Group Members: Morathi Mnkandla, Ali Shan Ahad

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A03 Neural Network Zoo: Transformer Elephant

Working on the Neural Network Zoo project was an engaging and creative way for our group to deepen our understanding of neural network architectures. Instead of simply studying them from a textbook, we were encouraged to visualize and present them as “animals,” which made the learning experience more interactive and memorable. Our group selected the **Transformer Elephant**, symbolizing intelligence, memory, and focus—traits that closely align with the transformer’s capabilities in deep learning.

Learning Insights

At the beginning of the project, we revisited the foundational concept of **neural networks**, understanding how artificial neurons mimic the human brain by receiving inputs, applying weights, and generating outputs through activation functions. From there, we explored how networks like CNNs, RNNs, and LSTMs evolved to solve specific problems. What fascinated us most was how the **Transformer** architecture revolutionized this field by replacing recurrence with **self-attention**.

Through our research, we learned that the transformer’s strength lies in its **attention mechanism**, which allows it to focus on important parts of input data regardless of their position in a sequence. Unlike RNNs, which process data step by step, transformers analyze the entire sequence at once, making them faster and more efficient. We found this concept exciting because it explained why modern AI models such as **ChatGPT, BERT, and Vision Transformers (ViT)** perform so well. It was eye-opening to realize that transformers are not just theoretical constructs—they power nearly every state-of-the-art system in natural language processing and computer vision today.

Challenges and Group Process

Our biggest challenge was simplifying complex technical concepts into creative, easy-to-understand visuals. The transformer’s structure—made up of **encoders, decoders, multi-head attention, and positional encoding**—can be difficult to visualize. We spent time brainstorming how to represent these ideas symbolically through our chosen animal. Eventually, we agreed on the **elephant** because of its strong memory, intelligence, and social awareness—qualities that mirror how transformers remember long-term dependencies and pay attention to relationships between data points.

We also divided tasks based on our strengths: one member focused on researching transformer architecture and applications, another worked on the creative design and visualization, while the rest handled writing, structure, and presentation flow. This collaborative division made the process efficient and ensured everyone contributed meaningfully.

Creating the poster was another interesting challenge. We wanted the illustration to communicate both technical meaning and creativity. The idea of **“attention beams”** coming from the elephant’s eyes to represent self-attention was one of the most fun and creative parts

of the project. It allowed us to turn an abstract concept into something visually engaging that others could easily grasp during the zoo tour.

Deeper Understanding

Through this project, we gained a much deeper appreciation for how different neural networks are suited to different types of problems. For instance, RNNs are great for short sequential data, LSTMs improve memory handling, but Transformers surpass both by processing data in parallel and handling long-term context without losing information. This insight helped us see why the Transformer Elephant stands as one of the most powerful “animals” in the Neural Network Zoo.

We also realized that neural networks aren’t competing technologies—they complement each other. Each has its own “personality,” just like animals in a zoo. The zoo analogy made it easier to understand the ecosystem of AI models, where each network plays a specific role depending on the task, from recognizing images to generating text or analyzing speech.

Personal and Group Growth

This activity strengthened our teamwork and creative communication skills. We learned to translate technical ideas into visual metaphors that anyone—even those new to deep learning—could understand. It also gave us confidence in discussing advanced concepts like self-attention, feed-forward networks, and positional encoding in simpler terms.

Most importantly, this project showed us how creativity and technical knowledge can go hand in hand. We didn’t just memorize how transformers work; we understood *why* they are designed the way they are and *how* their principles can be applied in other domains like healthcare, robotics, and multimodal AI.

In conclusion, working on the **Transformer Elephant** taught us that deep learning models, much like animals, have unique traits and specializations. The experience allowed us to learn collaboratively, think visually, and appreciate the diversity of neural network architectures in a memorable way. It was both an educational and creative journey that reinforced our understanding of modern AI systems and how they continue to evolve.