Back to the Future of Generative Artificial Intelligence

Historical Timeline of Generative Artificial Intelligence Technological Breakthroughs

- **1964-1966:** Joseph Weizenbaum develops "ELIZA", the **world's first chatbot** at the MIT AI lab.

- **1982:** John Hopfield develops the Hopfield Network which was the first **Recurrent Neural Network (RNN)** that could learn.

- **1997:** Sepp Hochreiter and Jurgen Schmidhuber introduce the idea of **Long Short-Term Memory (LSTM)**.

- **1998:** Yann Le Cun et al. introduce "LeNet", which is the first modern **Convolutional Neural Network (CNN)** in addition to having practical application. "LeNet" and future CNNs were inspired by the "Neocognitron" Artificial Neural Network (ANN) developed by Kunihiko Fukushima in 1979 which still serves as a blueprint and closely resembles modern CNN architecture to this day.

- **2003:** Yoshua Bengio et al. develop first **Feed-Forward Artificial Neural Network (FFANN)** that predicts the next word given a sequence of words.

- **2010-2014: Generative Adversarial Networks (GANs)** are introduced by Ian Goodfellow et al. which enable the generation of realistic data.

- **2011:** Apple launches first iPhone with Siri which brings **AI assistants** to the public.

- **2013:** Advances are made in text representation with the introduction of **Word Embeddings** (Word2Vec, GloVe, FastText) at Google which build on the One-Hot Encoding and Count-based (Bag-of-Words, N-grams, TF-IDF) text representations.

- **2013: Variational Autoencoders (VAEs)** introduced by Max Welling et al. which allow for generating new samples by sampling from learned distribution.

- **2015:** Dzimtry Bahdanau et al. introduce the **Attention model** which solves the problem with previous architectures that need to remember an entire sentence before translation. In the same year, the **Diffusion model** is created by Jascha Sohl-Dickstein et al which serves as the basis for future Text-to-Image models.

- **2017:** Ashish Vaswani et al. propose the **Transformer architecture** at Google while Paul Christiano et al. develop **Reinforcement Learning from Human Feedback (RLHF)**.

- **2018:** Creation of modern **Language Models (LMs)**; Bidirectional Encoder Representations from Transformers (BERT) at Google and Generative Pre-trained Transformer (GPT) at OpenAI.

- **2019:** GPT-2 language model released by OpenAI and StyleGAN released by NVIDIA which enabled fine-grained control over visual attributes of high-quality generated synthetic images.

- **2020:** GPT-3 **Large Language Model (LLM)** introduced by OpenAI.

- **2021:** DALL-E Text-to-Image model which is a multimodal implementation of GPT-3 is released by OpenAI.

- **2022:** DALL-E 2 and ChatGPT released by OpenAI while Stability AI release Stable Diffusion which is another Text-to-Image Model, Google releases their own LLM called PaLM and Anthropic creates **Reinforcement Learning from Artificial Intelligence Feedback (RLAIF)**.

- **2023:** Google launches Bard, OpenAI release GPT-4 and DALL-E 3, EU passes AI Act, UK hold AI Safety Summit at Bletchley Park, Japan release more lenient AI regulation that piques the interest of some AI researchers and Google release an academic paper explaining how to scale RLHF with RLAIF.

- **2024 and Beyond:** Artificial General Intelligence (AGI), Artificial Super Intelligence (ASI), Robotics, etc.

Questions & Answers

Any Questions?

Links

Generative AI is **cumulative** as the next technological breakthrough builds on the previous so one can learn about each of the technological breakthroughs in the timeline in **sequence** both **theoretically and practically**.

Theoretical	Practical
Reading **academic papers**	Personal project **implementing code from academic paper**. Professional project **applying Generative AI at work**.
RNN: Fool-proof RNN Explanation by Misra Turp, A Friendly Introduction to RNNs by Luis Serrano, RNNs Clearly Explained by Josh Starmer	**Try it Yourself:** https://thispersondoesnotexist.com/, https://huggingface.co/spaces/dalle-mini/dalle-mini, https://www.phind.com/, https://chat.openai.com/, https://www.learn.xyz/
LSTM: LSTM Clearly Explained by Josh Starmer, LSTMs and GRUs by Misra Turp	
CNN: The Evolution of CNNs by CodeEmporium, CNNs Explained by deeplizard, A Friendly Introduction to CNNs and Image Recognition by Luis Serrano, Image Classification with CNNs by Josh Starmer, CNN Explained by Computerphile	
GAN: GANs by Computerphile, A Friendly Introduction to GANs by Luis Serrano	
Word Embeddings: Vectoring Words by Computerphile, A Complete Overview of Word Embeddings by AssemblyAI	**Walkthroughs:** https://colab.research.google.com/github/huggingface/notebooks/blob/main/examples/annotated_diffusion.ipynb, https://www.deeplearning.ai/short-courses/how-diffusion-models-work/
AE, VAE and Encoder-Decoder Architecture: Denoising and VAE by Luis Serrano, Encoder-Decoder Network by Computerphile	
Attention Model: Attention for ANNs by Josh Starmer, The Attention Mechanism in LLMs by Luis Serrano, The Math behind Attention by Luis Serrano	
Diffusion Model: Diffusion Model Explained in 4-Difficulty Levels by AssemblyAI, Diffusion Models by Outlier, Ultimate Guide to Diffusion Models by Aleksa Gordic, GitHub Repository with Diffusion Model Resources	
Transformer Architecture: Transformer ANN by Josh Starmer, What are Transformer Models by Luis Serrano, Transformers for Beginners by AssemblyAI	**Practice:** https://www.datacamp.com/, https://www.kaggle.com/, https://huggingface.co/, https://www.youtube.com/, https://paperswithcode.com/, https://www.deeplearning.ai/, https://www.wikipedia.org/
RLHF and RLAIF: RLHF Academic Paper, RLAIF Academic Paper, RLHF by HuggingFace, RLHF vs RLAIF by AssemblyAI, How RLAIF Works by AssemblyAI, RLHF vs RLAIF for Model Alignment by AssemblyAI, LLM Training by Sebastian Raschka	
LM: What is BERT by AssemblyAI, BERT by CodeEmporium, GPT by CodeEmporium, GPT-1, GPT-2, GPT-3, GPT-4 and ChatGPT Summary by HuiMing Song, GPT YouTube Playlist by Minsuk Heo	**Company Blogs:** Google, DeepMind, OpenAI, Cohere, Anthropic, NVIDIA, Meta
LLM: A Complete Look at LLMs by AssemblyAI	
AGI, ASI, Robotics, etc: Levels of AGI by DeepMind, Boston Dynamics YouTube Channel	

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