

From Search Engines to Answering Engines



Google

- Basically retrieves documents based on keyword searches.
- The search algorithms are based on string/pattern matching, statistical frequencies and Page rank (based on hyperlink popularity analysis).
- Scalable Programming Model
- There is some light-weight semantics – when you search for known objects or public data, Google knows about these types of entities (OneBox) and provides factual answers.

Actual Answers to Factual Questions

Google™

what time is it in Los Angeles

Web [Video](#)

Results 1 - 10 of about 1,150,000,000



5:23am Friday (PDT) - Time in Los Angeles, California

[Current local time in Los Angeles - California - U.S.A.](#)  

If it is e.g. 4 pm in Los Angeles, what time is it elsewhere? Show time difference between Los Angeles time and other time zones - Display a free clock for ...

www.timeanddate.com/worldclock/city.html?n=137 - 22k - [Cached](#) - [Similar pages](#) - 

[California, United States current local time from WorldTimeServer.com](#)  

Major Cities in California, United States include Los Angeles, ... When it's 12 noon next F in California, United States, what time will it be where ...

www.worldtimeserver.com/current_time_in_US-CA.aspx - 32k - [Cached](#) - [Similar pages](#) -

[Los Angeles, California, United States current local time from ...](#)  

Los Angeles, California, United States - before placing a telephone call or making

Syntactic vs. Semantic Search

- Syntactic search – can match the query against
 - index of the textual content of the resources
 - URIs (URLs, URNs) in the system
 - literals in the RDF metadata
 - or a combination of these, possibly using:
 - Exact, prefix or substring match, stemming, minimal edit distance
- Semantic search – in addition to syntactic search, can use
 - index of the meaning of sentences in each resource
 - semantic knowledge structures and analysis
 - the graph structure of RDF metadata
 - or a combination of these, possibly using:
 - query expansion, classification/categorization, tagging, graph traversal, microformats, RDF & OWL inferencing and reasoning

Types of “Semantic Search” Engines

- Semantically-enhanced Search
 - Orion, DBPedia
- NLP-based Search
 - MetaWeb Freebase, MS Powerset, ...
- Computational-NLP-based Search
 - True Knowledge, (Wolfram Alpha?), ...

Google Orion

- Technology that can better understand associations and concepts related to search.
- It finds relationships between queries and related concepts and presents those as search refinements:
 - Pages are scanned in “real-time” by Google after a query is entered.
 - Conceptually and contextually related sites/pages are then identified and expressed in the form of the improved refinements.
- Also provides longer “snippets” (text extracts containing the keywords) when users input queries of three words or more.

Orion Search Refinements

Timeline results for French Revolution

1792 In 1792, after the outbreak of the **French Revolution**, Cooper stated his enthusiasm for the **French Revolution**, and made a trip to Paris from March to ...

www.pabook.libraries.psu.edu

1793 If you had attended," he wrote in his unpublished Apology for the **French Revolution** in 1793, "to the history of the **French Revolution** as minutely as .

www.gutenberg.org

[More timeline results »](#)

Book results for French Revolution

[The French Revolution: from its origins to 1793](#) - by Georges Lefebvre, Elizabeth Moss Evanson, Paul ... - 379 pages

[The French Revolution](#) - by Adrian Gilbert - 32 pages

[Rights of Man: Being an Answer to Mr. Burke's ...](#) - by Thomas Paine - 261 pages

Searches related to: **French Revolution**

[american revolution](#)

[causes of french revolution](#)

[marie antoinette](#)

[napoleon](#)

[effects of the french revolution](#)

[louis xvi](#)

[robespierre](#)

[enlightenment](#)

DBPedia

- Based on SPO-triples
- Extracts information from Wikipedia info boxes
- Has a powerful graph query language SPARQL (plus extensions)
- Exampe queries:
 - <http://wiki.dbpedia.org/OnlineAccess#h28-5>

Metaweb Freebase

- Freebase contains structured information on many popular topics, like movies, music, people and locations – all reconciled and freely available.
- A base is a new kind of Website that anyone can build using Freebase; It is a place to organize and share collections of information about a particular subject.
- Covers millions of topics in hundreds of categories.
- Freebase has two search interfaces:
 - Free form queries; a text search box.
 - MQL (MetaWeb Query Language) queries.

Your bases

Your types

Administrator

[make a base](#)

You are not an administrator of any bases. Why don't you consider creating one?

Find a base

Go

or explore them all

Resources

- [Screencast: Making Bases](#)
- [Screencast: Using the filter view](#)
- [Freebase FAQ](#)
- [API Documentation](#)
- [Contribution Guidelines](#)

New on Freebase

Getting Started



Freebase users have created bases about all kinds of things. Have a look around and join in or [start your own](#).

