1. **Automatically category**

Phase 1:

* Search the photo in the given dataset after taking this one by the camera

Phase 2:

* Create the meta data of this photo and save it to the database:
* Information of the object (e.g., author, style, content, etc.,)
* Object detected and recognized

**2.  Plan**

Phase 1:

* *Step 1: Make the literature survey about this one*

**Expectation**

* + **Collect all the survey on the world**
  + Classify the research direction
  + Show the **performance and limitation** of the current system
  + List all the tool and language of developing the applications
  + Write a report of the literature review

**Method**

* *Step 2: Make the simple prototype*

**Expectation**

* + Collect all the survey on the world
  + Classify the research direction
  + Show the **performance and limitation** of the current system
  + List all the tool and language of developing the applications

**Method**

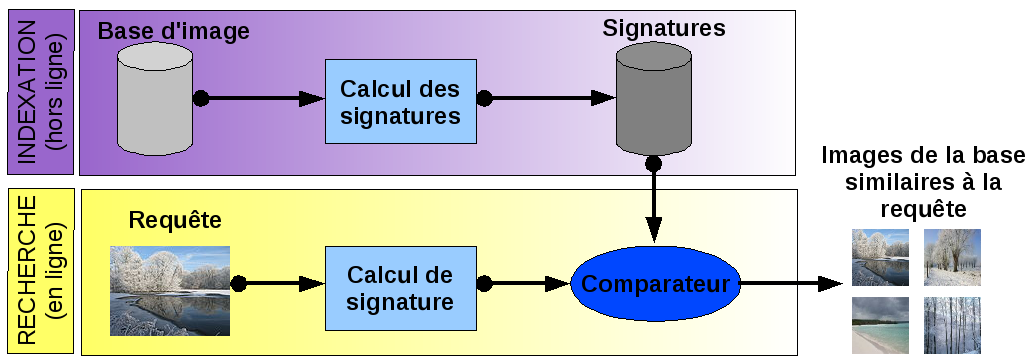
Phase 2:

1. **Report 1: Tools, language, limitation,etc.,**
2. **Search by photos**

**a.1 Algorithm**

**Content-based image retrieval** (**CBIR**), also known as **query by image content** (**QBIC**) and **content-based visual information retrieval**(**CBVIR**) is the application of [computer vision](https://en.wikipedia.org/wiki/Computer_vision) techniques to the [image retrieval](https://en.wikipedia.org/wiki/Image_retrieval) problem, that is, the problem of searching for [digital images](https://en.wikipedia.org/wiki/Digital_image) in large [databases](https://en.wikipedia.org/wiki/Database) (see this survey for a recent scientific overview of the CBIR field). Content-based image retrieval is opposed to traditional **concept-based approaches** (see [**Concept-based image indexing**](https://en.wikipedia.org/wiki/Concept-based_image_indexing)).

**"Content-based" means that the search analyzes the contents of the image rather than the**[**metadata**](https://en.wikipedia.org/wiki/Metadata_(computing))**such as keywords, tags, or descriptions associated with the image.** The term "content" in this context might refer to **colors, shapes, textures, or any other information that can be derived from the image itself**. CBIR is desirable because searches that rely purely on metadata are dependent on annotation quality and completeness. Having humans manually annotate images by entering keywords or metadata in a large database can be time consuming and may not capture the keywords desired to describe the image. The evaluation of the effectiveness of keyword image search is subjective and has not been well-defined. In the same regard, CBIR systems have similar challenges in defining success.



## Technical progress[[edit](https://en.wikipedia.org/w/index.php?title=Content-based_image_retrieval&action=edit&section=2" \o "Edit section: Technical progress)]

The interest in CBIR has grown because of the limitations inherent in metadata-based systems, as well as the large range of possible uses for efficient image retrieval. Textual information about images can be easily searched using existing technology, but this requires humans to manually describe each image in the database. This can be impractical for very large databases or for images that are generated automatically, e.g. those from [surveillance cameras](https://en.wikipedia.org/wiki/Surveillance_camera). It is also possible to miss images that use different synonyms in their descriptions. Systems based on categorizing images in semantic classes like "cat" as a subclass of "animal" can avoid the miscategorization problem, but will require more effort by a user to find images that might be "cats", but are only classified as an "animal". Many standards have been developed to categorize images, but all still face scaling and miscategorization issues.[[2]](https://en.wikipedia.org/wiki/Content-based_image_retrieval#cite_note-Eakins-2)

