PEOPLE'S DEMOCRATIC REPUBLIC OF ALGERIA
MINISTRY OF HIGHER EDUCATION AND SCIENTIFIC RESEARCH

NATIONAL SCHOOL OF TECHNOLOGY
MASTER'S THESIS
INDUSTRIAL ENGINEERING AND MAINTENANCE DEPARTMENT

Selecting an appropriate Deep Learning algorithm for Predictive Maintenance

Abstract:

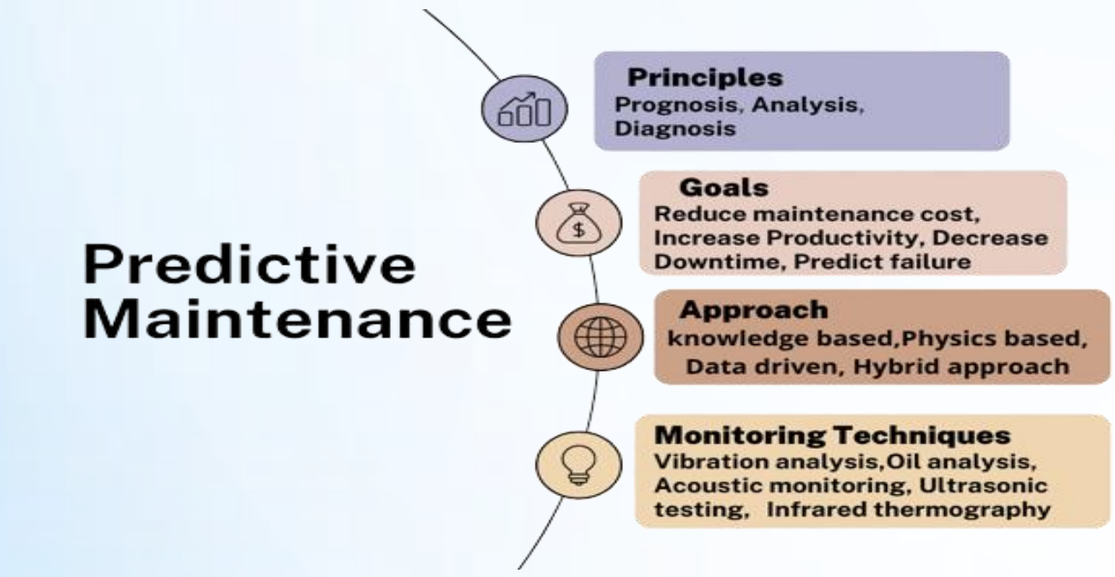
In industries, equipment maintenance is an important key, and affects the operation time of equipment and its efficiency. Thus, equipment faults need to be identified and solved, avoiding shutdown in the production processes. Deep learning (DL) techniques have been emerged as a promising tool in Predictive Maintenance (PdM) applications to prevent failures in equipment. In this context many deep learning algorithms are available. Hence, the research question of this paper is: What are the best deep learning algorithms to resolve predictive maintenance issues?

Objective:

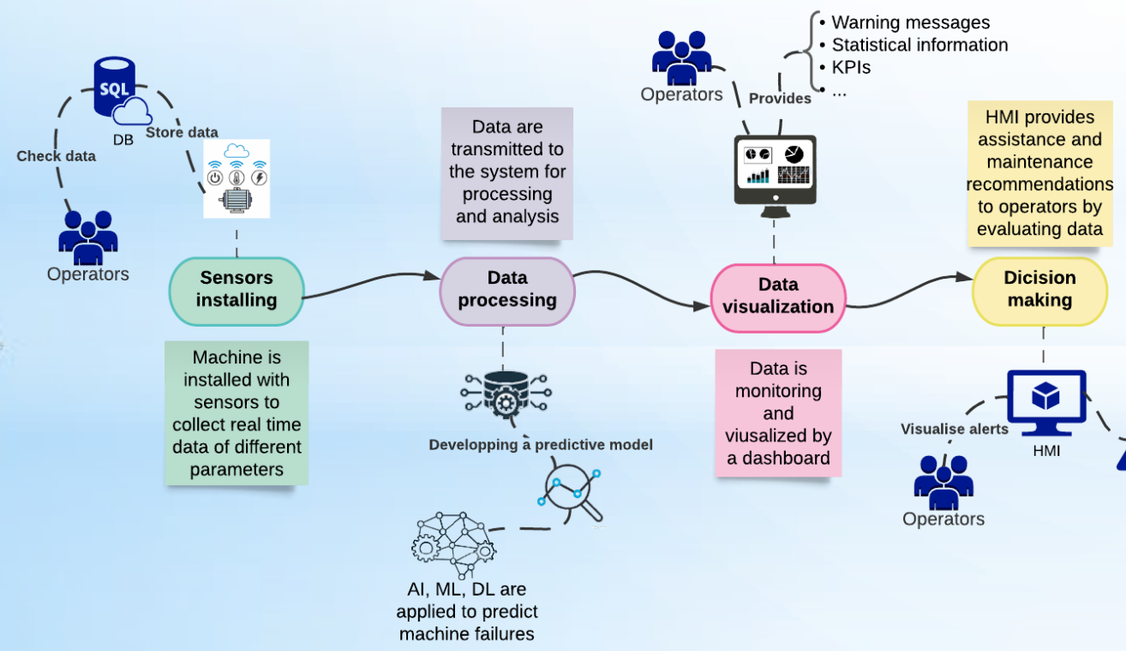
Make a comparative study to choose the best deep learning algorithm for predictive maintenance.

