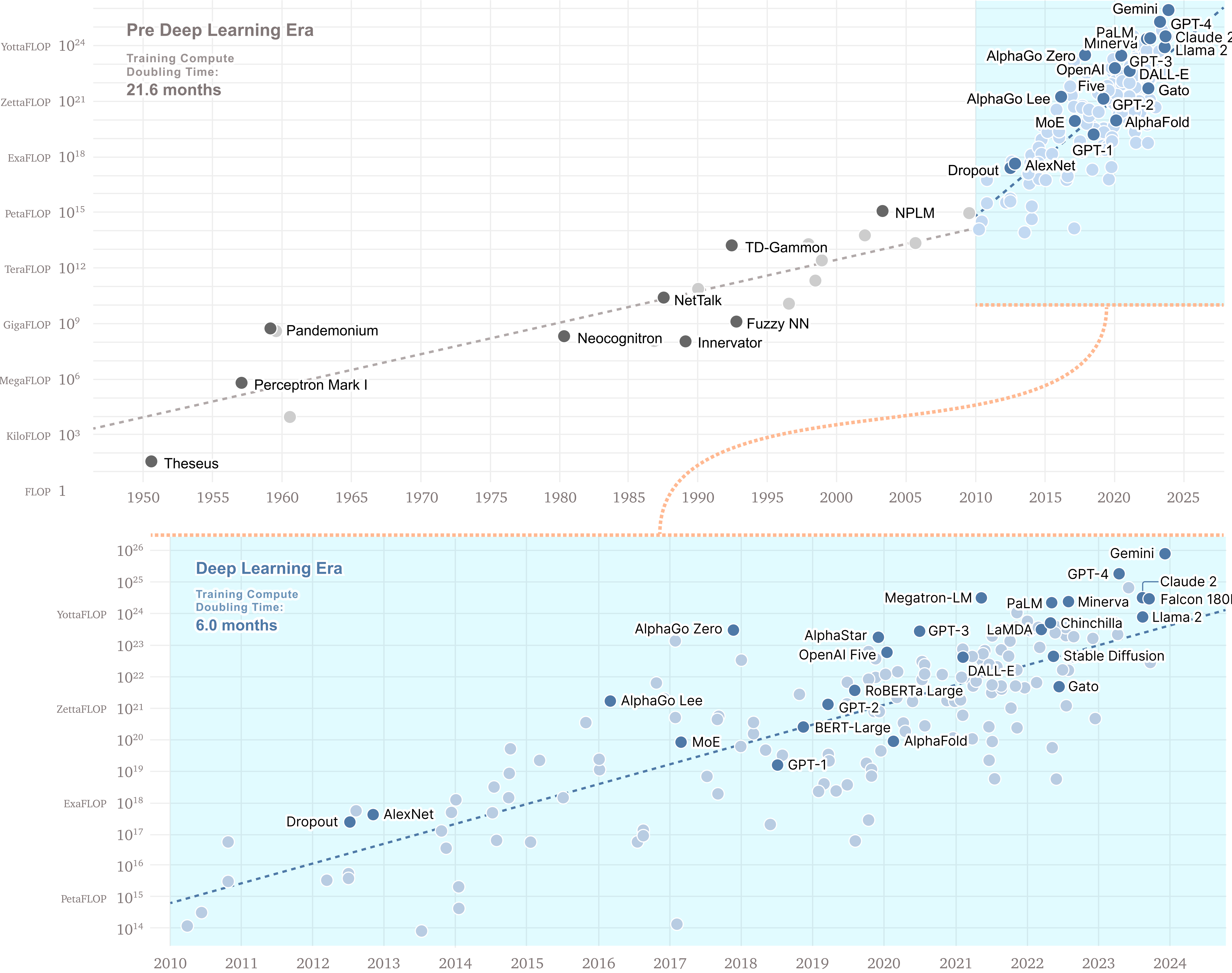# Compute Used for AI Training Runs

**Total compute used to train notable AI models**, measured in total FLOP (floating-point operations) | Logarithmic



**Pre Deep Learning Era**

Training Compute
Doubling Time:
**21.6 months**

Labeled points (upper chart): Gemini, GPT-4, PaLM, Claude 2, Minerva, Llama 2, AlphaGo Zero, GPT-3, OpenAI Five, DALL-E, AlphaGo Lee, Gato, MoE, GPT-2, AlphaFold, GPT-1, Dropout, AlexNet, NPLM, TD-Gammon, NetTalk, Fuzzy NN, Pandemonium, Neocognitron, Innervator, Perceptron Mark I, Theseus

**Deep Learning Era**

Training Compute
Doubling Time:
**6.0 months**

Labeled points (lower chart): Gemini, GPT-4, Claude 2, Megatron-LM, Falcon 180B, PaLM, Minerva, Llama 2, AlphaGo Zero, AlphaStar, GPT-3, LaMDA, Chinchilla, OpenAI Five, Stable Diffusion, DALL-E, RoBERTa Large, Gato, AlphaGo Lee, GPT-2, MoE, BERT-Large, AlphaFold, GPT-1, Dropout, AlexNet

**Release Date**

"Computing Power and the Governance of Artificial Intelligence"
Sastry, Heim, Belfield, Anderljung, Brundage, Hazell, O'Keefe, Hadfield et al., 2024