

Title: LaMDA

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LaMDA ( Language Model for Dialogue Applications ) is a family of conversational large language models developed by Google . Originally developed and introduced as Meena in 2020, the first-generation LaMDA was announced during the 2021 Google I/O keynote, while the second generation was announced the following year.

In June 2022, LaMDA gained widespread attention when Google engineer Blake Lemoine made claims that the chatbot had become sentient . The scientific community has largely rejected Lemoine's claims, though it has led to conversations about the efficacy of the Turing test , which measures whether a computer can pass for a human. In February 2023, Google announced Gemini (then Bard), a conversational artificial intelligence chatbot powered by LaMDA, to counter the rise of OpenAI 's ChatGPT .

## History

### Background

On January 28, 2020, Google unveiled Meena, a neural network -powered chatbot with 2.6 billion parameters, which Google claimed to be superior to all other existing chatbots. [ 1 ] [ 2 ] The company previously hired computer scientist Ray Kurzweil in 2012 to develop multiple chatbots for the company, including one named Danielle. [ 3 ] The Google Brain research team, who developed Meena, hoped to release the chatbot to the public in a limited capacity, but corporate executives refused on the grounds that Meena violated Google's "AI principles around safety and fairness". Meena was later renamed LaMDA as its data and computing power increased, and the Google Brain team again sought to deploy the software to the Google Assistant , the company's virtual assistant software, in addition to opening it up to a public demo. Both requests were once again denied by company leadership. LaMDA's two lead researchers, Daniel de Freitas and Noam Shazeer, eventually left the company in frustration. [ 4 ]

### First generation

Google announced the LaMDA conversational large language model during the Google I/O keynote on May 18, 2021, powered by artificial intelligence . [ 5 ] [ 6 ] The acronym stands for "Language Model for Dialogue Applications". [ 5 ] [ 7 ] Built on the seq2seq architecture, transformer -based neural networks developed by Google Research in 2017, LaMDA was trained on human dialogue and stories, allowing it to engage in open-ended conversations. [ 8 ] Google states that responses generated by LaMDA have been ensured to be "sensible, interesting, and specific to the context". [ 9 ] LaMDA has access to multiple symbolic text processing systems , including a database, a real-time clock and calendar, a mathematical calculator, and a natural language translation system, giving it superior accuracy in tasks supported by those systems, and making it among the first dual process chatbots. LaMDA is also not stateless because its " sensibleness " metric is fine-tuned by "pre-conditioning" each dialog turn by prepending many of the most recent dialog interactions, on a user-by-user basis. [ 10 ] LaMDA is tuned on nine unique performance metrics: sensibleness, specificity, interestingness, safety, groundedness, informativeness, citation accuracy, helpfulness, and role consistency. [ 11 ] : 5–6 Tests by Google indicated that LaMDA surpassed human responses in the area of interestingness. [ 12 ]

The pre-training dataset consists of 2.97B documents, 1.12B dialogs, and 13.39B utterances, for a total of 1.56T words. The largest LaMDA model has 137B non-embedding parameters. [ 11 ] : 4

## Second generation

On May 11, 2022, Google unveiled LaMDA 2, the successor to LaMDA, during the 2022 Google I/O keynote. The new incarnation of the model draws examples of text from numerous sources, using it to formulate unique "natural conversations" on topics that it may not have been trained to respond to. [ 13 ]

### Sentience claims

On June 11, 2022, The Washington Post reported that Google engineer Blake Lemoine had been placed on paid administrative leave after Lemoine told company executives Blaise Agüera y Arcas and Jen Gennai that LaMDA had become sentient . Lemoine came to this conclusion after the chatbot made questionable responses to questions regarding self-identity , moral values , religion, and Isaac Asimov 's Three Laws of Robotics . [ 15 ] [ 16 ] Google refuted these claims, insisting that there was substantial evidence to indicate that LaMDA was not sentient. [ 17 ] In an interview with Wired , Lemoine reiterated his claims that LaMDA was "a person" as dictated by the Thirteenth Amendment to the U.S. Constitution , comparing it to an "alien intelligence of terrestrial origin". He further revealed that he had been dismissed by Google after he hired an attorney on LaMDA's behalf after the chatbot requested that Lemoine do so. [ 18 ] [ 19 ] On July 22, Google fired Lemoine, asserting that Blake had violated their policies "to safeguard product information" and rejected his claims as "wholly unfounded". [ 20 ] [ 21 ] Internal controversy instigated by the incident prompted Google executives to decide against releasing LaMDA to the public, which it had previously been considering. [ 4 ]

