

# Map of dermatology: Web image browser for differential diagnosis in dermatology

**Maged N. Kamel Boulos**

Department of Healthcare Informatics, School for Health, University of Bath, Bath BA2 7AY, United Kingdom.

**Address for correspondence:** Dr. Maged N. Kamel Boulos, Healthcare Informatics, School for Health, University of Bath, Norwood House 5.14, Claverton Down, Bath BA2 7AY, United Kingdom. E-mail: M.N.K.Boulos@bath.ac.uk

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## BACKGROUND

The Web has very rapidly evolved over the last decade, from a mostly text-based information channel to a powerful multimedia-publishing medium rivalling traditional print media. Most internet search engines have matched this evolution of the Web from text to multimedia by developing their own dedicated image search tools and interfaces, and there are even some search engines that specialize only in image searching. Examples of image search engines on the Web include Cydral, Ditto Image Search, Google Image Search, Picsearch, and Yahoo Image Search. Google Image Search is the most effective image search engine, with the broadest index/coverage of images from the Web among all surveyed engines.<sup>[1]</sup>

Online services that leverage existing search engines have also existed for sometime, for example, Soople for Google. This paper reports on one such service, a dermatology-specific “add-on” to the Google Image Search that is intended to produce results that might be hard to achieve by the average user using the basic Google Image Search interface.

## MAP OF DERMATOLOGY

The Web has opened new, efficient, and effective ways for storing, retrieving, and distributing clinical images.<sup>[2,3]</sup> Today, anyone with Internet access can

browse thousands of high-quality dermatology images on the Web at no cost, apart from that of connecting to the internet. This free and easy access to online dermatology image collections has multiple educational, clinical, and research applications.<sup>[3-6]</sup> Manual indexing of images on the Web, though having the potential of producing the best search results, has its own limitations. That is where the Map of Dermatology (<http://healthcybermap.org/dermap/>) comes in to help.

Dermatology is a visual discipline. For skin conditions, regional and morphological groupings of digital dermatology image collections have sometimes proved useful in various clinical (differential diagnosis) and educational settings.<sup>[5-9]</sup> Map of Dermatology enables users to search for images of skin conditions by body region or morphology rather than by condition name, which is much more useful and natural in answering questions about unknown clinical presentations/diagnoses, especially for nonspecialists. Users are then presented with eight broad categories of lesions to choose from. Clicking any of these morphological categories fetches conditions belonging to it. These can then be clicked to display the corresponding images.

## WHY MAP OF DERMATOLOGY?

The challenges of the early days of the Web (e.g. hardware and Internet-connection-speed issues)<sup>[4]</sup> have

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been superseded today by new ones related to information overload and knowledge management. The question is no longer how to download and display high-resolution Web images, but how to find relevant images among millions of existing Web images.

When faced with a dermatological presentation that they are not familiar with, non-specialist users prefer a tool that would help them answer questions such as, “Which condition is more likely to present in a given body region with a particular morphology?” Using the Map of Dermatology, non-specialists can pinpoint a diagnosis or differential diagnosis by browsing the resultant image sets and comparing them to the clinical presentation at hand (“Does it look like this?”).

The main *raison d'être* for Map of Dermatology is to provide a value-added interface that is better and more useful than the raw Google Image Search (<http://images.google.com/>), on which it is based. The demonstrator's maps are based on regional or morphological differential diagnosis lists from Fitzpatrick's color atlas and synopsis of clinical dermatology.<sup>[10]</sup>

#### **LIMITATIONS OF CURRENT DERMATOLOGY ONLINE ATLASES**

Currently, Dermatlas (<http://dermatlas.org/derm/>), DOIA and PeDOIA (dermatology online atlas and its pediatric version—[http://dermis.multimedica.de/index\\_e.htm](http://dermis.multimedica.de/index_e.htm)), and the Brazilian atlas dermatologico (<http://www.atlasdermatologico.com.br/>) hold a total of approx 18,000 images for all dermatological diagnoses in their databases (combined), whereas Google Image Search indexes over 13,600 images related to psoriasis alone (though Google will not actually allow its users to browse beyond the first 800 or 900 images in any result set). In fact, Google indexes 1,187,630,000 images in total (all figures current as of April 2005)—of them tens of thousands are related to dermatology.

#### **ADVANTAGES OF MAP OF DERMATOLOGY**

Map of Dermatology relies on tens of thousands of

images produced by dermatologists worldwide (rather than producing our own limited and costly content).

The Map of Dermatology interface allows users to query Google's image index for dermatology images by skin lesion morphology and affected body regions by “translating” such queries into lists of possible diagnoses (named skin conditions). Using the Boolean operator “OR,” the preformulated Map of Dermatology image queries are hand-tweaked to care for the many synonyms of some skin conditions (and characteristic lesions, for example, shagreen patch in tuberous sclerosis), plus localization (and its synonyms/subregions too), and produce the best results within Google's limit of ten terms per query.

#### **LIMITATIONS OF MAP OF DERMATOLOGY**

Occasionally, the image results returned by Map of Dermatology are irrelevant. Also, users must obtain the appropriate permissions to use any image linked from Map of Dermatology/Google from the owner of that material.

#### **FUTURE DIRECTIONS**

Better and more comprehensive maps can also be developed based on the differential diagnosis algorithms/trees in Ashton and Leppard's *Differential diagnosis in dermatology*.<sup>[11]</sup> The improved maps could also allow users for further refining the results by selecting specific subregions, taking into consideration the many other aspects of patients and their skin lesions, and point to categorized written resources about the condition at hand, in addition to images.

The list of differential diagnoses could also be sorted in order of frequency or probability (though such order can sometimes be country- or geographical-region specific), with more common conditions displayed higher up the differential diagnosis list. New options can be added to allow users to limit retrieved images to a particular image file type or based on image size. Similarly, users can be offered the option to retrieve images from only academic domains.

Also, it should be possible to intercept Google results and scan or filter them for dead links or search further within results (as a workaround to Google's limit of 10 words per query) before displaying them.

Finally, the possibility of developing a dedicated, clinically or dermatologically aware image search engine (instead of relying on general search engines such as Google Image Search) could be explored. Such dedicated engine would spider Web pages for images in a way similar to Google, but would process the text surrounding images and automatically index those images using a specialized medical text indexer.<sup>[12]</sup> This has the potential of producing much more relevant and accurate results in response to clinical or dermatological queries, and could also improve the support of disease synonyms in image queries.

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## ANNOUNCEMENT

**COSMECON – 2006, Bangalore**  
(International Conference on Aging & Anti-aging)

14<sup>th</sup>, 15<sup>th</sup>, and 16<sup>th</sup> July 2006

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2<sup>nd</sup> deadline - 15<sup>th</sup> June 2006

For submission of abstract: 15<sup>th</sup> June 2006