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## Thème

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**Time Series and Machine Learning for Rainfall  
Forecasting by Analysing Weather Data in Algeria.**

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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

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

Our work aims to investigate the effectiveness of using weather data for rainfall forecasting in Algeria with Machine Learning. The research objectives encompass identifying relevant weather data specific to Algeria, employing various machine learning and deep learning algorithms and techniques to determine the most accurate approach for utilizing Algerian weather data as input features, and evaluating the effectiveness of incorporating these indices in rainfall prediction models.

By addressing these objectives, this study contributes to a better understanding of how weather data can improve rainfall forecasting in Algeria's context.

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

Avec l'impact croissant du réchauffement climatique et les conditions climatiques diverses prévalant en Algérie, l'irrégularité des schémas de précipitations est devenue une préoccupation majeure et la prévision des précipitations est devenue très difficile.

Notre travail vise à étudier l'efficacité de l'utilisation des données météorologiques pour la prévision des précipitations en Algérie à l'aide de l'apprentissage automatique. Les objectifs de recherche comprennent l'identification des données météorologiques pertinents spécifiques à l'Algérie, l'utilisation de différentes techniques et algorithmes d'apprentissage automatique et d'apprentissage profond pour déterminer l'approche la plus précise pour l'utilisation des données météorologiques algériens comme caractéristiques d'entrée, et l'évaluation de l'efficacité de l'incorporation de ces indices dans les modèles de prévision des précipitations.

En abordant ces objectifs, cette étude contribue à une meilleure compréhension de la manière dont les données météorologiques peuvent améliorer la prévision des précipitations dans Algérie.

**Mots-clés :** Apprentissage automatique, apprentissage profond, prévision des précipitations, changements climatiques, analyse climatique, intelligence artificielle

## 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.
- R<sup>2</sup>:** 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.