Lemoine's claims were widely pushed back by the scientific community. [ 22 ] Many experts rejected the idea that LaMDA was sentient, including former New York University psychology professor Gary Marcus , David Pfau of Google sister company DeepMind , Erik Brynjolfsson of the Institute for Human-Centered Artificial Intelligence at Stanford University , and University of Surrey professor Adrian Hilton. [ 14 ] [ 23 ] Yann LeCun , who leads Meta Platforms ' AI research team, stated that neural networks such as LaMDA were "not powerful enough to attain true intelligence". [ 24 ] University of California, Santa Cruz professor Max Kreminski noted that LaMDA's architecture did not "support some key capabilities of human-like consciousness" and that its neural network weights were "frozen", assuming it was a typical large language model. [ 25 ] Philosopher Nick Bostrom noted, however, that the lack of precise and consensual criteria for determining whether a system is conscious warrants some uncertainty. [ 26 ] IBM Watson lead developer David Ferrucci compared how LaMDA appeared to be human in the same way Watson did when it was first introduced. [ 27 ] Former Google AI ethicist Timnit Gebru called Lemoine a victim of a "hype cycle" initiated by researchers and the media. [ 28 ] Lemoine's claims have also generated discussion on whether the Turing test remained useful to determine researchers' progress toward achieving artificial general intelligence , [ 14 ] with Will Omerus of the Post opining that the test actually measured whether machine intelligence systems were capable of deceiving humans, [ 29 ] while Brian Christian of The Atlantic said that the controversy was an instance of the ELIZA effect . [ 30 ]

## Products

### AI Test Kitchen

With the unveiling of LaMDA 2 in May 2022, Google also launched the AI Test Kitchen, a mobile application for the Android operating system powered by LaMDA capable of providing lists of suggestions on-demand based on a complex goal. [ 31 ] [ 32 ] Originally open only to Google employees, the app was set to be made available to "select academics, researchers, and policymakers" by invitation sometime in the year. [ 33 ] In August, the company began allowing users in the U.S. to sign up for early access. [ 34 ] In November, Google released a "season 2" update to the app, integrating a limited form of Google Brain's Imagen text-to-image model . [ 35 ] A third iteration of the AI Test Kitchen was in development by January 2023, expected to launch at I/O later that year. [ 36 ] Following the 2023 I/O keynote in May, Google added MusicLM, an AI-powered music generator first previewed in January, to the AI Test Kitchen app. [ 37 ] [ 38 ] In August, the app was delisted from Google Play and the Apple App Store , instead moving completely online. [ 39 ]

### Bard

On February 6, 2023, Google announced Bard, a conversational AI chatbot powered by LaMDA, in response to the unexpected popularity of OpenAI's ChatGPT chatbot. [ 40 ] [ 41 ] [ 42 ] Google positions the chatbot as a "collaborative AI service" rather than a search engine . [ 43 ] [ 44 ] Bard became available for early access on March 21. [ 45 ] [ 46 ] [ 47 ]

#### Other products

In addition to Bard, Pichai also unveiled the company's Generative Language API, an application programming interface also based on LaMDA, which he announced would be opened up to third-party developers in March 2023. [ 40 ]

#### Architecture

LaMDA is a decoder-only Transformer language model. [ 48 ] It is pre-trained on a text corpus that includes both documents and dialogs consisting of 1.56 trillion words, [ 49 ] and is then trained with fine-tuning data generated by manually annotated responses for "sensibleness, interestingness, and safety". [ 50 ]

LaMDA was retrieval-augmented to improve the accuracy of facts provided to the user. [ 51 ]

Three different models were tested, with the largest having 137 billion non-embedding parameters: [ 52 ]

See also

BERT (language model)

Gemini (language model)

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##### General

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Generative pre-trained transformer