This page will keep you in the loop on any changes happening in the bases you belong to.



World War Two



Le Louvre



Edgar Allan Poe

Vote on flagged items

Mystery fiction vs Mystery

[The Darksword Trilogy, Volume III: Triumph of the Darksword vs Das dunkle Schwert. Der Herrscher von Merilon.](#)

Bicycle Wheel vs Bicycle Wheel



You've added: 16 Facts
On Freebase since: Mar 26, 2008

Featured Views



Exhibition

Exhibitions Base



Depictions of the Virgin Mary in the Louvre

Le Louvre Base



Computer Science books

Computer Science Base

Microsoft Powerset

- Provides a NLP-based search engine.
- Powerset tries to read and understand every sentence on a Web page and allows asking questions in plain English.
- Powerset search and discovery experience is currently based on Wikipedia and Freebase.
- In large, Powerset is trying to match the meaning of a query with the meaning of sentences in Wikipedia or facts in Freebase.

Ready. Powerset. Go.

search wikipedia articles

Explore

[search tips & examples](#)

watch demo video



Search & read
Wikipedia
articles

Discover Factz

For most people, places and things, Powerset shows a summary of Factz from across Wikipedia.

Henry VIII **dissolved** : **monasteries**, abbey,
granted : land, abbey, Thomas
married : wife, Anne Boleyn, ...
founded : professorships, Brist

try these: [Mae West](#)
[Orson Welles](#)
[Darth Vader](#)

Unlock Meaning

Powerset finds articles related to the meaning of your query. And sometimes even direct answers.

Wikipedia

Films by david lynch

David Lynch: Films directed

Blue Velvet Dune Eraserhead Twin Peaks: Fire Walk with Me Inland Empire Lost Highway Mulholland Drive

try these: [who directs films](#)
[what was banned by the FDA](#)
[what did Rita Moreno win](#)

Scan Summaries

Powerset summarizes pages for easy browsing, with tools that follow you as you read and explore.

Show Outline Show Factz

The Daily Show

The Daily Show won Emmy Award

The Daily Show won Peabody

try these: [California Gold Rush](#)
[The Simpsons Movie](#)
[High Plains Drifter](#)

Powerset Services

- In the search box, you can express yourself in keywords, phrases, or simple questions.
- On the search results page, Powerset gives more accurate results, often answering questions directly, and aggregating information from across multiple articles.
- Powerset's technology follows you into enhanced Wikipedia articles, giving you a better way to quickly digest and navigate content.

Powerset Factz

- Factz are concise representations of information extracted from sentences.
- They are represented in three parts: the subject, relation and object (e.g., Oswald shot JFK).
- Factz do not always represent truth, but rather propositions that are asserted in the text of Wikipedia.
- On the search results page, you will often see Factz for general topic queries; these Factz are collected from pages across Wikipedia.
- On a particular topic page, you can see the Factz extracted from the given page in the outline.

Types of “Semantic Search” Engines

- Semantically-enhanced Search (barely covered here)
 - Google Orion, Yahoo! SearchMonkey, (MS Kumo?), ...
- NLP-based Search
 - MetaWeb Freebase, MS Powerset, ...
- Computational-NLP-based Search
 - True Knowledge, (Wolfram Alpha?), ...

True Knowledge

- Provides an Answer Engine aimed at improving the experience of finding known facts on the Web.
- Represents the world's knowledge in a form that is clear and accessible to humans, as well as being comprehensible to computers.
- Combines knowledge through a process of inference, drawing conclusions, and cross-referencing stored information to produce a reasoned answer.

True Knowledge[®]

BETA

Ask a Question

Add Knowledge

Answer

e.g. Where can I see a movie in Cambridge, UK?

When was Grover Cleveland president of the US?

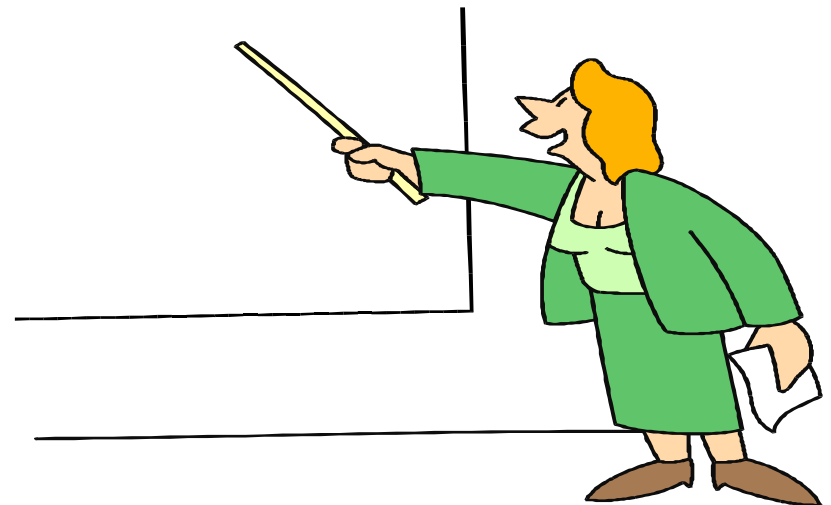
Answering questions based on 159,345,295 facts on 5,426,732 things

