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Google™



# What does Google do?

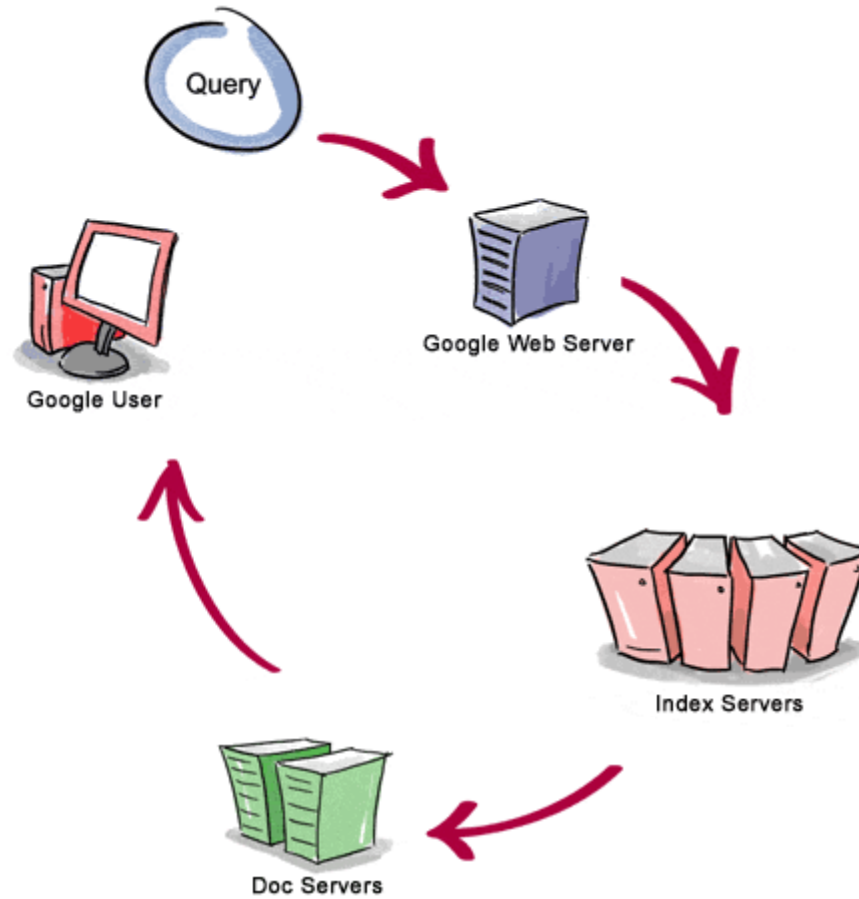
---

- **Beginnings...**
  - Web search, circa 1995
  - Sergey Brin and Larry Page
- **How does it work?**
  - Crawling, indexing, storage



# What does Google do?

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# What does Google do?


**YAHOO! SEARCH** Web


[Answers](#) [My Web](#) [Search Services](#) |


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**Search Results** 1 - 10 of about 96 for [Castro touts Cuban social achievements](#)

[HOT NEWS... Cubalinda.com-Your Travel to Cuba!!!...](#)   
... retired 64-year-old **social** worker who joined a Canadian ... of support for **Castro** at home is **Cuban** national pride at ... one of the great **achievements** of the last twenty ...  
[www.cubalinda.com/English/General\\_Info/PressNews.asp](http://www.cubalinda.com/English/General_Info/PressNews.asp) - 118k - [Cached](#) - [More from this site](#) - [Save](#)

[Notizie di The Washington Post](#)   
Pagina che permette di scegliere di visualizzare notizie RSS di altri siti ... Officials fear death toll will rise. Bush **Touts** Reduced Deficit ... submit the names and **Social** Security numbers of tens of ... more "control" from Mark **Cuban** when dealing with NBA officials ...  
[www.itisvolta.it/rss/canale.asp?c=4&t=The+Washington+Post](http://www.itisvolta.it/rss/canale.asp?c=4&t=The+Washington+Post) - 207k - [Cached](#) - [More from this site](#) - [Save](#)

