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Thesis

To obtain the Engineering Degree

Field : **Computer Science**
Option : **Information Systems and Web Development (SIW)**

Real-Time Attendance Management System using Face Recognition

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Presented by :
Miss. LAOUEDJ Sarah
Miss. AGGOUN Lina

Submitted on July 4th of 2023, In front of the jury composed of :

Dr. Amina BELALIA :	ESI	- Presidente
Pr. Sidi Mohammed BENSLIMANE :	ESI	- Superviser
Dr. Rabab BOUSMAHA :	ESI	- Co-superviser
Dr. Oussama SERHANE :	ESI	- Examiner
Mr. Abdelkrim NACHEF :	ICOSNET	- Invited

Academic Year : 2022/2023

Dedication

“

To my dear father, my shoulder to lean on, the one who whipped so many tears of mine, who always had faith in me, supported me and believed in my potential. To my beloved mother, peace be upon her soul, whom i wish she was here today,

To my elder sister Samia who has always put me first even before her own self, who has done so many sacrifices for me, my sweet sister whom I don't know what would I have done without her, the one who was having my back throughout every step of the way. To my gentle-hearted brothers Faouzi, Mohammed and toufik for always being their for me. To my step-mother and my little sisters Safaa and Aya for their unconditional love, support and encouragement,

To the best partner I could have asked for, Lina for her patience, dedication and for all the joyful moments we had together throughout this journey,

To all those who are dear to me, to each and every one of you,

”

- Sarah

Dedication

“

First and foremost, I would like to express my deepest gratitude to my loving father, whose unwavering support, guidance, and encouragement have been instrumental in shaping me into the person I am today. To my incredible mother, thank you for your endless love, sacrifices, and belief in my dreams,

To my beloved sister, Zahra, and my dear brother, Nadhir, you have been my constant companions, cheerleaders, and confidants. Thank you for your consistent support, encouragement, and uncoditional love,

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To all those who have offered me help and support, whether in close proximity or from afar,and to the cherished friends, mentors, and loved ones who have wholeheartedly believed in me,

”

- Lina

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Abstract

The field of AI has witnessed significant progress in recent years, enabling innovative applications across various domains. Biometrics, a branch of AI, focuses on identifying and verifying individuals based on unique physiological or behavioral traits. Among these biometric modalities, face recognition has gained considerable attention due to its non-intrusive nature and high recognition accuracy.

This thesis explores the development of a novel real-time facial recognition-based attendance management web application. The system employs state-of-the-art deep learning techniques to detect faces, identify spoofing attacks and recognize employees. By combining computer vision and machine learning approaches, the system achieves reliable, efficient and secure attendance management.

The implementation of the facial recognition-based attendance system showcases the potential of AI and biometric technologies in revolutionizing traditional attendance management systems. The results demonstrate the system's effectiveness in accurately identifying individuals in real-time, thereby streamlining the attendance tracking process. Furthermore, the web application offers scalability and flexibility, making it adaptable to various educational or corporate environments.

Keywords : Artificial Intelligence, Biometrics, Face Recognition, Attendance System, Web Application.

Résumé

Ces dernières années, le domaine de l'intelligence artificielle (IA) a connu des avancées significatives, permettant des applications innovantes dans divers domaines. La biométrie, en tant que branche de l'IA, se concentre sur l'identification et la vérification des individus en se basant sur des traits physiologiques ou comportementaux uniques. Parmi les différentes modalités biométriques, la reconnaissance faciale a suscité une attention considérable en raison de sa nature non intrusive et de sa grande précision d'identification.

Cette thèse explore le développement d'une application web de gestion de présence basée sur la reconnaissance faciale. Le système utilise des techniques dd'apprentissage automatique pour détecter les visages, contrer les attaques de contrefaçon et reconnaître les employés. En combinant la computer vision et les approches d'apprentissage automatique, le système parvient à une gestion fiable, efficace et sécurisée de la présence.

La mise en œuvre du système de gestion de présence basé sur la reconnaissance faciale met en évidence le potentiel de l'IA et des technologies biométriques pour révolutionner les systèmes traditionnels de gestion de présence. Les résultats démontrent l'efficacité du système pour identifier avec précision les individus en temps réel, ce qui permet de rationaliser le suivi de la présence. De plus, l'application web offre une évolutivité et une flexibilité, ce qui la rend adaptable à différents environnements éducatifs ou corporatifs.