**Initial CBIR systems were developed to search databases based on image color, texture, and shape properties**. After these systems were developed, the need for user-friendly interfaces became apparent. Therefore, efforts in the CBIR field started to include human-centered design that tried to meet the needs of the user performing the search. This typically means inclusion of: query methods that may allow descriptive semantics, queries that may involve user feedback, systems that may include machine learning, and systems that may understand user satisfaction levels

## Techniques

## Many CBIR systems have been developed, but the problem of retrieving images on the basis of their pixel content remains largely unsolved.

### Query techniques

### Different implementations of CBIR make use of different types of user queries.

[Query by example](https://en.wikipedia.org/wiki/Query_by_example) is a query technique that involves providing the CBIR system with an example image that it will then base its search upon. The underlying search algorithms may vary depending on the application, but result images should all share common elements with the provided example.

Options for providing example images to the system include:

* A preexisting image may be supplied by the user or chosen from a random set.
* The user draws a rough approximation of the image they are looking for, for example with blobs of color or general shapes.[[5]](https://en.wikipedia.org/wiki/Content-based_image_retrieval#cite_note-Shapiro2001-5)

This query technique removes the difficulties that can arise when trying to describe images with words.

#### Semantic retrieval

*Semantic* retrieval starts with a user making a request like "find pictures of Abraham Lincoln". This type of open-ended task is very difficult for computers to perform - Lincoln may not always be facing the camera or in the same pose. Many CBIR systems therefore generally make use of lower-level features like texture, color, and shape. These features are either used in combination with interfaces that allow easier input of the criteria or with databases that have already been trained to match features (such as faces, fingerprints, or shape matching). However, in general, image retrieval requires human feedback in order to identify higher-level concepts.[[3]](https://en.wikipedia.org/wiki/Content-based_image_retrieval#cite_note-Rui-3)

#### Relevance feedback (human interaction)

Combining CBIR search techniques available with the wide range of potential users and their intent can be a difficult task. An aspect of making CBIR successful relies entirely on the ability to understand the user intent.[[6]](https://en.wikipedia.org/wiki/Content-based_image_retrieval#cite_note-Ddata-6) CBIR systems can make use of [*relevance feedback*](https://en.wikipedia.org/wiki/Relevance_feedback), where the user progressively refines the search results by marking images in the results as "relevant", "not relevant", or "neutral" to the search query, then repeating the search with the new information. Examples of this type of interface have been developed.[[7]](https://en.wikipedia.org/wiki/Content-based_image_retrieval#cite_note-Bird-7)

#### Iterative/machine learning

[Machine learning](https://en.wikipedia.org/wiki/Machine_learning) and application of iterative techniques are becoming more common in CBIR.

#### Other query methods

Other query methods include browsing for example images, navigating customized/hierarchical categories, querying by image region (rather than the entire image), querying by multiple example images, querying by visual sketch, querying by direct specification of image features, and multimodal queries (e.g. combining touch, voice, etc.)

### Content comparison using image distance measures

The most common method for comparing two images in content-based image retrieval (typically an example image and an image from the database) is using an image distance measure. An image distance measure compares the similarity of two images in various dimensions such as color, texture, shape, and others. For example, a distance of 0 signifies an exact match with the query, with respect to the dimensions that were considered. As one may intuitively gather, a value greater than 0 indicates various degrees of similarities between the images. Search results then can be sorted based on their distance to the queried image.[[5]](https://en.wikipedia.org/wiki/Content-based_image_retrieval#cite_note-Shapiro2001-5)Many measures of image distance (Similarity Models) have been developed.

