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Web Crawler Report

Our knowledge base was created by using a web crawler to extract content from different web pages relevant to blackholes. That data was stored in separate text files. We analyzed the text using TF-IDF to extract the top 50 relevant words in the files. TF value gives a frequency score of items in a document and IDF gives information relative to rarity in a collection of documents. We multiply these terms together to extract what we consider to be the most important terms from each of the documents. Once we got the top 50 or so terms, we manually picked 10 of them to build our knowledge base around. The 10 terms we picked were magnetic, singularity, horizon, galaxies, interstellar, wormhole, gravastars, telescope, suns and shadow. Our knowledge base is represented through a python dictionary with values containing sentences relating to the term which we then pickled. Below are screenshots of our knowledge base.

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$ python knowledge_builder.py
Choose 10 terms to search for:
Type in a term: magnetic
['(Image credit: Dust and magnetic fields: NASA/SOFIA; Star field image: NASA/Hubble Space Telescope) Magnetic for
at the heart of the Milky Way is so much quieter than its counterparts in other galaxies.', 'New observations, ta
become so good, so impressive, that I don't think there's any doubt anymore.', 'To view the neighborhood superna
ssive black hole and the one churning farther away, the telescopes need to observe "the entire range of the electr
omagnetic spectrum, from the radio up to the gamma rays," Markoff said.', 'Psaltis said photons, plasma, gas and m
agnetic fields are all described in a black hole's forecast.', 'Watch the video Scientists can't directly observe
black holes with telescopes that detect x-rays, light, or other forms of electromagnetic radiation.')]

Type in a term: singularity
['Is a singularity really a spot of infinite density and zero volume?', 'Thorne: That's one way to describe it, bu
t the singularity, like the black hole itself, we believe is quite rich in its structure.', '[ 8 Shocking Things W
e Learned From Stephen Hawking's Book ] As you near the singularity, we expect that it stretches and squeezes you
in a chaotic way that ultimately kills you and destroys the matter of which you're made.', 'And when you get right
in a chaotic way that ultimately kills you and destroys the matter of which you're made.', 'And when you get right
to the singularity itself, the laws of physics as we know them break down and the laws of quantum gravity take ho
ld.', 'Since we don't understand those laws very well yet, we can't say what the nature of the very core of the si
ngularity is.', 'Within the event horizon, one would find the black hole's singularity, where previous research su
ggests all of the object's mass has collapsed to an infinitely dense extent.', 'This means the fabric of space and
time around the singularity has also curved to an infinite degree, so the laws of physics as we currently know th
em break down.', 'The event horizon protects us from the unknown physics near a singularity,' Loeb said.', 'The s
ingularity at the center of a black hole is the ultimate no man's land: a place where matter is compressed down t
o an infinitely tiny point, and all conceptions of time and space completely break down.', 'Something has to replac
e the singularity, but we're not exactly sure what.', 'Gravastars Another attempt to eradicate the singularity - o
ne that doesn't rely on untested theories of quantum gravity - is known as the gravastar.', 'The difference betwee
n a black hole and a gravastar is that, instead of a singularity, the gravastar is filled with dark energy.', 'Th
e spin of a rotating black hole stretches the singularity into a ring.', 'And according to the math of Einstein's
theory of general relativity (which is the only math we've got), once you pass through the ring singularity, you e
nter a wormhole and pop out through a white hole (the polar opposite of a black hole, where nothing can enter and
matter rushes out at the speed of light) into an entirely new and exciting patch of the universe.', 'The singulari
ty, stretched into a ring, is rotating at such a fantastic pace that it has incredible centrifugal force.', 'Outsi
de this region, radiation is falling inward toward the singularity, compelled by the extreme gravitational pull.』
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Type in a term: interstellar
["This is one of the first instances where we can really see how magnetic fields and interstellar matter interact
with each other," said study co-author Joan Schmelz, an astrophysicist at NASA Ames Research Center in California
.', 'If a black hole passes through a cloud of interstellar matter, for example, it will draw matter inward in a p
rocess known as accretion.', 'Lastly, occasionally black holes find each other in the darkness of interstellar spa
ce and merge together.')]

Type in a term: wormhole
["Interstellar," which opened in theaters across the United States on Friday (Nov. 7), delves into black holes an
d wormholes, and it touches down on more than one alien planet.', '[ \Interstellar\': A Space Epic in Pictures ]
Journey through a wormhole Wormhole travel across the universe and supergiant black holes are just some of the won
ders seen in the film "Interstellar.", 'The astronauts are aided in their quest by a wormhole - a sort of tunnel
that allows relatively quick travel between widely separated parts of the universe - which had mysteriously appear
ed near Saturn some years before.', 'Cooper steers the pioneers' ship, called Endurance, through the wormhole into
a planet-rich portion of a faraway galaxy.', 'Though wormholes are a favored sci-fi trope, nobody knows whether o
r not they actually exist.', 'Furthermore, scientists say, a wormhole would likely collapse quickly unless it was
proped open using some kind of negative-energy matter.', 'So the big wormhole in "Interstellar" would require som
e serious and exotic engineering work - but I'll stop here, so I don't give too much away about the film.', 'The
"Interstellar" visual-effects team used equations provided by Thorne to come up with their representation of the
wormhole, depicting its entrance as a shimmering sphere - just as it likely would look in real life, Thorne said.',
', 'Neither wormholes nor black holes have been depicted in any Hollywood movie in the way that they actually woul
d appear,' Thorne said recently in an "Interstellar" science video produced by Wired magazine.', 'Facts, theories
and definition - Einstein's theory of general relativity - The hunt for wormholes: How scientists look for space-
time tunnels Let's go for a spin Planck stars and gravastars may have awesome names, but the reality of their exis
tence is in doubt.', 'And according to the math of Einstein's theory of general relativity (which is the only math
we've got), once you pass through the ring singularity, you enter a wormhole and pop out through a white hole (th
e polar opposite of a black hole, where nothing can enter and matter rushes out at the speed of light) into an ent
irely new and exciting patch of the universe.', '(Image credit: All About Space magazine) Jump to: Are black holes
wormholes?', 'What about wormholes?', '(Image credit: Karl Tate, SPACE.com contributor) (opens in new tab) Over t
he years scientists have looked into the possibility that black holes could be wormholes to other galaxies.', 'Re
ading Kip Thorne's popular book about wormholes is what first got me excited about physics as a child,' Massey sa
id. But it doesn't seem likely that wormholes exist. "Indeed, Thorne, about his recent advice to the movie
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If we develop a chatbot around this knowledge base it should be capable of giving sophisticated dialogue back to the user. An example of this could look like this:

User: What is another type of blackhole?

Chatbot: A wormhole is another well known phenomena similar to blackholes.

User: What is a wormhole?

Chatbot: A wormhole is different from a blackhole as a blackhole has an end with no escape known as a singularity. According to the math of Einstein's theory of general relativity (which is the only math we've got), once you pass through the ring singularity, you enter a wormhole and pop out through a white hole (the polar opposite of a black hole, where nothing can enter and matter rushes out at the speed of light) into an entirely new and exciting patch of the universe.