

# Analysis of Inter-LLM and Intra-LLM Alignment in Image Description and Generation

Mid Sweden University  
Quantitative Research and Development

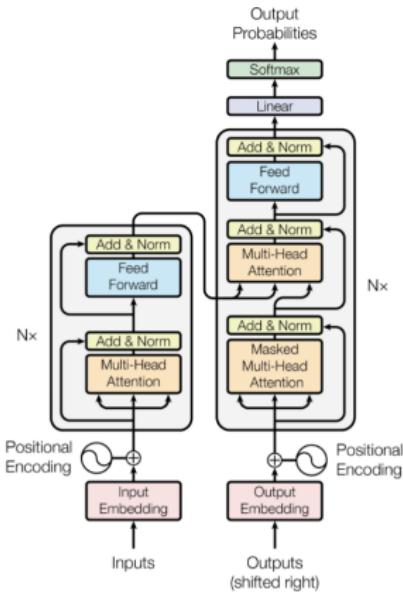
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# Outline

- Transformer
  - Attention
- Large Language Model (LLM)
  - Multimodal Large Language Model
    - Contrastive Image-Language Pre-training (CLIP)
  - Large Language Model for Image Captioning
  - Large Language Model for Image Generation

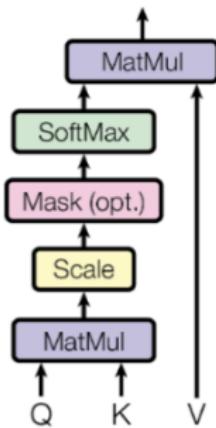
# Transformer



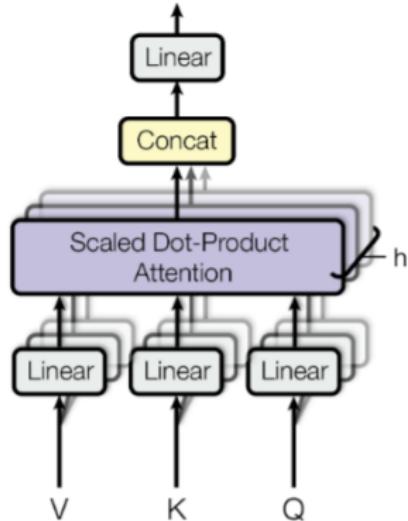
**Figure:** The Transformer - model architecture. Reprinted from Figure 1 in Vaswani et al. (2017) [1].

# Attention

Scaled Dot-Product Attention



Multi-Head Attention



**Figure:** (left) Scaled Dot-Product Attention (right) Multi-Head Attention consists of several attention layers running in parallel.  
Reprinted from Figure 2 in Vaswani et al. (2017) [1].

# Large Language Model (LLM)

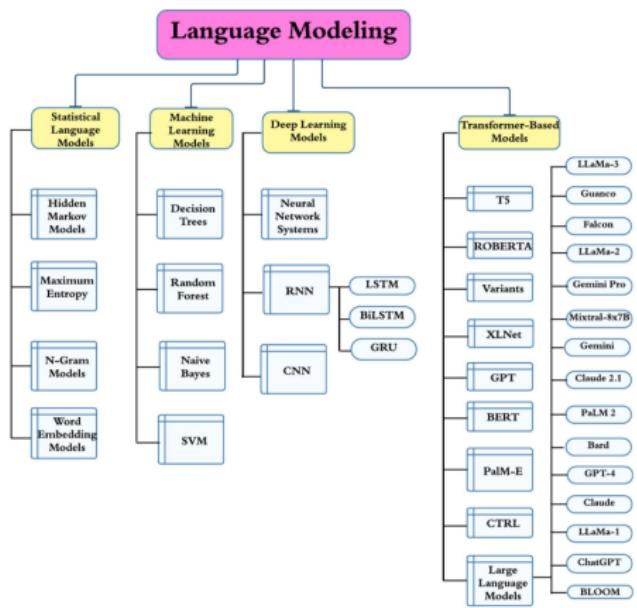
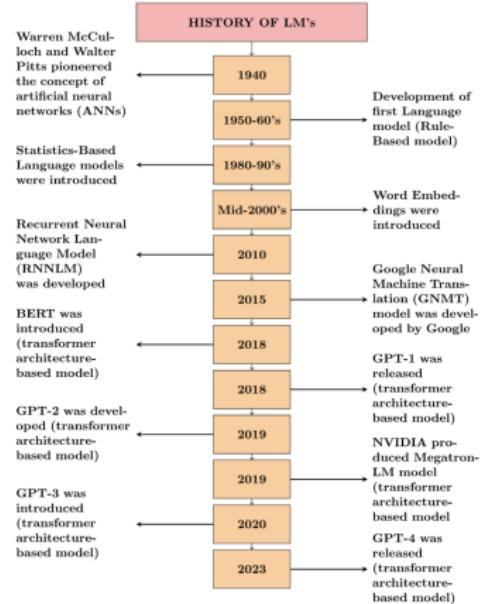