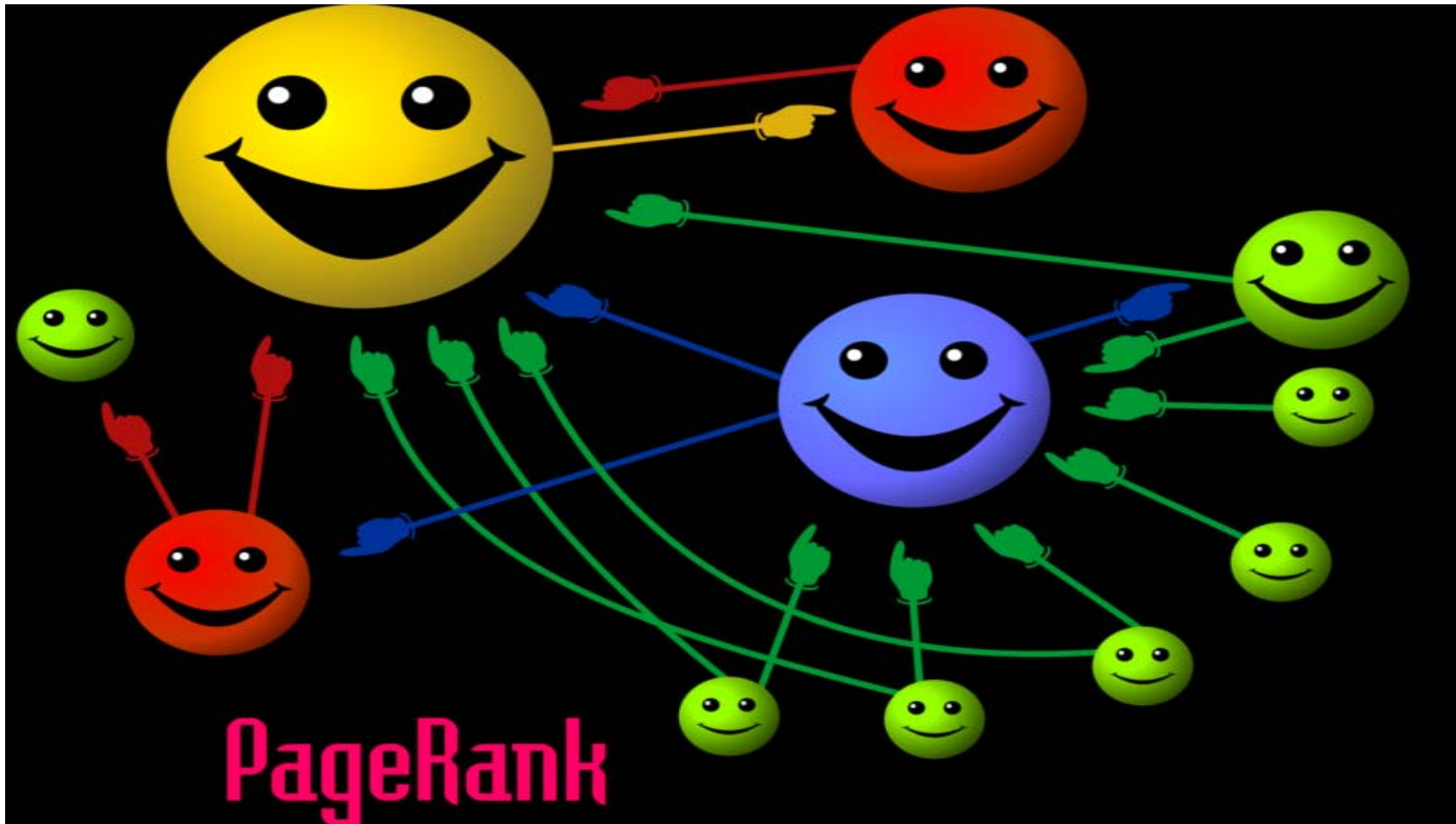
[CNSNews.com](#)   
... 7/25/2001 -- **Social** Security Commission Battles Critics ... 7/16/2001 -- **Castro** Gov't Criticizes Bush For Tightening Sanctions ... 6/29/2001 -- House GOP **Touts** First-Half **Achievements** ...  
[www.cnsnews.com/Nation/Archive/200107/Archive.asp](http://www.cnsnews.com/Nation/Archive/200107/Archive.asp) - 37k - [Cached](#) - [More from this site](#) - [Save](#)

[What suits you?](#)   
What goes well with you? What looks good on your body? Eh! Umm... I... don't know... I guess... J No matter how much we have read or heard about what to wear and what not, we run high risk of making mistakes in this area. ... Another company **touts** aromatherapy's promise as "a mood alternative, as biofeedback tied in to relaxation, stress ...  
[o3.indiatimes.com/garimadutt/archive/2006/02/27/504720.aspx](http://o3.indiatimes.com/garimadutt/archive/2006/02/27/504720.aspx) - 525k - [Cached](#) - [More from this site](#) - [Save](#)



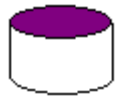
# PageRank

---



# A Repeating Pattern

---



```
Stirred_stuff GracieStirs(unstirred_stuff) {  
  While it's not completely stirred yet:  
    Keep stirring!  
  When done, give back the stirred_stuff  
}
```