#### Color

Computing distance measures based on color similarity is achieved by computing a [color histogram](https://en.wikipedia.org/wiki/Color_histogram) for each image that identifies the proportion of pixels within an image holding specific values.[[2]](https://en.wikipedia.org/wiki/Content-based_image_retrieval#cite_note-Eakins-2) Examining images based on the colors they contain is one of the most widely used techniques because it can be completed without regard to image size or orientation.[[3]](https://en.wikipedia.org/wiki/Content-based_image_retrieval#cite_note-Rui-3) However, research has also attempted to segment color proportion by region and by spatial relationship among several color regions.[[9]](https://en.wikipedia.org/wiki/Content-based_image_retrieval#cite_note-Mayron-9)

#### Texture

[Texture](https://en.wikipedia.org/wiki/Image_texture) measures look for visual patterns in images and how they are spatially defined. Textures are represented by [texels](https://en.wikipedia.org/wiki/Texel_(graphics)" \o "Texel (graphics)) which are then placed into a number of sets, depending on how many textures are detected in the image. These sets not only define the texture, but also where in the image the texture is located.

Texture is a difficult concept to represent. The identification of specific textures in an image is achieved primarily by modeling texture as a two-dimensional gray level variation. The relative brightness of pairs of pixels is computed such that degree of contrast, regularity, coarseness and directionality may be estimated.The problem is in identifying patterns of co-pixel variation and associating them with particular classes of textures such as *silky*, or *rough*.

Other methods of classifying textures include:

* [Co-occurrence matrix](https://en.wikipedia.org/wiki/Image_texture)
* [Laws texture energy](https://en.wikipedia.org/wiki/Image_texture)
* [Wavelet transform](https://en.wikipedia.org/wiki/Wavelet_transform)
* [Orthogonal transforms (Discrete Tchebichef moments)](https://en.wikipedia.org/w/index.php?title=Orthogonal_transforms_(Discrete_Tchebichef_moments)&action=edit&redlink=1)

#### Shape

Shape does not refer to the shape of an image but to the shape of a particular region that is being sought out. Shapes will often be determined first applying [segmentation](https://en.wikipedia.org/wiki/Segmentation_(image_processing)) or [edge detection](https://en.wikipedia.org/wiki/Edge_detection) to an image. Other methods use shape filters to identify given shapes of an image.[[12]](https://en.wikipedia.org/wiki/Content-based_image_retrieval#cite_note-12) Shape descriptors may also need to be invariant to translation, rotation, and scale.

Some shape descriptors include:

* [Fourier transform](https://en.wikipedia.org/wiki/Fourier_transform)
* [Moment invariant](https://en.wikipedia.org/wiki/Image_moment)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **id** | **Name of tool** | **Function** | **How** | **Limitation** |
| 1 | Google search image | -Google's [Search by image](https://en.wikipedia.org/wiki/Google_Images#Search_by_image) is a feature that utilizes **reverse image search** and allows users to search for related images just by uploading an image or image URL. | -Google accomplishes this by **analyzing the submitted picture and constructing** a mathematical model of it using advanced algorithms.  -It is then compared with billions of other images in Google's databases before returning matching and similar results.  -It should be noted that when available, Google also uses [metadata](https://en.wikipedia.org/wiki/Metadata) about the image such as description |  |
| 2 | TinEye | [TinEye](https://en.wikipedia.org/wiki/TinEye) is a search engine specializing in reverse image search | - Upon submitting an image, TinEye creates a "unique and compact digital signature or fingerprint" of said image and matches it with other indexed images.  - This procedure is able to match even heavily edited versions of the submitted image, but will not usually return similar images in the results. |  |
| 3 | Pixsy | [Pixsy](https://www.pixsy.com/) reverse image search technology detects image matches on the public internet for images uploaded to the Pixsy platform  . | - New matches are automatically detected and alerts send to the user. For unauthorised use, Pixsy offers a compensation recovery servicefor commercial use of the image owners work.  -Pixsy partners with over 25 law firms and attorneys around the world to bring resolution for copyright infringement |  |
| 4 | Pinterest | Pinterest acquired startup company *VisualGraph* in 2014 and introduced visual search on its platform | By using reverse image search, Pinterest is able to extract visual features from fashion objects (e.g. shoes, dress, glasses, bag, watch, pants, shorts, bikini, earrings) and offer product recommendations that look similar |  |
| 5 |  |  |  |  |

# List of [Content-based image retrieval](https://en.wikipedia.org/wiki/Content-based_image_retrieval) engines

**Source**: Wikipedia, the free encyclopedia

This is a list of publicly available [Content-based image retrieval](https://en.wikipedia.org/wiki/Content-based_image_retrieval) (CBIR) engines. These image search engines look at the content (pixels) of images in order to return results that match a particular query.