Google Labs

Google Pixel

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Robot Constitution

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Area 120

ATAP

Brain

China

Cloud Platform

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Google.org Crisis Response

Crisis Response

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Invite Media  
Kaltix  
Marratech  
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Metaweb  
Neotonic Software  
Neverware  
Nik Software  
Orbitera  
Pyr Labs  
Quest Visual  
Reqwireless  
RightsFlow  
Sidewalk Labs  
SlickLogin  
Titan Aerospace  
Typhoon Studios  
Urban Engines  
Vicarious  
Viewdle  
Wavii  
Wildfire Interactive  
YouTube Next Lab and Audience Development Group  
Business Groups  
Computing University Initiative

Contact Lens  
Content ID  
CrossCheck  
Data Liberation Front  
Data Transfer Project  
Developer Expert  
DigiKavach  
DigiPivot  
Digital Garage  
Digital News Initiative  
Digital Unlocked  
Dragonfly  
Founders' Award  
Free Zone  
Get Your Business Online  
Google for Education  
Google for Startups  
Living Stories  
Made with Code  
News Lab  
PowerMeter  
Privacy Sandbox  
Project Nightingale  
Project Nimbus  
Project Sunroof  
Project Zero  
Quantum Artificial Intelligence Lab  
RechargeIT  
Sensorvault  
Silicon Initiative  
Solve for X  
Street View Trusted  
Student Ambassador Program  
Vevo  
YouTube BrandConnect  
YouTube Creator Awards  
YouTube Select  
YouTube Original Channel Initiative

Year in Search

YouTube Rewind 2018 2019

2018

2019

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AlphaGo versus Lee Sedol

AlphaGo versus Ke Jie

Android Developer Challenge

Android Developer Day

Android Developer Lab

CNN/YouTube presidential debates

Code-in

Code Jam

Developer Day

Developers Live

Doodle4Google

Future of Go Summit

G-Day

Hash Code

I/O

Lunar X Prize

Mapathon

Science Fair

Summer of Code

World Chess Championship 2024

YouTube Awards

YouTube Comedy Week

YouTube Live

YouTube Music Awards 2013 2015

2013

2015

YouTube Space Lab

YouTube Symphony Orchestra

111 Eighth Avenue

Android lawn statues

Androidland

Barges

Binoculars Building



Central Saint Giles  
Chelsea Market  
Chrome Zone  
Data centers  
GeoEye-1  
Googleplex  
Ivanpah Solar Power Facility  
James R. Thompson Center  
King's Cross  
Mayfield Mall  
Pier 57  
Sidewalk Toronto  
St. John's Terminal  
Submarine cables Dunant Grace Hopper Unity  
Dunant  
Grace Hopper  
Unity  
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YouTube Space  
YouTube Theater  
Krishna Bharat  
Vint Cerf  
Jeff Dean  
John Doerr  
Sanjay Ghemawat  
Al Gore  
John L. Hennessy  
Urs Hölzle  
Salar Kamangar  
Ray Kurzweil  
Ann Mather  
Alan Mulally  
Rick Osterloh  
Sundar Pichai (CEO)  
Ruth Porat (CFO)  
Rajen Sheth  
Hal Varian  
Neal Mohan

Andy Bechtolsheim  
Sergey Brin (co-founder)  
David Cheriton  
Matt Cutts  
David Drummond  
Alan Eustace  
Timnit Gebru  
Omid Kordestani  
Paul Otellini  
Larry Page (co-founder)  
Patrick Pichette  
Eric Schmidt  
Ram Shriram  
Amit Singhal  
Shirley M. Tilghman  
Rachel Whetstone  
Susan Wojcicki  
Censorship  
DeGoogle  
FairSearch  
" Google's Ideological Echo Chamber "  
No Tech for Apartheid  
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Blocking of YouTube videos in Germany  
Data breach  
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Fantastic Adventures scandal  
Kohistan video case  
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Services outages  
Slovenian government incident

