



Freebase and the Google Knowledge Graph

Freebase



- Started in 2005 by [Metaweb](#) to create a “open, shared database of the world's knowledge”
- Online in 2007
- Acquired by Google in 2010
- Read-only in 2014
- Original basis for [Google Knowledge Graph](#)
- Decommissioned in 2016; 2014 [dumps](#) still available as RDF
- Google allowed Wikidata to use the data

Freebase was a Pioneer

- Early examples of graph-based knowledge repositories like [Wordnet](#) (1985) and [Geonames](#) (2005) were narrow in scope
- Freebase & DBpedia (2007) had general scope
- DBpedia focused on extracting from Wikipedia
- Freebase extracted from Wikipedia and other sources, built a community of contributors, and created a very large ontology

Miley Cyrus

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- Book Character
- Fictional Character
- Author
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Miley Ray Cyrus (born Destiny Hope Cyrus; November 23, 1992) is an American actress and pop singer. She achieved wide fame for her role as Miley Stewart/Hannah Montana on the Disney Channel sitcom Hannah Montana. Cyrus recorded music for the soundtracks, Hannah Montana (2006) and Hannah Montana 2/Meet Miley Cyrus (2007), released by Walt Disney Records. With the success of the Hannah Montana franchise she established herself as a teen idol. In 20... [More](#)

[W](#) [Read article at Wikipedia](#)

Date of birth: Nov 23, 1992 (age 18 years)

Place of birth: [Nashville, Tennessee, United States of America](#)

Place Musical Career Began: [Los Angeles, North America](#)

Active as Musical Artist (start): 2003

Musical Genres: [Pop rock](#), [Teen pop](#), [Bubblegum pop](#), [Dance-pop](#), [Pop music](#), [Country pop](#), [Electropop](#), [Southern rock](#), [Adult contemporary music](#)

Also known as: [Miley Ray Cyrus](#), [Destiny Hope Cyrus](#), [Hannah Montana](#), [Smiley Miley](#), [Cyrus](#), [Miley](#), [Destiny Cyrus](#)

People

Place of birth: [Nashville, Tennessee, United States of America](#)

Miley Cyrus Quotes

« *Pink isn't just a color, it's an attitude!* »

Country of nationality: [United States of America](#)

Gender: [Female](#)

Profession: [Singer](#)
[Actor](#)
[Songwriter](#)
[Guitarist](#)

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Miley Cyrus elsewhere on the web

[★ Official Website](#)

[MusicBrainz](#)

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[Portugese Wikipedia](#)

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Screenshot

AppAppeal

Freebase Approach

- Initially populated with Wikipedia data
 - Crowdsourced updates/additions to schema & data, like Wikipedias and later Wikidata
 - Tools to upload structured data, both schema & data
- Focus on data, not text
 - Text (multilingual) for short short descriptions
- Graph based schema, but syntax, semantic, and query language different from RDF
- Open-source data that could be downloaded initially in a custom format, later in RDF
- Business model: sell services using their custom query engine

Freebase Schema

- Statistics
 - ~10,000 types
 - ~3,500 properties
 - ~130M entities
 - ~2B triples
- Modeled many relations a CVTs (compound value type) object to allow more roles, e.g.
:bho :spouseOf [a :Marriage with spouse :bho, :mo;
:start "1992"; :location :chi]
- Larger, cleaner & more organized than DBpedia

The Last Picture Show

- A final dump with 1.9B triples in RDF is [available](#) from Google
 - See also <http://basekb.com/docs/>
- Used for [DARPA Deft](#) program, [NIST TAC](#) and other research efforts as a reference KB
 - Freebase relations still used for some evaluations
- Data transferred to Wikidata and [Google Knowledge Graph](#)

Google Knowledge Graph

- Freebase was initial version of Google knowledge Graph, originally called the [Google Knowledge Vault](#)
- You can query the current Google Knowledge Graph in a limited way
 - Inputs: query string, types, limit, ...
 - Output: (JSON) ranked list of entities that match, along with types, short description, ID (= freebase ID)
- See simple `gkg.py` example

