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Assignment Report: *Literature Review Comparing Human Cognitive Process
And Deep Learning Models.*

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Summary Research Paper's:

- *Paper 1: An Alternative to Cognitivism Computational Phenomenology for Deep Learning.*

This paper talks about a different way of looking at how deep learning works compared to older views of artificial intelligence. The author argues that traditional cognitivism treats thinking as rule-based logic, while deep learning is more like a process of experience.

The author analyzes how similarly the deep learning system deals with data and how humans build their understanding, offering a new way to understand artificial intelligence in relation to human's cognition.

Overall, it encourages a shift from logical models of intelligence to ones based on learning and experience.

- *Paper 2: Human Computation vs. Machine Learning an Experimental Comparison for Image Classification.*

This research compares humans and machines learning models in image classification to understand differences in cognitive and recognition.

The study used experiments where human and ML were provided with same images for classification to evaluate accuracy and errors.

The dataset contained 13000+ ISS photographs of Earth at night.

Results showed ML models achieved higher accuracy and faster classification while humans were better at detecting low quality images.

Humans required several seconds per image (5–10 seconds), while ML models classified the entire dataset in a fraction of second per image.

The study revealed that human and machine pattern recognition operate differently, while AI are better in repetitive tasks and human are better in uncertain situations.

- *Paper 3: Cognitive Computational Model Using Machine Learning Algorithm in Artificial Intelligence Environment.*

In this paper the author discussed how machine learning can simulate human's brain in term of thinking and learning such as decision-making, memory and perception by combining DBN (Deep Belief Network) with three hidden layers (500–500–2000 neurons) and a Multilayer Perceptron (MLP) as classifier.

The model was evaluated on the MNIST dataset and achieved 95.3% accuracy, outperforming a baseline MLP (92.1%). Training required 50 epochs (2.5 hours on GPU).

The author links ideas from psychology and computer science to show how computers can represent memory and learning using mathematical rules. The goal is to build AI systems that behave more like human thinkers and can adapt to new problems.

- *Paper 4: Conceptual review of artificial intelligence differences between human and machine learning.*

This paper compares human and machine learning in terms of learning and explains how human learning is driven by experience, emotions and context, while machine learning depends on data and algorithms.

Humans can often learn quickly from just a few examples, but AI needs a large amount of data to reach the same result.

The paper also discussed that even though AI capable of performing complex recognition and prediction but its lacks the emotional and awareness that guide human thought.

- *Paper 5: The Understanding of Deep Learning: A Comprehensive Review.*

The author in this paper explains what deep learning is and how it has been developed in recent years, with deep details about techniques used by neural networks like convolutional neural network (CNN) and Recurrent neural networks (RNNs) for speech recognition.

CNNs reduced ImageNet classification errors from 26% to 15%, while in speech recognition, RNN deep LSTMs achieved word error rates below 10%.

Training large CNNs required weeks on multiple GPUs and Models often had hundreds of millions of parameters, making them resource-intensive.

The paper also connects these ideas to human thinking, saying that the process is like how people learn from examples. In addition, it discusses the main challenges in deep learning, such as the need for big data and the lack of clear explanations for model decisions.

-Paper 6: *Human and Machine Learning*.

This study looks at the similarities and differences between how humans and computers learn by using games like chess and Go games. For example, IBM's Deep Blue defeated Garry Kasparov 3.5–2.5 in 1997, AlphaGo defeated Lee Sedol 4–1, after training on 30 million expert moves and using 1920 CPUs and 280 GPUs.

It discusses that humans rely on reasoning, memory and creativity, while machines learn by processing examples and finding patterns and relationships, and highlighted that humans adapt quickly when the environment changes, but machines learning system must be retrained. For example, moving model from playing chess to Go game.

And finally, the research suggests that combining human intuition with AI algorithms could lead to stronger AI system in the future.