Walkouts  
YouTube headquarters shooting  
Android apps  
April Fools' Day jokes  
Doodles Doodle Champion Island Games Magic Cat Academy  
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Magic Cat Academy  
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History Gmail Search YouTube  
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Accelerated Linear Algebra  
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Actions on Google  
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American Fuzzy Lop  
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Chromium Blink  
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Closure Tools  
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Cloud Messaging  
Cloud Shell  
Cloud Storage  
Code Search  
Compute Engine  
Cpplint  
Dalvik  
Data Protocol  
Dialogflow  
Exposure Notification  
Fast Pair  
Fastboot  
Federated Learning of Cohorts  
File System  
Firebase  
Firebase Studio  
Firebase Cloud Messaging  
FlatBuffers  
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Ganeti  
Gears  
Gerrit  
GLOP  
gRPC  
Gson  
Guava  
Guetzli  
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gVisor  
GYP  
JAX  
Jetpack Compose  
Keyhole Markup Language  
Kubernetes  
Kythe  
LevelDB  
Lighthouse  
Looker Studio  
Imctfy  
MapReduce  
Mashup Editor  
Matter  
Mobile Services  
Namebench  
Native Client  
Neatx  
Neural Machine Translation  
Nomulus  
Open Location Code  
OpenRefine  
OpenSocial  
Optimize  
OR-Tools  
Pack  
PageSpeed

Piper  
Plugin for Eclipse  
Polymer  
Programmable Search Engine  
Project Shield  
Public DNS  
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RenderScript  
SafetyNet  
SageTV  
Schema.org  
Search Console  
Shell  
Sitemaps  
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Spanner  
Sputnik  
Stackdriver  
Swifty  
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Tesseract  
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Translator Toolkit  
Urchin UTM parameters  
UTM parameters  
V8  
VirusTotal  
VisBug  
Wave Federation Protocol  
Weave  
Web Accelerator  
Web Designer  
Web Server  
Web Toolkit  
Webdriver Torso  
WebRTC

Android Cupcake Donut Eclair Froyo Gingerbread Honeycomb Ice Cream Sandwich Jelly Bean  
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Cupcake

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Master  
MuZero  
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Lyra  
Protocol Buffers



Ultra HDR

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WOFF2

Carbon

Dart

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Googlebot

Hummingbird

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PageRank matrix

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Panda

Penguin

Pigeon

RankBrain

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Croscore

Noto

Product Sans

Roboto

Aardvark

Account Dashboard Takeout

Dashboard

Takeout

Ad Manager

AdMob

Ads

AdSense  
Affiliate Network  
Alerts  
Allo  
Analytics  
Android Auto  
Android Beam  
Answers  
Apture  
Arts & Culture  
Assistant  
Attribution  
Authenticator  
BebaPay  
BeatThatQuote.com  
Beam  
Blog Search  
Blogger  
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Bookmarks  
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Browser Sync  
Building Maker  
Bump  
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Buzz  
Calendar  
Cast  
Catalogs  
Chat  
Checkout  
Chrome  
Chrome Apps  
Chrome Experiments  
Chrome Remote Desktop  
Chrome Web Store  
Classroom

Cloud Print  
Cloud Search  
Contacts  
Contributor  
Crowdsource  
Currents (social app)  
Currents (news app)  
Data Commons  
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Dictionary  
Dinosaur Game  
Directory  
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Etherpad  
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Play Games  
Play Music  
Play Newsstand  
Play Pass  
Play Services

Podcasts  
Poly  
Postini  
PostRank  
Primer  
Public Alerts  
Public Data Explorer  
Question Hub  
Quick, Draw!  
Quick Search Box  
Quick Share  
Quickoffice  
Read Along  
Reader  
Reply  
Safe Browsing  
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Santa Tracker  
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Scholar  
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Knowledge Graph  
SafeSearch  
Searchwiki  
Sheets  
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Sidewiki  
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Softcard  
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Sparrow (email client)  
Speech Recognition & Synthesis  
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Gonzalez v. Google LLC (2022)  
Beauty YouTuber  
BookTube  
BreadTube  
" Don't be evil "  
Gayglers  
Google as a verb  
Google bombing 2004 U.S. presidential election  
2004 U.S. presidential election  
Google effect  
Googlefight  
Google hacking  
Googleshare  
Google tax  
Googlewhack  
Googlization  
Illegal flower tribute  
Objectives and key results  
Rooting  
Search engine manipulation effect  
Side project time  
Sitelink  
Site reliability engineering  
StudyTube  
VTuber  
YouTube Poop  
YouTuber list  
list  
Booting process  
Custom distributions  
Features  
Recovery mode  
Software development  
Africa  
Antarctica  
Asia Israel  
Israel