Current types

Book
BookSeries
Educational
Organization
Event
Government
Organization
LocalBusiness
Movie
MovieSeries
MusicAlbum
MusicGroup
MusicRecording
Organization
Periodical
Person
Place
SportsTeam
TVEpisode
TVSeries
VideoGame
VideoGameSeries
WebSite

Knowledge Graph Search

The screenshot shows the Google Search Central Knowledge Graph Search API documentation. The page title is "Method entities.search". A sidebar on the left lists navigation options: "On this page" (with a dropdown arrow), "HTTP request", "Query parameters", "Request body", "Response body", "Response fields", "JSON-LD keywords", "Schema.org compatibility", "List of schema extensions", and "...". The main content area includes a breadcrumb trail: "Home > Search Central > Knowledge Graph Search API > Reference". Below the title, there is a description: "Searches Knowledge Graph for entities that match the constraints." and a section for "HTTP request" showing the method: "GET https://kgsearch.googleapis.com/v1/entities:search". On the right side, there is a "Try this method" panel with a close button. It contains the text: "Call this method on live data and see the result. Experiment with authorization and field settings. For help, check the [APIs Explorer documentation](#)." Below this, the "Request parameters" section lists several fields: "ids" (input type "string" with a plus button), "indent" (input type "true" with a dropdown arrow), "languages" (input type "string" with a plus button), "limit" (input type "10"), "prefix" (input type "true" with a dropdown arrow), "query" (input type "Clinton"), and "types" (input type "Person" with a minus button).

[Try It](#)

First you Need a Google API key

- With a google account, you can get a [API key](#)
 - You can have different keys for different projects
 - Many services are free with moderate use
 - You can get one [here](#)
- You can also authenticate with Google services using [OAUTH](#), which is more convenient
 - See how to do it [here](#)

Example

Query about **Taylor Swift**

```
https://kgsearch.googleapis.com/v1/entities:search?query=taylor+swift&key=API_KEY&limit=1&indent=True
```

```
{ "@context": { "@vocab": "http://schema.org/",
  "goog": "http://schema.googleapis.com/",
  "resultScore": "goog:resultScore",
  "detailedDescription": "goog:detailedDescription",
  "EntitySearchResult": "goog:EntitySearchResult",
  "kg": "http://g.co/kg"},
"@type": "ItemList",
"itemListElement": [
  { "@type": "EntitySearchResult",
    "result": { "@id": "kg:/m/0dl567",
      "name": "Taylor Swift",
      "@type": ["Thing", "Person"],
      "description": "Singer-songwriter",
      "image": {"contentUrl": "https://t1.gstatic.com/images?q=tbn:ANd9GcQm...",
        "url": "https://en.wikipedia.org/wiki/Taylor_Swift",
        "license": "http://creativecommons.org/licenses/by-sa/2.0"},
      "detailedDescription": {"articleBody": "Taylor Alison Swift is an American singer-songwriter ...",
        "url": "http://en.wikipedia.org/wiki/Taylor_Swift",
        "license": "https://en.wikipedia.org/wiki/Wikipedia:Text_of_Creative_..."},
      "url": "http://taylorswift.com/" },
    "resultScore": 896.576599 } ] }
```

gkg.py

- [gkg.py](#) is a simple python program gets one or more matches for a query string
- You can also specify
 - How many to return in a ranked list
 - One or more types (e.g., Person, Book, Place)
 - One or more languages for the name and descriptions

What's it good for?