## Commercial CBIR search engines

| Name | Description | External Image Query | Metadata Query | Index Size (Estimate, Millions of Images) | Organization Type | License (Open/Closed) |
| --- | --- | --- | --- | --- | --- | --- |
| [Pixolution](http://demo.pixolution.de/) | CBIR search engine, by pixolution | No | No | 32M | Private Company | Closed |
| [JustVisual (formerly known as Superfish)](http://justvisual.com/) | pure image-to-image search | yes | yes | Billions | Start-up | API |
| [Picalike](http://www.picalike.com/products/similarity-search.php) | CBIR engine for Mobile and eCommerce | No | No (additional filters can be added) |  | Private Company | Closed |
| [Elastic Vision](http://elastic-vision.software.informer.com/) | Smart image searcher with content-based clustering in a visual network. | No | No |  | Private Company | Closed |
| [Google Image Search](https://web.archive.org/web/20010721221641/http:/images.google.com/) | Google's CBIR system with [reverse image search](https://en.wikipedia.org/wiki/Reverse_image_search) | Yes | Yes |  | Public Company | [Google Custom Search](https://en.wikipedia.org/wiki/Google_Custom_Search) API access |
| [Yandex Image Search](http://images.yandex.ru/) | Yandex CBIR system | Yes | Yes | 10000M | Public Company | Closed |
| [Baidu Image Search](http://stu.baidu.com/) | Baidu's CBIR system | Yes | Yes | 1000M | Public Company | Closed |
| [ID My Pill](http://www.idmypill.com/) | Automatic prescription pill identification (CBIR) | Yes | No |  | Private Company | Open (via API) |
| [Imense Image Search Portal](http://www.imense.com/) | CBIR search engine, by Imense. | No | Yes | 3M | Private Company | Closed |
| [Imprezzeo Image Search](http://www.imprezzeo.com/) | CBIR search engine, by Imprezzeo. | No | Yes |  | Private Company | Closed |
| [Incogna Image Search](http://www.incogna.com/) | CBIR search engine, by Incogna Inc. | No | Yes | 100M | Private Company | Closed |
| [Chic Engine](http://www.chicengine.com/) | Visual fashion search engine (CBIR) | Yes | No |  | Private Company | Closed |
| [MiPai similarity search engine](http://mipai.esuli.it/) | Online similarity search engine | Yes | Yes | 100M | Individual | Closed |
| [Piximilar](http://labs.ideeinc.com/visual/) | Demo engine, developed by Idee Inc. | No | No | 3M | Private Company1 | Closed |
| [Empora](http://www.empora.com/) | Product comparison & shopping using CBIR for product images. Previously known as Pixsta | No | Yes | 0.5M | Private Company | Closed |
| [Shopachu](http://www.shopachu.com/) | Shopping & fashion CBIR engine, by Incogna Inc. | No | Yes | 1M | Private Company | Closed |
| [TinEye](http://www.tineye.com/) | CBIR site for finding variations of web images, by Idee Inc. | Yes | No | 24200M | Private Company | Closed |
| [PicScout](http://www.picscout.com/) | CBIR service tracks image usage across the web. | Yes | Yes | 270M | Private Company ([Getty Images](https://en.wikipedia.org/wiki/Getty_Images)) | Open (via API) |
| [Galaxy](https://oddconcepts.kr/index.en.html) | CBIR engine for finding product/catalogue/video frames, by Odd Concepts Inc. | Yes | Yes | 35M | Private Company | Closed |
| [Tiltomo](http://www.tiltomo.com/) | CBIR system using Flickr photos | No | Yes |  | Private Company | Closed |
| [eBay Image Search](http://morelikethis.ebay.com/IS?_catid=11450&_kw=t-shirt) | Image Search for eBay Fashion | No | Yes | 20M | Public Company | Closed |
| [IMMENSELAB](http://www.immenselab.com/) | CBIR search engine by [KBKGROUP](http://www.kbkgroup.org/). | Yes | No | 10M | Private Company | Closed |
| [Macroglossa Visual Search](https://en.wikipedia.org/wiki/Macroglossa_Visual_Search) | CBIR visual search engine | Yes | No |  | Private Company | Closed |
| [NoClone](https://en.wikipedia.org/w/index.php?title=NoClone&action=edit&redlink=1) | PC image search engine and classification based on content | Yes (a set) | No |  | Private Company | Closed |
| [Querbie](http://www.querbie.com/) | General purpose CBIR visual search engine | Yes | Yes | 20M | Private Company | Closed |

