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MÉMOIRE

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Thème

Machine Learning and Deep Learning for Rainfall Forecasting Using Weather Data.

Présenté par :

- Ms. Hafsa MEDDAH

Soutenu le : 08/ 07/2023 Devant le jury composé de :

- | | |
|-------------------------|-------------|
| - Mr. Sahraoui DHELIM | Superviseur |
| - Mr. Souleymene CHAIB | Superviseur |
| - Dr. KHALDI BELKACEM | Président |
| - Dr. BEKKOUCHE Mohamed | Examineur |

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DEDICATION

First of all, Alhamdulillah the mightiest for giving me the strength and the resolve to finish this work. With that being said, I am dedicating this work to all the lovely people who supported and helped me grow and be the person that I am today, starting with my precious family, my biggest source of strength and the most important part of my life, with my loving parents who never stopped believing in me and supported me every step of the way, and my dearest siblings Abouallah, Khadidja, Assia, Meryam and Ayoub for always sacrificing their time, efforts and money for my sake and never expecting anything in return, I wouldn't be here if it weren't for them and I am forever grateful for their kindness towards me.

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With the increasing impact of global warming and the diverse climatic conditions prevalent in the Globe, the irregularity of rainfall patterns has become a significant concern, and rainfall forecasting has become very challenging.

Our work aims to investigate the effectiveness of using weather data for rainfall forecasting with various learning techniques.

The research objectives encompass identifying the most performant Machine and Deep Learning Algorithms for the rain forecasting task, finding the most relevant weather data features, uncovering the best pairing between the different algorithms and the features for maximized accuracy.

By addressing these objectives, this study contributes to a better understanding of how weather data can be utilized to improve rainfall forecasting.

Keywords: Machine learning, deep learning, rainfall forecasting, climatic changes, climatic analysis, artificial intelligence, weather data

Avec l'impact croissant du réchauffement climatique et les diverses conditions climatiques prévalant dans le Globe, l'irrégularité des régimes de précipitations est devenue une préoccupation importante, et les prévisions de précipitations sont devenues très difficiles.

Notre travail vise à étudier l'efficacité de l'utilisation des données météorologiques pour la prévision des précipitations avec diverses techniques d'apprentissage.

Les objectifs de recherche englobent l'identification des algorithmes de machine et d'apprentissage profond les plus performants pour la tâche de prévision de la pluie, la recherche des caractéristiques de données météorologiques les plus pertinentes, la découverte de la meilleure association entre les différents algorithmes et les fonctionnalités pour une précision maximale.

En abordant ces objectifs, cette étude contribue à une meilleure compréhension de la façon dont les données météorologiques peuvent être utilisées pour améliorer les prévisions de précipitations.

Mots-clés : Apprentissage automatique, apprentissage profond, prévision des pré-

ABBREVIATIONS

- AI:** Artificial Intelligence.
- ML:** Machine Learning.
- DL:** Deep Learning.
- KNN:** K Nearest Neighbors.
- ANN:** Artificial Neural Networks.
- RF:** Random Forest.
- RMSE:** Root Mean Squared Error.
- MAE:** Mean Absolute Error.
- MBE:** Mean Bias Error.
- ELM:** Extreme Learning Machine.
- R²:** R-squared.
- ReLU:** The Rectified Linear Unit.
- LSTM:** Long Short-Term Memory.
- SVM:** Support Vector Machines.
- SVR:** Support Vector Regression.
- NLP:** Natural Language Processing.
- IoT:** Internet of Things.
- NN:** Neural Networks.
- CNN:** Convolutional Neural Networks.

MASE: Mean Absolute Squared Error.

MAPE: Mean Absolute Percentage Error.

BP: Back Propagation.

SOM: Self Organizing Map.

GR: Generalized Regression.

RBF: Radial Basis Function.