True Knowledge Components

- **Knowledge Base (KB)** – a huge database of facts on any topic.
- **Knowledge Generator** – infers facts either using KB, other generated facts or external feeds of knowledge.
- **Browser interface** – supports NLP & query language.
- **Query/Answer System** – uses KB and generated facts to answer queries.
- **System Assessment** – further processes existing facts in order to maintain semantic consistency of KB.
- **User Assessment** – enables user to endorse or contradict particular facts in KB.

Contents

- Web 1.0, Web 2.0, Web 3.0, Web X.0...
- Syntactic vs. Semantic Search
- Semantic Search Engines
- Spectrum of Semantic Search Problems?!



The Spectrum of Semantic Search Problems

Impossible

Optimization: Requires massive parallel computer
Example: "What is the best vocation for me now?"

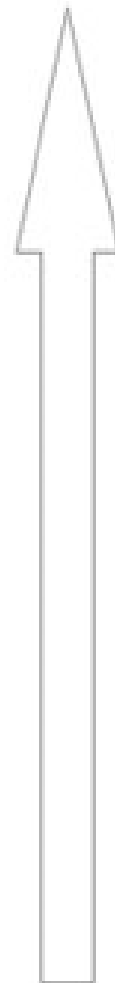
Inference: Requires NLP + Inference Engine + Database
Example: "What US Senator took money from foreign entity?"

Google

Natural Language: Requires query analysis
Example: "What year was Leonardo Da Vinci born?"

Simple: Solvable with Google Statistical Algorithm
Example: "read write web blog"

Harder



Debunking the Spectrum of Semantic Search Problems

Query 1: What is the best vocation for me now?

Search Problem: *find x*:

Search solution (note 1) : $x = \text{best} + \text{vocation}$

Query 2: What US Senator took money from foreign entity?

Search Problem: *find x*:

Search solution (note 2) : $x = \text{US (adjacent) Senator} + \text{took (adjacent) money (near) foreign (adjacent) entity}$

Query 3: What year was Leonardo Da Vinci born?

Search Problem: *find x*:

Search solution (note 3) : $x = \text{year} + \text{Leonardo_Da_Vinci} + \text{born}$

Query 4: read write web blog

Search Problem: *find x*:

Search solution: $x = \text{read} + \text{write} + \text{web} + \text{blog}$

Google “goes religious” 😊

Web

Results 1 - 10 of about 425,000 for what is the [best vocation](#) for me [now](#). (0.30 seconds)

Did you mean: [what is the best *vacation* for me now](#)

YouTube - [Vocation](#) - Please Don't Leave **Me Now** (Live @ Keller Klub)

Vocation playing "Please Don't Leave **Me Now**" live @ the Keller Klub in Stuttgart/Germany on the 12.07.07. Setlist: 1. No Words 2. Dear Mister Lawyer 3.

www.youtube.com/watch?v=IbPaC3jQVbQ - 54k - [Cached](#) - [Similar pages](#) - [Note this](#)

[best vocation](#) information/ discernment website? - Catholic Answers ...

Feb 18, 2008 ... **what is the best vocation** discernment website you have come ... Forgive **me** for tooting my own horn, but in all humility, I offer this: ...

forums.catholic.com/showthread.php?t=214385 - 74k - [Cached](#) - [Similar pages](#) - [Note this](#)

USCCB - [Vocations](#) & Priestly Formation - What People are Saying ...

Recently, someone sent **me** a copy of the short film, Fishers of Men, which was produced by the This is the **best vocations** video that I have ever seen, ...

www.usccb.org/vocations/testimonies.shtml - 21k - [Cached](#) - [Similar pages](#) - [Note this](#)

[The Archdiocese of Canberra & Goulburn](#) - About the Archdiocese

For **me now** at 28, it is a response I am making to God's call in order to love We also have Robert Love studying in Rome at the late-**vocations** seminary, ...

www.cg.catholic.org.au/about/default.cfm?loadref=160 - 36k -

[Cached](#) - [Similar pages](#) - [Note this](#)

Sponsored Links

[Is Vocational](#)

Move your career forward with an accredited online degree!

www.CourseAdvisor.com

[Best Vacation](#)

Vacation in Colorado? Yes!