- It's one easy tool for [entity linking](#) in text
 - assigning a unique id to entities, e.g., famous individuals, locations, or companies
- ***Trump was born in Queens, New York***
- Gkg will find these and their IDs, which are also often mentioned as Wikidata properties
 - Lets us align an entity in the Google knowledge graph with one in Wikidata and then on to DBpedia

Tyrannosaurus (Q14332)

- **m/07hjh**: Freebase ID of entity Tyrannosaurus
 - Try <http://g.co/kg/m/07hjh>
 - Wikidata property (P646) with label *Freebase ID*
- **/g/11r_php4q**: *Google Knowledge Graph ID*
- Wikidata has a property ([P2671](#)) with label *Google Knowledge Graph ID*
 - Try https://g.co/kg/g/11r_php4q
- Only 101 Wikidata items have [both](#)

What's it not good for?

- We get no relations 😞
- Google's KG has many properties about its entities
- These are not available in the public service
- But are no doubt very useful to Google's search allowing it to do more accurate entity linking and even answer questions

About

[donaldjtrump.com](#)

Donald John Trump is an American politician, media personality, and businessman who served as the 45th president of the United States from 2017 to 2021. Trump graduated from the Wharton School of the University of Pennsylvania with a bachelor's degree in 1968. [Wikipedia](#)

Born: June 14, 1946 (age 76 years), [Jamaica Hospital Medical Center, New York, NY](#)

Spouse: [Melania Trump](#) (m. 2005), [Marla Maples](#) (m. 1993–1999), [Ivana Trump](#) (m. 1977–1992)

Net worth: 3.2 billion USD (2022) [Forbes](#)

Children: [Ivanka Trump](#), [Donald Trump Jr.](#), [Barron Trump](#), [Eric Trump](#), [Tiffany Trump](#)

Height: 6' 3"

Party: [Republican Party](#)

Sources include: [Ballotpedia](#), [Wikipedia](#). [Learn more](#)

[Feedback](#)

Info box Google shows for Donald Trump

Microsoft has a KG, too

The image shows a Microsoft Bing search results page for "donald trump". The browser address bar shows "bing.com". The search bar contains "donald trump" with icons for voice search, image search, and a magnifying glass. Below the search bar are tabs for "ALL", "SHOPPING", "IMAGES", "VIDEOS", "MAPS", "NEWS", and "MORE".

The main search results for "Donald Trump" are displayed, including a profile picture, the name "Donald Trump", and the title "45th President of the United States". Below this are several filter buttons: "Top stories", "Written works", "Quotes", "Speeches", "Achievements", and "Biography".

Under the "News about Donald Trump" section, there is a link to "bing.com/news" and a grid of news snippets. The top snippet is titled "How Donald Trump is shaping the midterms for Republicans" with a sub-headline "Despite not being a candidate, Donald Trump is looming large this midterm..." and is attributed to "MSNBC NEWS · 1h · on MSN". Other snippets include "Donald Trump's Remark About Kate Sparked 'Profanity' From William,..." from Newsweek (5h), "Donald Trump settles lawsuit with group of protesters" from THE BALTIMORE SUN (2h), "Teasing a 2024 run, Donald Trump returns to Iowa to boost Republicans ahead ..." from Des Moines Register (7h), and "Donald Trump Calls on Mitch McConnell to be Impeached" from Newsweek (3h).

On the right side of the page, a knowledge graph (KG) for Donald Trump is displayed. It features a large image of Donald Trump with the text "Donald Trump" and "45th President of the United States". Below the image are social media icons for Wikipedia, Facebook, Instagram, YouTube, and IMDb. The text describes him as an American politician, media personality, and businessman who served as the 45th president from 2017 to 2021. It also lists his education at the Wharton School of Business and his website "donaldjtrump.com". At the bottom, it lists his birth date (June 14, ...), political party (Republican, 1987-19...), and spouse (Ivana Zelníčková, m. 1977;...).

Final Thoughts

- Search engines exploit knowledge they gather from the web (schema.org), NLP processing, Wikipedia, Wikidata, and others
- There is an ecology of sorts and all of these are becoming more interlinked and integrated
- I've found it useful to use the Google KG search for **entity linking** when a Wikidata or DBpedia was not found
- Freebase pioneered many of the features we see in Wikidata today