- Critical Analysis:

All papers show different ways of understanding the similarities between human cognition and machine learning. Most of them agree that deep learning has made great progress in simulating how people learn from experience. However, computers can recognize patterns vastly and handle large amounts of dataset, but they still lack the deeper awareness and reasoning that humans use.

All papers agree that AI can replicate some cognitive processes but not full depth of human intelligence.

- **Connections:**

All papers explain how machine learning can learn in ways that resemble human thinking, moving away from rule-based system toward learning through experience.

Another shared idea is that both humans and machines improve through feedback and reward concept.

Also, there is connection that all papers suggest that the best progress in AI will be from combining insights from psychology and computer science, and comparing human and machine learning will help identify the strengths and weaknesses of AI.

- **Conflicts Between the findings:**

There is some difference between how the authors interpret the relationship between human and machine learning.

Some of the papers assume that deep learning is an experiential process while other papers say that deep learning only imitates human thought on surface level.

Also, some papers found that in image recognition machines outperform humans in accuracy and speed while others argue that humans still have an advantage when environment changes.

This keeps the debate opening for AI approaching real human's intelligence or simply mimicking its behavior without true cognitive.

- *Synthesis Matrix for Literature Review:*

Study	Authors	Year	Research Design	Key Finding / Results	Methodology	Limitations
An Alternative to Cognitivism Computational Phenomenology for Deep Learning.	Pierre Beckmann, Guillaume Kostner, Ines Hipolito	2023	Conceptual	Introduces computational phenomenology proposes a non-representation alism interpretation of deep learning.	Theoretical discussion comparing cognitivism and phenomenology with examples from neural networks.	Conceptual only No empirical proof
Human Computation vs. Machine Learning an Experimental Comparison for Image Classification	Gloria Re Calegari, Gioele Nasi, Irene Celino	2018	Experimental	Computers were faster and more accurate, humans better with ambiguous images due to contextual understanding.	Human volunteers and ML models compared identical image-recognition tasks.	Limited dataset (ISS images only), small human sample size.
Cognitive Computational Model Using Machine Learning Algorithm in Artificial Intelligence Environment	Shangyi Liu Constantin-Viktor Spiridonidis Moaiad Ahmad Khder	2022	Experimental	DBN+MLP model achieved 95.3% accuracy on MNIST, outperforming baseline MLP	Built DBN (3 hidden layers) + MLP) trained on MNIST with 50 epochs.	Tested only on MNIST, lacks generalization to complex real-world tasks.
Conceptual review of artificial intelligence differences between human and machine learning	Büşra Fadim Sarıkaya	2024	Conceptual	Comparing human learning (contextual, emotional, creative) with AI learning (data-driven, rule-based) highlights adaptability as a human strength.	Literature review analyzing theoretical and practical aspects of human and machine learning.	General overview, lacks empirical data
The Understanding of Deep Learning: A Comprehensive Review.	Ranjan Kumar Mishra, G. Y. Sandesh Reddy, Himanshu Pathak	2021	Review	Reviews how deep learning models function similarly to human learning through layered pattern recognition, identifies data dependency and explainability issues.	Review of neural network architectures and cognitive parallels with human reasoning.	Overview, lacks specific experiments

Human and Machine Learning	Dirk Helbing, Stefano Balietti	2018	Experimental	Explores differences in adaptability between humans and AI. Humans learn through creativity and reasoning, while machines rely on statistical learning.	Game-based study examining learning behavior in humans and computer algorithms.	Simplified simulation may not generalize to real-world situation.
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Pierre Beckmann, Guillaume Kostner, Ines Hipolito. An Alternative to Cognitivism Computational Phenomenology for Deep Learning.

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Shangyi Liu, Constantin-Viktor Spiridonidis, Moaiad Ahmad Khder. Cognitive Computational Model Using Machine Learning Algorithm in Artificial Intelligence Environment.

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Dirk Helbing, Stefano Balietti. Human and Machine Learning.

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