**CBIR research projects/demos/open source projects**

| Name | Description | External Image Query | Metadata Query | Index Size (Estimate, Millions of Images) | Organization Type | License (Open/Closed) |
| --- | --- | --- | --- | --- | --- | --- |
| [akiwi](http://www.akiwi.eu/) | akiwi is a semi-automatic image keywording tool using CBIR techniques. It was developed by HTW Berlin / pixolution GmbH | Yes | Yes | 15M | University | Closed |
| [ALIPR](http://www.alipr.com/) | Developed by Penn State University researchers | Yes | Yes |  | University | Closed |
| [Anaktisi](http://www.anaktisi.net/) | This Web-Solution implements a new family of CBIR descriptors. These descriptors combine in one histogram color and texture information and are suitable for accurately retrieving images. | Yes | No | 0.225M | University | Open |
| [BRISC](http://brisc.sourceforge.net/) | BRISC is a recursive acronym for BRISC Really IS Cool, and is (conveniently enough) also an anagram of Content-Based Image Retrieval System. | Yes | No |  | University | GPL |
| [digiKam](https://en.wikipedia.org/wiki/DigiKam) | Extensive photo management application build on top of [KDE](https://en.wikipedia.org/wiki/KDE) libraries. It provides, besides many other features, reverse searches for images in the local collection, detection of duplicates and a fuzzy search by drawings. | Yes | Yes | Desktop-based | KDE | [GPL](https://en.wikipedia.org/wiki/GPL) |
| [Caliph & Emir](http://www.semanticmetadata.net/features/) | Creation and Retrieval of images based on MPEG-7. | Yes | No | Desktop-based | University | [GPL](https://en.wikipedia.org/wiki/GPL) |
| [FIRE](http://thomas.deselaers.de/fire/) | Open source query by visual example CBIR system. Developed at RWTH Aachen University. [FIRE](http://thomas.deselaers.de/FIRE) is a research system developed with extensibility in mind and can easily be combined with textual information retrieval systems. | No | No |  | University | Open |
| [GNU Image Finding Tool](https://www.gnu.org/software/gift/) | Query by example image search system. | Yes | No | Desktop-based | GNU | [GPL](https://en.wikipedia.org/wiki/GPL) |
| [ISSBP](http://imense.com/similarsearch/desktop) | Similar Image Search by Imense plugin for Adobe Bridge, free beta. | Yes | Yes | free-beta limited to 4k images | Private Company | Closed |
| [img(Rummager)](http://www.img-rummager.com/) | Image retrieval Engine (Freeware Application). | Yes | No | Desktop-based | Individual | Closed |
| [imgSeek](http://server.imgseek.net/) | photo collection manager and viewer with content-based search and many other features. | Yes | No |  | Individual | [GPL](https://en.wikipedia.org/wiki/GPL) |
| [IKONA](https://www.rocq.inria.fr/cgi-bin/imedia/circario.cgi/demos) | Generic CBIR system - INRIA - IMEDIA | Yes | Yes |  | University | Closed |
| [IOSB](http://www.iosb.fraunhofer.de/servlet/is/28046/) | Image retrieval demonstration software of Fraunhofer IOSB (Germany) | Yes | No | Desktop-based | Research Institute | Closed |
| [LIRE](http://www.lire-project.net/) | Java GPL library for content based image retrieval based on Lucene including multiple low level global and local features and different indexing strategies including bag of visual words and hashing. | Yes | Yes |  | University | GPL |
| [Lucignolo](http://lucignolo.isti.cnr.it/) | Image similarity search engine using only the native full-text search engine Lucene. | Yes | Yes | 106M | Research Institute | Closed |
| [MIFile](http://mifile.deepfeatures.org/) | Image similarity search engine based on MI File (Metric Inverted File) developed at ISTI-CNR. [Source code](https://github.com/giamato/mi-file) of the MI File. | No | No | 100M | Research Institute | Open |