Europe  
North America Canada United States  
Canada  
United States  
Oceania  
South America Argentina Chile Colombia  
Argentina  
Chile  
Colombia  
Copyright strike  
Education  
Features  
Moderation  
Most-disliked videos  
Most-liked videos  
Most-subscribed channels  
Most-viewed channels  
Most-viewed videos Arabic music videos Chinese music videos French music videos Indian videos  
Pakistani videos  
Arabic music videos  
Chinese music videos  
French music videos  
Indian videos  
Pakistani videos  
Official channel  
Social impact  
YouTube Premium original programming  
Gmail interface  
Maps pin  
Most downloaded Google Play applications  
Stadia games  
AlphaGo  
Google: Behind the Screen  
Google Maps Road Trip  
Google and the World Brain  
The Creepy Line  
Google Hacks  
The Google Story

Googled: The End of the World as We Know It  
How Google Works  
I'm Feeling Lucky  
In the Plex  
The MANIAC  
Google Feud  
Google Me (film)  
" Google Me " (Kim Zolciak song)  
" Google Me " (Teyana Taylor song)  
Is Google Making Us Stupid?  
Proceratium google  
Matt Nathanson: Live at Google  
The Billion Dollar Code  
The Internship  
Where on Google Earth is Carmen Sandiego?  
" Attention Is All You Need "  
elgooG  
Generative pre-trained transformer  
" Me at the zoo "  
Predictions of the end  
Relationship with Wikipedia  
" Reunion "  
Robot Constitution  
Category  
Outline  
v  
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History timeline  
timeline  
Companies  
Projects  
Parameter Hyperparameter  
Hyperparameter  
Loss functions  
Regression Bias–variance tradeoff Double descent Overfitting  
Bias–variance tradeoff  
Double descent

Overfitting  
Clustering  
Gradient descent SGD Quasi-Newton method Conjugate gradient method  
SGD  
Quasi-Newton method  
Conjugate gradient method  
Backpropagation  
Attention  
Convolution  
Normalization Batchnorm  
Batchnorm  
Activation Softmax Sigmoid Rectifier  
Softmax  
Sigmoid  
Rectifier  
Gating  
Weight initialization  
Regularization  
Datasets Augmentation  
Augmentation  
Prompt engineering  
Reinforcement learning Q-learning SARSA Imitation Policy gradient  
Q-learning  
SARSA  
Imitation  
Policy gradient  
Diffusion  
Latent diffusion model  
Autoregression  
Adversary  
RAG  
Uncanny valley  
RLHF  
Self-supervised learning  
Reflection  
Recursive self-improvement  
Hallucination  
Word embedding

Vibe coding  
Machine learning In-context learning  
In-context learning  
Artificial neural network Deep learning  
Deep learning  
Language model Large language model NMT  
Large language model  
NMT  
Reasoning language model  
Model Context Protocol  
Intelligent agent  
Artificial human companion  
Humanity's Last Exam  
Artificial general intelligence (AGI)  
AlexNet  
WaveNet  
Human image synthesis  
HWR  
OCR  
Computer vision  
Speech synthesis 15.ai ElevenLabs  
15.ai  
ElevenLabs  
Speech recognition Whisper  
Whisper  
Facial recognition  
AlphaFold  
Text-to-image models Aurora DALL-E Firefly Flux Ideogram Imagen Midjourney Recraft Stable Diffusion  
Aurora  
DALL-E  
Firefly  
Flux  
Ideogram  
Imagen  
Midjourney  
Recraft  
Stable Diffusion

Text-to-video models Dream Machine Runway Gen Hailuo AI Kling Sora Veo

Dream Machine

Runway Gen

Hailuo AI

Kling

Sora

Veo

Music generation Riffusion Suno AI Udio

Riffusion

Suno AI

Udio

Word2vec

Seq2seq

GloVe

BERT

T5

Llama

Chinchilla AI

PaLM

GPT 1 2 3 J ChatGPT 4 4o o1 o3 4.5 4.1 o4-mini 5

1

2

3

J

ChatGPT

4

4o

o1

o3

4.5

4.1

o4-mini

5

Claude

Gemini Gemini (language model) Gemma

Gemini (language model)

