mathematics, or a related field
- Strong programming skills in Python and familiarity with ML frameworks such as PyTorch and Keras
- Knowledge of visualization techniques
- Interest in biometrics and explainable AI
- Communication skills in English or French
- A recommendation letter is a plus

Outcomes

The internship will contribute to cutting edge research in biometrics and explainable AI. Results may lead to a conference publication.

How to Apply

Please send your CV and Master transcript to the contacts below. In your email, explain your motivation for applying.

- romain.giot@labri.fr
- boyu.zhu@labri.fr

References

- Zhu, B., & Giot, R. (2025). *Biometric Confusion Matrix and Inter ZooPlot: Two Novel Visualizations for Biometric Verification Evaluation.* IEEE International Joint Conference on Biometrics (IJCB 2025).
- Yager, N., & Dunstone, T. (2008). *The biometric menagerie.* IEEE Transactions on Pattern Analysis and Machine Intelligence, 32(2), 220–230.
- Giot, R., Bourqui, R., & El-Abed, M. (2016). *Zoo graph: a new visualization for biometric system evaluation.* IEEE International Conference Information Visualisation (IV), 190–195.
- Dunstone, T., & Yager, N. (Eds.). (2009). *Biometric system and data analysis: Design, evaluation, and data mining.* Boston, MA: Springer US.