| [MUVIS](http://muvis.cs.tut.fi/) | CBIR System at TUT- Tampere University of Technology. | Yes | No | Desktop-based | University | Closed |
| [Pastec](http://www.pastec.io/) | C++ LGPL index and search engine for near-duplicate image retrieval that uses bag of visual words with ORB features. | Yes | Yes |  | Private company | LGPL |
| [PIRIA](http://www.kalisteo.org/en/index.htm) | CBIR tool developed at CEA-LIST, LVIC (Vision and Content Engineering Laboratory). | Yes | Yes | 1000 M | University | Closed |
| [PicsLikeThat](http://www.picslikethat.com/) | Image search using visual similarity search and sorting combined with a recommender system. (Cooperation of pixolution GmbH, fotolia and HTW Berlin) | No | No | 12M | University | Closed |
| [Pixcavator](http://inperc.com/wiki/index.php?title=Pixcavator_image_search) | Similar image search based on topological image analysis | Yes | No | Desktop-based | Private company | Closed |
| [QuickLook](http://projects.ivl.disco.unimib.it/quicklook/) | Visual information retrieval system with relevance feedback | No | Yes |  | University | Closed |
| [RETIN](http://retin.ensea.fr/) | Interactive images retrieval system - CNRS - ETIS Lab., MIDI Team | No | No |  | University | Closed |
| [Retrievr](http://labs.systemone.at/retrievr/) | Search and explore in a selection of Flickr images by drawing a rough sketch or uploading an image. | No | No |  | University | Closed |
| [SIMBA](https://web.archive.org/web/20100410041238/http:/simba.informatik.uni-freiburg.de/) | demo of system by the Albert-Ludwigs-Universitet Freiburg (Germany) Inst. for Pattern Recognition and Image Processing | Yes | No | 0.002M | University | Closed |
| [TagProp](http://pascal.inrialpes.fr/local/tagprop/) | The demonstration of image annotation tool TagProp in ICCV2009 for image set: Corel 5k ESP Game IAPR TC-12 and MIR Flickr. | No | Yes |  | Institute | Closed |
| [VIRaL](http://viral.image.ntua.gr/) | Visual Image Retrieval and Localization: A visual search engine that, given a query image, retrieves photos depicting the same object or scene under varying viewpoint or lighting conditions. Using Flickr photos of urban scenes, it automatically estimates where a picture is taken, suggests tags, identifies known landmarks or points of interest, and links to relevant Wikipedia articles. It currently supports 39 cities around the world. | Yes | Yes | 2.221M | University | Closed |
| [Windsurf](http://www-db.deis.unibo.it/Windsurf/) | A general framework for efficiently processing content-based image queries with particular emphasis to the region-based paradigm; it provides an environment where different alternatives of the paradigm can be implemented, allowing such implementations to be compared on a fair basis, from the points of view of both effectiveness and efficiency. | Yes | No |  | University | Open but not free |
| [PIBE](http://www-db.deis.unibo.it/PIBE/) | An adaptive image browsing system that provides users with an intuitive, easy-to-use, structured view of an image collection and complements it with ideas from the field of adaptable content-based similarity search. A hierarchical view of images (the Browsing Tree) that can be customized according to user preferences is provided. | Yes | No |  | University | Closed |
| [SHIATSU](http://www-db.deis.unibo.it/Shiatsu/) | A novel system for automatic video tagging which is based on shot boundaries detection and hierarchical annotation processes. The tagging phase assigns semantic concepts to both shot sequences and whole videos, by exploiting visual features extracted from key frames. | Yes | Yes |  | University | Closed |