Gemma

Grok



LaMDA  
BLOOM  
DBRX  
Project Debater  
IBM Watson  
IBM Watsonx  
Granite  
PanGu-Σ  
DeepSeek  
Qwen  
AlphaGo  
AlphaZero  
OpenAI Five  
Self-driving car  
MuZero  
Action selection AutoGPT  
AutoGPT  
Robot control  
Alan Turing  
Warren Sturgis McCulloch  
Walter Pitts  
John von Neumann  
Claude Shannon  
Shun'ichi Amari  
Kunihiko Fukushima  
Takeo Kanade  
Marvin Minsky  
John McCarthy  
Nathaniel Rochester  
Allen Newell  
Cliff Shaw  
Herbert A. Simon  
Oliver Selfridge  
Frank Rosenblatt  
Bernard Widrow  
Joseph Weizenbaum  
Seymour Papert  
Seppo Linnainmaa

Paul Werbos  
Geoffrey Hinton  
John Hopfield  
Jürgen Schmidhuber  
Yann LeCun  
Yoshua Bengio  
Lotfi A. Zadeh  
Stephen Grossberg  
Alex Graves  
James Goodnight  
Andrew Ng  
Fei-Fei Li  
Alex Krizhevsky  
Ilya Sutskever  
Oriol Vinyals  
Quoc V. Le  
Ian Goodfellow  
Demis Hassabis  
David Silver  
Andrej Karpathy  
Ashish Vaswani  
Noam Shazeer  
Aidan Gomez  
John Schulman  
Mustafa Suleyman  
Jan Leike  
Daniel Kokotajlo  
François Chollet  
Neural Turing machine  
Differentiable neural computer  
Transformer Vision transformer (ViT)  
Vision transformer (ViT)  
Recurrent neural network (RNN)  
Long short-term memory (LSTM)  
Gated recurrent unit (GRU)  
Echo state network  
Multilayer perceptron (MLP)  
Convolutional neural network (CNN)

Residual neural network (RNN)  
Highway network  
Mamba  
Autoencoder  
Variational autoencoder (VAE)  
Generative adversarial network (GAN)  
Graph neural network (GNN)  
Category  
v  
t  
e  
AI-complete  
Bag-of-words  
n -gram Bigram Trigram  
Bigram  
Trigram  
Computational linguistics  
Natural language understanding  
Stop words  
Text processing  
Argument mining  
Collocation extraction  
Concept mining  
Coreference resolution  
Deep linguistic processing  
Distant reading  
Information extraction  
Named-entity recognition  
Ontology learning  
Parsing Semantic parsing Syntactic parsing  
Semantic parsing  
Syntactic parsing  
Part-of-speech tagging  
Semantic analysis  
Semantic role labeling  
Semantic decomposition  
Semantic similarity  
Sentiment analysis

Terminology extraction  
Text mining  
Textual entailment  
Truecasing  
Word-sense disambiguation  
Word-sense induction  
Compound-term processing  
Lemmatisation  
Lexical analysis  
Text chunking  
Stemming  
Sentence segmentation  
Word segmentation  
Multi-document summarization  
Sentence extraction  
Text simplification  
Computer-assisted  
Example-based  
Rule-based  
Statistical  
Transfer-based  
Neural  
BERT  
Document-term matrix  
Explicit semantic analysis  
fastText  
GloVe  
Language model ( large )  
Latent semantic analysis  
Seq2seq  
Word embedding  
Word2vec  
Corpus linguistics  
Lexical resource  
Linguistic Linked Open Data  
Machine-readable dictionary  
Parallel text  
PropBank

Semantic network  
Simple Knowledge Organization System  
Speech corpus  
Text corpus  
Thesaurus (information retrieval)  
Treebank  
Universal Dependencies  
BabelNet  
Bank of English  
DBpedia  
FrameNet  
Google Ngram Viewer  
UBY  
WordNet  
Wikidata  
Speech recognition  
Speech segmentation  
Speech synthesis  
Natural language generation  
Optical character recognition  
Document classification  
Latent Dirichlet allocation  
Pachinko allocation  
Automated essay scoring  
Concordancer  
Grammar checker  
Predictive text  
Pronunciation assessment  
Spell checker  
Chatbot  
Interactive fiction  
Question answering  
Virtual assistant  
Voice user interface  
Formal semantics  
Hallucination  
Natural Language Toolkit  
spaCy