01 Predictive Maintenance

Predictive maintenance (PdM) is a recent preventive maintenance approach that consists of improving the performance and efficiency of the manufacturing process by increasing the life span of equipment and ensuring sustainable operational management [1]

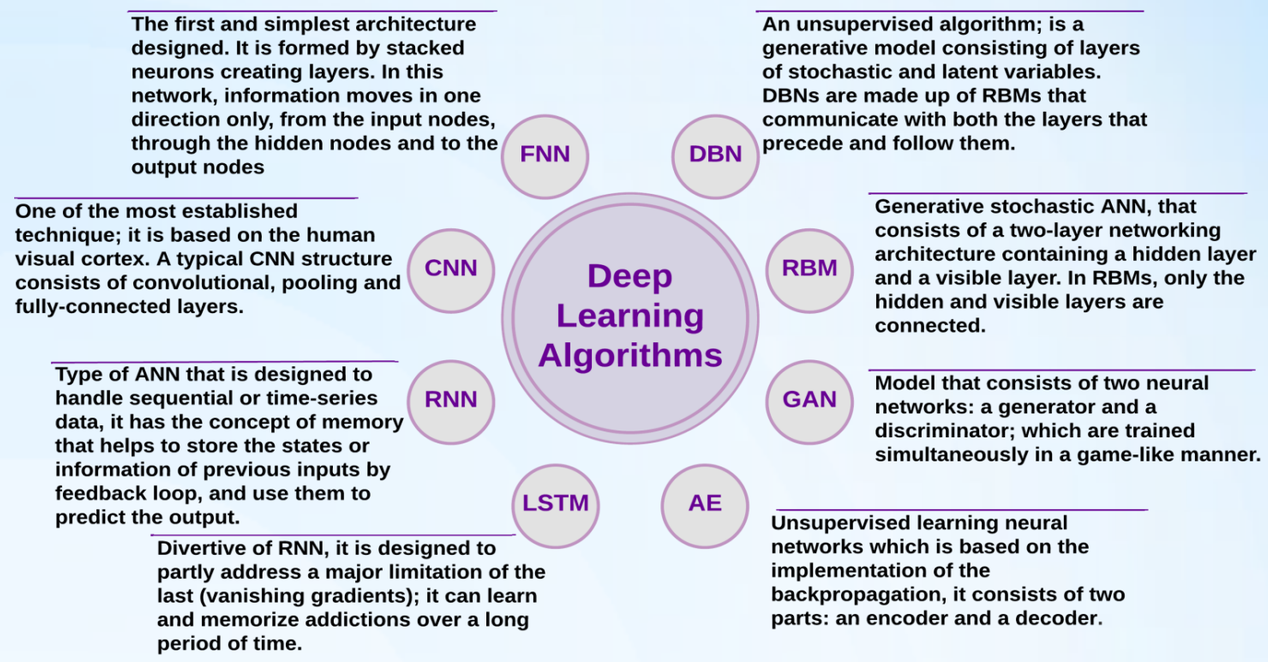


02 Deployment of PdM

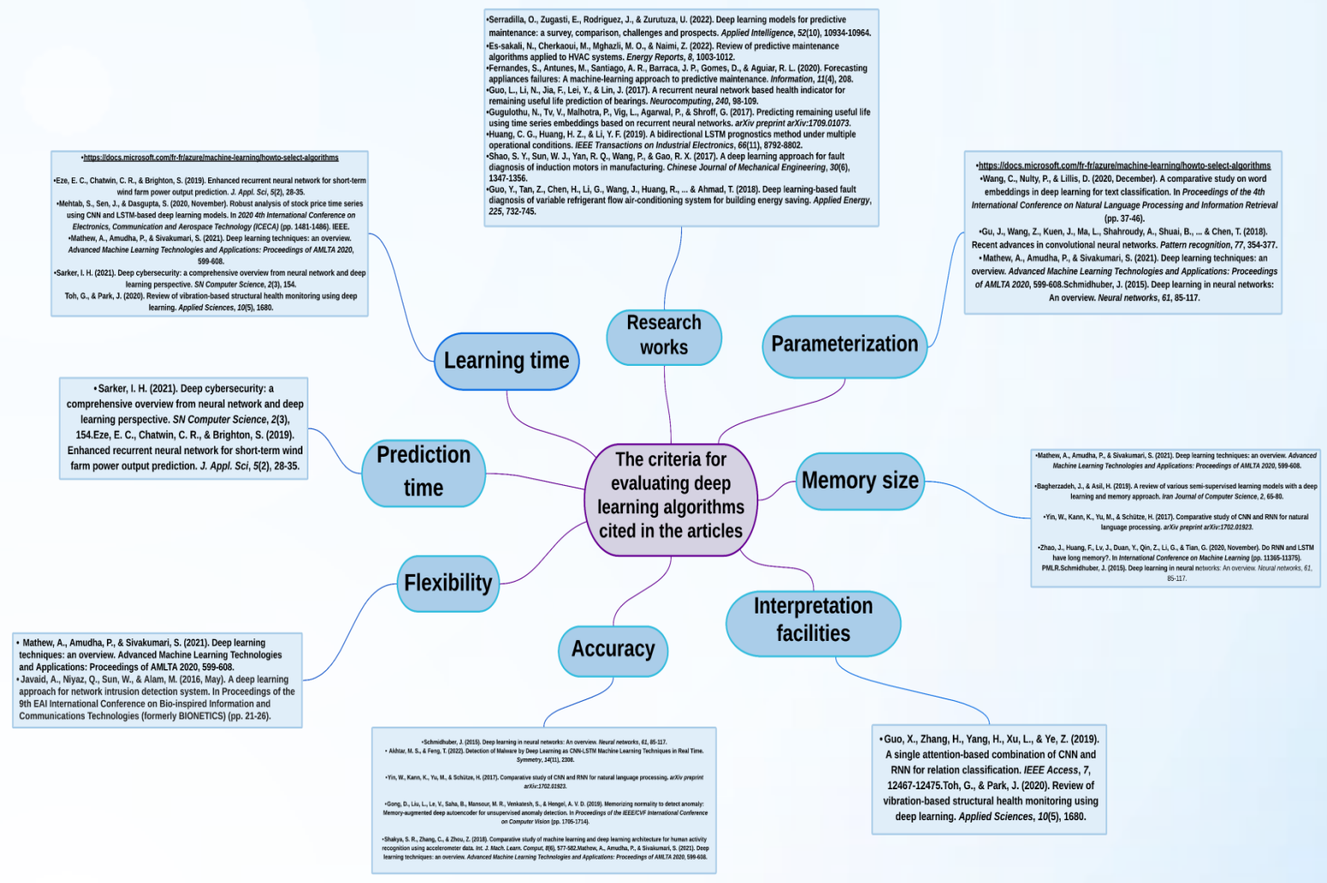


03 Deep Learning

Deep Learning (DL) is a subset of machine learning and artificial intelligence, that uses artificial neural networks to learn from data. These neural networks are designed to mimic the functioning of the human brain by processing data in successive layers[2].



04 Deep Learning for PdM



Criteria/Algorithm	CNN	RNN	LSTM	AE	GAN	FNN	RBM	DBN
Accuracy	****	****	****	**	***	**	**	****
Learning time	**	**	**	***	*	***	****	*
Memory size	***	****	****	**	**	**	**	**
Parameterization	***	**	**	*	***	***	*	***
Prediction time	**	****	****	***	***	***	*	**
Flexibility	****	****	****	**	**	**	****	**
Interpretation facilities	**	*	*	*	*	*	*	*
research works	***	***	****	***	**	*	**	**
Score	23	24	25	20	16	15	20	16

05 Conclusion

The present research aims to select the most suitable algorithm for PdM, by a comparative study according to common criteria retained in the literature.
According to the scores, LSTM, CNN and RNN have shown best results.

Bibliographic References :

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Realised by:
LARIBI Hadjer [h_laribi@enst.dz]
MELIANI Ouezna[o_meliani@enst.dz]

Supervised by:
Dr. BELAYADI Djahida [d_belayadi@esi.dz]

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