# Google Search

---

```
DoSearch(keyword) {  
    RelevantPages = LookupInIndex(keyword);  
    EvenMoreRelevantPages = RemoveSpam(RelevantPages);  
    RankedPages = Rank(EvenMoreRelevantPages);  
    Display RankedPages  
}
```



# Lookup

---

– # Andromeda	12	199	233	766...
– # Antlia	12	766	1023	6544...
– # Aquarius	12	344	544	888...
– # Aquila	12	234	544	1023...
– # Ara	12	655	788	999...
– # Aries	12	17	45	89...
– # Auriga	12	63	99	544...
– # Boötes	12	76	126	877...
– # Caelum	12	766	899	1077...
– # Camelopardalis	12	344	766	950...
– # Cancer	12	34	67	98...
– # Canes Venatici	12	354	764	856...
– # Canis Major	12	23	45	67...
– # Canis Minor	12	34	56	57...
– # Capricornus	12	22	54	65...
– # Carina	12	66	77	88...
– # Cassiopeia	12	21	43	54...
– # Centaurus	12	355	877	1232...
– # Cepheus	12	387	966	3299...
– # Cetus	12	544	865	976...
– # Chamaeleon	12	566	891	2103...
– # Circinus	12	725	1467	4300...



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---

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# Create Snippets

---

## [Carina](#)

The **constellation Carina** is known as the Keel, which is the bottom part of old ships. **Carina** was originally a part of Argo Navis, which was a huge boat in ...

[www.windows.ucar.edu/tour/link=/the\\_universe/Constellations/carina.html](http://www.windows.ucar.edu/tour/link=/the_universe/Constellations/carina.html) - 12k - [Cached](#) - [Similar pages](#)

## [MySpace.com - Carina Round - Alternative / Indie / Rock - www ...](#)

MySpace music profile for **Carina Round** with tour dates, songs, videos, pictures, blogs, band information, downloads and more.

[www.myspace.com/carinaround](http://www.myspace.com/carinaround) - 191k - [Cached](#) - [Similar pages](#)

## [Carina \(constellation\) - Wikipedia, the free encyclopedia](#)

**Carina** (pronounced /kəˈraɪnə/, Latin: keel) is a southern **constellation** which forms part of the old **constellation** of Argo Navis. ...

[en.wikipedia.org/wiki/Carina\\_\(constellation\)](http://en.wikipedia.org/wiki/Carina_(constellation)) - 61k - [Cached](#) - [Similar pages](#)

## [Suzie Carina free picture galleries](#)

Suzie **Carina** free pictures featuring the hot pornstar Suzie **Carina**. ... Twisty's Girls (\$24.95 monthly) XXX Adult Stars (\$2.95 trial) ...

[www.pornstarbook.com/suzie\\_carina.shtml](http://www.pornstarbook.com/suzie_carina.shtml) - 73k - [Cached](#) - [Similar pages](#)

## [Carina Software](#)

For more than fifteen years, **Carina Software** has been offering full-featured planetarium software used by amateur and professional astronomers, ...

[www.carinasoft.com/](http://www.carinasoft.com/) - 1k - [Cached](#) - [Similar pages](#)



# Remove Spam!

---

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# Run PageRank

## [Constellation Carina](#)

The Milky Way passing trough **Carina** and the neighbouring constellation Vela (north of **Carina**) makes this field worth for random scanning through the sky. ...

[seds.org/Maps/Stars\\_en/Fig/carina.html](http://seds.org/Maps/Stars_en/Fig/carina.html) - 7k - [Cached](#) - [Similar pages](#)

75 A

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[www.carinasoft.com/](http://www.carinasoft.com/) - 1k - [Cached](#) - [Similar pages](#)

42 B

## [Chandra :: Photo Album :: Constellation Carina](#)

**Carina Constellation** The story behind the name: **Carina** means the keel or bottom of a ship. This **constellation** was originally part of a larger pattern ...

[chandra.harvard.edu/photo/constellations/carina.html](http://chandra.harvard.edu/photo/constellations/carina.html) - 17k - [Cached](#) - [Similar pages](#)

84 C

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162 D

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34 E

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68 F

# Return the Results

---

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## [Category:Carina constellation - Wikipedia, the free encyclopedia](#)

From Wikipedia, the free encyclopedia. Jump to: navigation, search. The main article for this category is **Carina constellation**. **Constellation** map ...

[en.wikipedia.org/wiki/Category:Carina\\_constellation](http://en.wikipedia.org/wiki/Category:Carina_constellation) - 23k - [Cached](#) - [Similar pages](#)

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# A Challenge (for more advanced students)

---

- You would like to implement a search engine that can search through all the files on your local computer.
- Grep?
- Creating an index
- But first we need to crawl...