Mots clés : Intelligence Artificielle, Biométrie, Reconnaissance Faciale, Système de Présence, Application Web.

ملخص

شهد مجال الذكاء الاصطناعي تقدمًا كبيرًا في السنوات الأخيرة، مما أتاح تطبيقات مبتكرة في مختلف المجالات. تركز التقنيات الحيوية، كفرع من فروع الذكاء الاصطناعي، على تحديد هوية الأفراد والتحقق منها بناءً على سمات فيزيولوجية أو سلوكية فريدة. ومن بين هذه التقنيات الحيوية، اكتسبت تقنية التعرف على الوجه اهتمامًا كبيرًا بسبب دقتها العالية.

تستكشف هذه الأطروحة تطوير تطبيق ويب لإدارة الحضور بناءً على تقنية التعرف على الوجه. يستخدم النظام تقنيات تعلم عميق حديثة لاكتشاف الوجوه ومواجهة هجمات التزييف والتعرف على الموظفين. من خلال دمج رؤية الحاسوب ومنهجيات التعلم الآلي، يحقق النظام إدارة حضور موثوقة وفعالة وآمنة.

تُظهر تنفيذ نظام إدارة الحضور القائم على التعرف على الوجه إمكانات التكنولوجيا الحيوية والذكاء الاصطناعي في ثورة أنظمة إدارة الحضور التقليدية. تُظهر النتائج فعالية النظام في تحديد هوية الأفراد بدقة في الوقت الحقيقي، مما يسهل عملية تتبع الحضور. بالإضافة إلى ذلك، يوفر التطبيق الويب مرونة وقابلية للتوسع، مما يجعله قابلًا للتكيف في مختلف البيئات التعليمية أو الشركات.

كلمات مفتاحية : الكلمات الرئيسية: الذكاء الاصطناعي، التقنيات الحيوية، التعرف على الوجه، نظام الحضور، تطبيق ويب.

Liste des sigles et acronymes

ISP	*Internet Service Provider*
SME	*Small and Medium-sized Enterprises*
VSE	*Village and Small Enterprises*
VSE	*Very Small Enterprises*
PoPs	*Points of Purchase*
VSP	*virtual private server*
DDOS	*Distributed Denial-of-Service*
SSL	*Secure Sockets Layer*
LFW	*Labeled Faces in the Wild*
DA	*Data Augmentation*
FD	*Face Detection*
FAS	*Face Anti-Spoofing*
FE	*Feature Extraction*
FR	*Face Recognition*
AI	*Artificial Intelligence*
ML	*Machine Learning*
DL	*Deep Learning*
TL	*Transfer Learning*
CNN	*Convolutional Neural Network*
RNN	*Recurrent Neural Network*
GAN	*Generative Adversarial Network*
DBN	*Deep Belief Network*

LSTM	*Long Short-Term Memory Network*
FFNN	*Feed Forward Neural Network*
AUC	*Area Under Curve*
ROC	*Receiver Operating Characteristic*
mAP	*Mean Average Precision*
FAR	*False Acceptance Rate*
FRR	*False Rejection Rate*
EER	*Equal Error Rate*
HTER	*Half Total Error Rate*
ACER	*Average Classification Error Rate*
YOLO	*You Only Look Once*
FCNN	*Fully Connected Neural Network*
CSPNet	*Cross Stage Partial Network*
SPP	*Spatial Pyramid Pooling*
FPN	*Feature Pyramid Network*
PAN	*Path Aggregation Network*
ELAN	*Efficient Layer Aggregation Network*
E-ELAN	*Extended Efficient Layer Aggregation Network*
BoF	*Bag of Freebies*
ReLu	*Rectified Linear Unit*
BN	*Batch Normalization*
dw	*depthwise*
TP	*True Positive*
TN	*True Negative*
FN	*False Negative*
FP	*False Positive*
LCC-FASD	*Large Crowd collected Facial Anti-Spoofing Dataset*