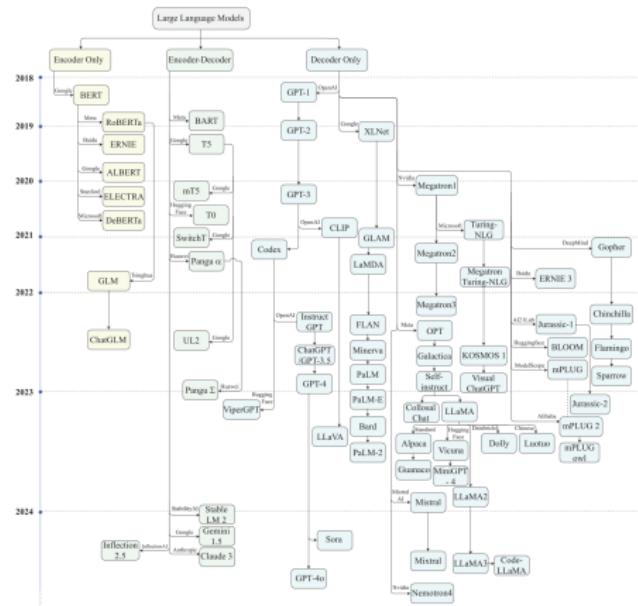
Figure: Types of language modeling. Reprinted from Figure 1 in Hadi et al. (2025) [2].

# Large Language Model (LLM)



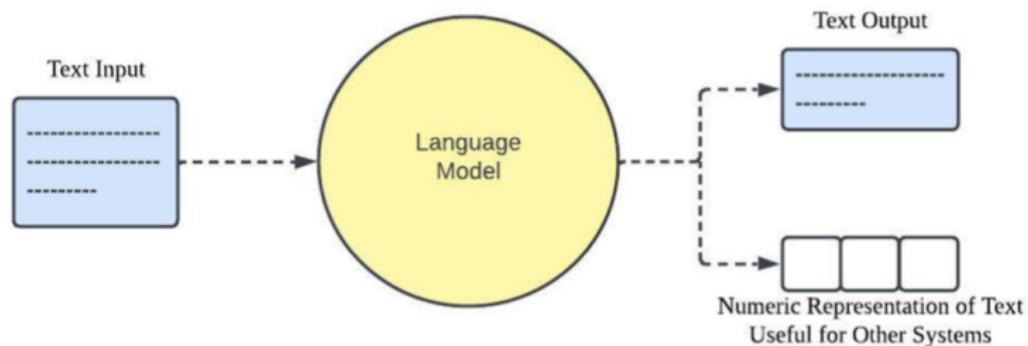
**Figure:** Brief history of language modeling. Reprinted from Figure 3 in Annepaka et al. (2025) [3].

# Large Language Model (LLM)



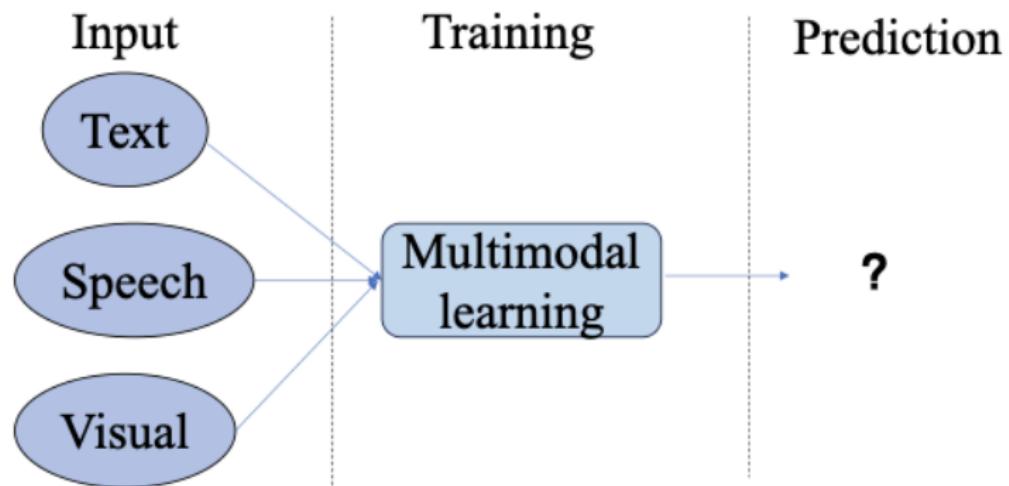
**Figure:** Evolutionary tree illustrating the progression of mainstream LLMs. Reprinted from Figure 12 in Shao et al. (2024) [4].

