**Fundamentals of Biometrics**

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**Frequency**

Every 2 years

**Remarque**

not held this year

**Summary**

The goal of this course is to give its participants an understanding of and competence with the advanced theories and concepts underlying analysis, modeling and interpretation of biometric data, as well as the state-of-the-art pattern recognition technologies for the design of biometric systems.

**Content**

1. **Introduction to Biometrics**: Identity and Biometrics, Individuality of Biometric Data, Generic Biometric System, Biometric Modalities, Recognition, Verification, Identification and Authentication

2. **Analysis, Modeling and Interpretation of Biometric Data**: Sensing, Representation and Feature Extraction, Local and Global Features, Enrollment and Template Creation, Deterministic, Statistical and Probabilistic Models, Biometric System Errors, Evaluation of Biometric Systems

3. **Leading Biometric Characteristics**: Physiological Characteristics (face (2D and 3D), fingerprints, iris, hand shape and veins, palmprint, ear), Behavioral Characteristics (dynamic signature, voice, gait, typing rhythm), Biological Traces (DNA, odour), Other modalities under development

4. **Fundamental Mathematical Tools for Analysis and Modeling in Biometrics**: Transforms, Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA), Local Texture Patterns, Histograms, Clustering Methods, Gaussian Mixture Models (GMMs), Dynamic Time Warping (DTW), Hidden Markov Models (HMMs), Bayesian Networks, Joint Factor Analysis (JFA), iVectors, Multiclassifiers

5. **Multimodal Biometrics**

6. **Advanced Topics in Biometrics**: Quality of Biometric Data, Robustness and Reliability of Biometric Systems, Ageing and Heterogeneous Biometrics, Soft Biometrics, Person Recognition at Distance, Synthetic Biometric Data Generation, Protection and Revocability of Biometric Templates

7. **Integration of Biometrics into Other Technologies**: identity documents, smart cards, mobile smartphones and tablets, e-technologies, cyber security.

**Keywords**

Biometrics, Identity verification, Identification, Fingerprint, Face, Iris, Signature, Palmprint, DNA.

**Learning Prerequisites**

**Recommended courses**


**Assessment methods**
Multiple.

Resources

Websites

• idiap.epfl.ch/bspg/teaching