# Remembering Dr. Seuss

---

	One Fish Two Fish Red Fish Blue Fish	The Butter Battle Book	The Cat in the Hat	Horton Hears a Who	The Lorax	Mr. Brown Can Moo! Can You?
fish	1	0	1	0	1	0
cow	1	0	0	0	0	1
elephant	0	1	0	1	0	0
bee	0	1	0	0	1	1
cat	1	0	1	0	0	0
crows	0	0	0	0	1	0
lorax	0	0	0	0	1	0



# Remembering Dr. Seuss

---

(COW and BEE) or CROWS

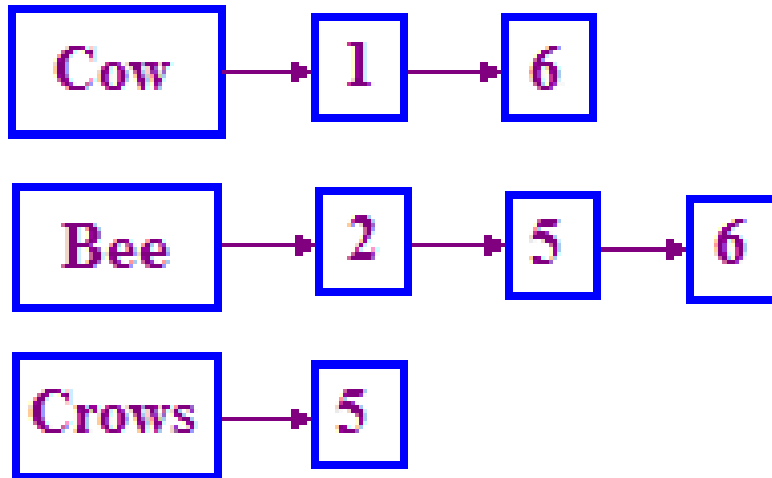
(100001 and 010011) or 000010 = 000011

	One Fish Two Fish Red Fish Blue Fish	The Butter Battle Book	The Cat in the Hat	Horton Hears a Who	The Lorax	Mr. Brown Can Moo! Can You?
fish	1	0	1	0	1	0
cow	1	0	0	0	0	1
elephant	0	1	0	1	0	0
bee	0	1	0	0	1	1
cat	1	0	1	0	0	0
crows	0	0	0	0	1	0
lorax	0	0	0	0	1	0



# Inverted Index

---



**How do you process a query now?**  
(COW and BEE)



# New Developments in Search

---

- **Universal Search**

- Search across all content sources, compare and rank all the information in real time, and deliver a single, integrated set of search results, giving a “blended” results page
- *Example:* Search for “Darth Vader” results in a single set of blended search results that include a humorous parody of the movie, images of the Darth Vader character, news reports on the latest Lucas film, as well as websites focused on the actor James Earl Jones – all available on the results page.
- Users no longer have to visit several different Google search properties to find such a wide array of information on the topic.



# New Developments in Search

---

- **Universal Search**

- Implementing universal search requires enhancements to:

- Google's technical infrastructure that enables the search engine to handle the computationally intensive tasks required to produce universal search results.
- Our ranking mechanism which automatically and objectively compares different types of information



# Cloud Computing

---

- **Remember “Supercomputers” like the Cray?**
- **They are still around!**
  - used mainly by the military, government intelligence agencies, universities, research labs, and large companies
  - solve enormously complex calculations for such tasks as...
    - simulating nuclear explosions,
    - predicting climate change,
    - designing airplanes,
    - analyzing which proteins in the body are likely to bind with potential new drugs.



# Cloud Computing

---

- **Cloud computing aims to apply that kind of power—measured in the tens of trillions of computations per second—to more general, but still problems like...**
  - analyzing risk in financial portfolios,
  - delivering personalized medical information,
  - powering immersive computer games,
- **All through the Web!**



# Cloud Computing

---

- It does that by networking large groups of servers that use low-cost consumer PC technology, with specialized connections to spread data-processing chores across them.



# Street View

---

- <http://maps.google.com/help/maps/streetview/>



# Nine Paths to Innovation

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1. Ideas come from everywhere
2. Share everything you can
3. You're Brilliant. We're Hiring
4. A license to pursue dreams (Google's 20% time policy)
5. Innovation not instant perfection (get something out there, get feedback, and iterate quickly and often)
6. Data is apolitical (use data based decision making)
7. Creativity loves Constraints
8. Users not money
9. Don't kill projects, morph them



# Questions?

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