Free 2008 Colorado Vacation Guide

www.Colorado.com

[Free Online Career Test](#)

Our Free Career Test Can Help You Find Your Dream Job. Start Here!

www.ProjectCareer.com

[Vacation Travel Reviews](#)

Get reviews from consumers on vacation & travel destinations.

viewpoints.com/Destinations

Freebase “what’s” it

Search Results

No items

Narrow results by type

No search results for "what is the best vocation for me now"

Perhaps you meant one of these search terms: [what](#), [is](#), [what is](#), [the](#), [what the](#), [is the](#), [what is the](#), [best](#), [what best](#), [is best](#), [what is best](#), [the best](#), [what the best](#), [is the best](#), [what is the best](#), [vocation](#), [what vocation](#), [what is vocation](#)

Search results for "what":

What If



What If, sometimes rendered as What If...?, is the title of several comic book series published by Marvel Comics, exploring "the road not traveled" by its various characters. Events in the series are considered separate from mainstream continuity in the Marvel Universe. The stories in the initial 1977-1984 series featured the alien Uatu the Watcher as narrator. The observer of events transpiring on Earth from his base on the moon, Uatu, a member of an immortal race of Watchers, is also able to...

WHAT

Radio Station , Broadcast

WHAT is a commercial radio station located in Philadelphia, Pennsylvania, broadcasting on 1340 AM. WHAT currently airs an adult standards format that initially began with a month of Frank Sinatra's music. WHAT flipped formats to the "Martini Lounge" format on August 31, 2007. According to their website The All-Sinatra format aired throughout the month of September. After September 30th, the station started an Adult Standards format featuring artists including Michael Buble, Harry Connick, Jr.,...

What a Way to Go!



Film

What A Way To Go! is a 1964 American comedy film directed by J. Lee Thompson and starring Shirley MaLaîne, Paul Newman, Robert Mitchum and Dean Martin. The plot of this movie was written around the concept of a comic-tragic flashback to a man's childhood. This is a comedy about a man who is a member of a family that is...

!but knows what vocation is...

eebase

Explore

Make

Help

arieljfrank | Settings | Sign out

vocation

Search

h Results

- 30 of 60+

w results by type

Vocation

Quotation Subject

A vocation as defined in a religious environment is an occupation for which a person is suited, trained or qualified. Often those who follow a religious vocation have an inclination to undertake the work, often called a calling. This type of vocation is either professional or voluntary and can include many different religious backgrounds. Vocations can be seen as fulfilling a psychological or spiritual need for the worker, and the term can also be used to EXPLAIN any occupation for which a...

Vocation

Musical Track

True Knowledge seems intelligent

True Knowledge[®]
BETA

what is the best vocation for me now

Answer

what is the best vocation for me now

Good answer? **Yes** **No**

Sorry. I couldn't find a meaningful interpretation of that. You can't meaningfully talk about yourself until you have established a true identity

External web pages (using standard web search):

[www.vocation.com - What is the best way to investigate and discern which](http://www.vocation.com/content-fwd5.htm)

What is the best way to investigate and discern which order is right for ... exists, God has something in mind for you, and now that you have decided to try ...

<http://www.vocation.com/content-fwd5.htm>

[www.vocation.com - I'm wondering what is the best way to go about choosin](http://www.vocation.com/content-fbl.htm)

Ask Your Vocation Question. E-Mail Newsletter. Enter your e-mail address to subscribe now: ... website has already given me, and also in advance for the help ...

<http://www.vocation.com/content-fbl.htm>

but isn't really 😊...

True Knowledge
BETA

what is the best vocation for barack

Answer

what is the best vocation for barack obama now

Good answer?

Yes

No

Sorry, I don't understand that question.

While you are here...

You might be interested in the answers to recent questions:

- How many legs does a bee have?
- What's the GDP of Japan?
- time in west sumatra
- How far is it from Moscow to Venice?
- What language do they speak in Maryland?
- What is the distance between Mumbai,India and Berlin?
- What is food
- What is the distance between Chicago and Toronto?

Or you can teach True Knowledge about:

yourself or another person – a business – anything else

External web pages (using standard web search):

[Obama Would Bring Out the Best in Us – Forward.com](http://www.forward.com/articles/14420/)

... meet extraordinary challenges, a period during which he discovered his vocation. ... Barack Obama has now been elected our President. ...

<http://www.forward.com/articles/14420/>