# Large Language Model (LLM)



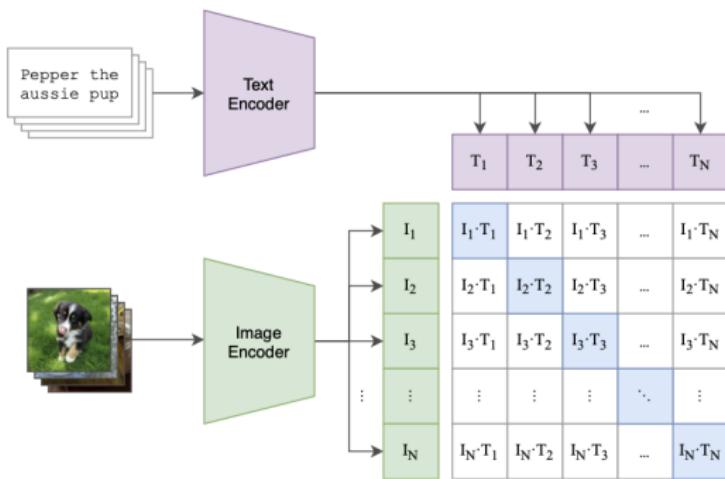
**Figure:** Workflow of a language model. Reprinted from Figure 2 in Annepaka et al. (2025) [3].

# Multimodal Large Language Model



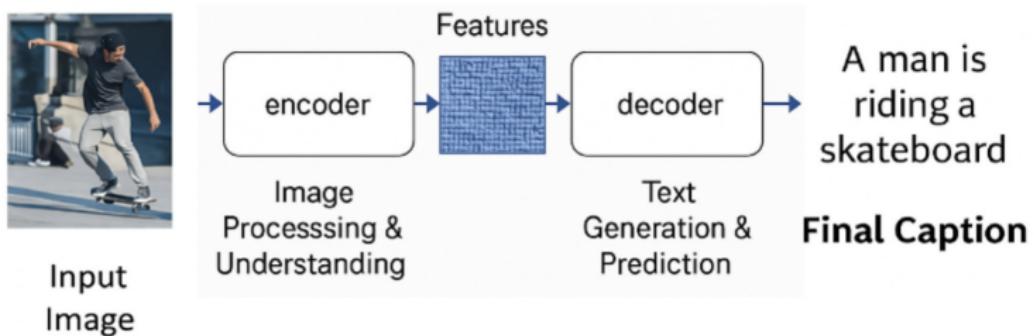
**Figure:** Definition of multimodal. Reprinted from Figure 1 in Wu et al. (2023) [5].

# Contrastive Language Image Pre-training (CLIP)



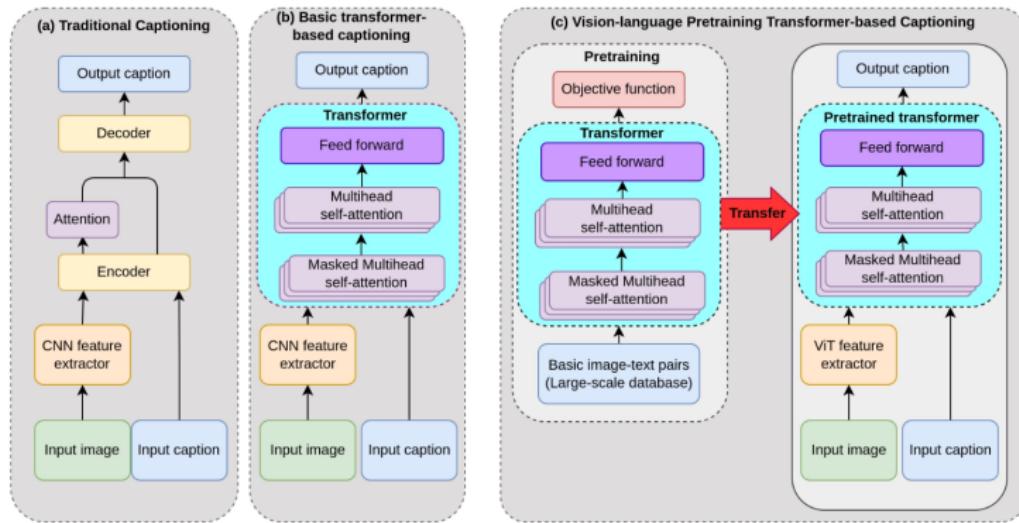
**Figure:** CLIP architecture and training. Reprinted from Figure 1 in Radford et al. (2021) [6].

# Large Language Model for Image Captioning



**Figure:** The general structure framework for image captioning.  
Reprinted from Figure 1 in Abdulgalil et al. (2025) [7].

# Large Language Model for Image Captioning



**Figure:** Development of captioning structures and systems.  
Reprinted from Figure 1 in Ondeng et al. (2023) [8].

# Large Language Model for Image Generation



**Figure:** Visual comparison of images generated with different text encoders. Reprinted from Figure 1 in Wang et al. (2025) [9].

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