The power of interactive digital documents

H. Maurer, hmaurer@iicm.edu, B. Zaka, bilal.zaka@gmail.com and S. Eisenberger, sonja.eisenberger@tugraz.at

Abstract:
Documents of all kinds are digitized today and then made available in databases, on the web, or via other channels. There is a lot to be said for it: Access is possible at any time, many people can use the same document at the same time, often it can be defined who can access a document and under what conditions, documents can often be searched according to various criteria, there are often powerful tools for managing documents, etc.

In this paper we show that there are also very powerful possibilities to use digital documents that have hardly been considered so far. We present a system NID (Networked Interactive Digital material) [01], which enables many important applications and which is now used in a number of very different environments, especially in the area of digital libraries of all sizes, in group-internal collections for the exchange of experiences and in learning applications and knowledge management applications.

1 Introduction
One remark to start with: We use document and book equivalently, but for clearly larger documents we tend to refer to them as books.

Digital documents have become an important area of application of modern information technology. Software systems for setting up and using collections of digital documents have been offered for over 40 years. A wide variety of file formats were used, from PDF to Word, from HTML or HTML-like formats in the WWW, or proprietary such as for Kindle applications, various formats for images, video and audio clips, etc.

Large document management systems, can (and have been) be used independent of the internet in for example in company-internal networks. There is a variety of possibilities available via the Internet. Every WWW server offers information that is stored as digital documents. Of the innumerable areas of application, we limit ourselves to digital libraries, but their applications can be surprisingly diverse: As an electronic version of a "normal" library, as an archive and communication medium for certain groups or as the basis for an e-learning system.

2. The basic ideas behind NID
It should be mentioned in advance that in sections 2 to 5 properties are explained in a general way, in section 7, however, images from existing NID materials provide concrete evidence of many of the previously “abstract” properties. For superficial information, it may be sufficient to skim through the figures in Section 7 to create interest.

The easiest way to understand the basic ideas behind NID is to observe how many libraries are switching from an analog version to a digital one. Existing books are either digitized or are already available in digital form from which the print version emerged. The digital versions are now e.g. as PDF files in a database (usually accessible via the Internet) encoded as HTML or offered in a format derived therefrom that enables also embedding of multimedia material. In addition, there is often the option of searching through a digital document (book) for keywords or in full text, or downloading it to your own computer in order to have a good collection of documents on your own device (in the form of e.g. Kindle books, PDF files or e-books). The possible advantages are obvious: Books can be accessed at any time and via the Internet from any location, and the same document can be accessed simultaneously by as many users as the provider (the library) wants. The library also has the option of introducing charging, possibly in consultation with the organizations that make the works available.

Users may be allowed to set personal bookmarks, use certain search algorithms, and more.

An innovative system like NID has to offer all of this, of course.

However, in a way such digital libraries are just easier to use than printed (analog) books without offering what we see as the new obvious main features of NID: The networking of materials and networking of users with users, experts and providers.

It should not be ignored that some aspects of a NID library should perhaps be available to all (even non-registered) users.

By networking materials, we mean that there must be the possibility of referring to other interesting information at every point on every page of a document. This can be a spot in the same or a different book, or a contribution on the WWW (text, image, multimedia clip, ...), a separate contribution, or a piece of special software offering good material, maybe also explaining or supplementing explanations dynamically and possibly according to user
specifications. Conversely, it should be possible, for example, to underpin the content of a WWW page by referring to a detailed section in a document. To put it differently, the linking of any material must be supported.

This naturally raises the question of who is allowed to create such links (in NID we call them annotations). The answer is obvious: you need a hierarchy of rights. Each user A can add any annotation for himself (“private annotation”), or for a group G of users (“group annotation”) who have agreed to see A’s annotations. Annotations for a broader public are controlled by someone with special rights and can approve them for everyone or set to “only for A” or “only for group G”.

It is important to understand that all annotations are not part of the document itself, but additions to it. The book itself cannot be changed after it has been uploaded as a NID document. Of course, it can be deleted by authorized persons or replaced by a new version, but then all the annotations attached to the previous document disappear.

Annotations can be edited, deleted or made accessible to different groups of users than the one initially defined by authorized persons. Private annotations remain private in any case, so they can only be viewed by the person who created them. However, as a precaution, they are not recommended for very personal or intimate aspects.

Annotations can also be added to a document as late as desired: This also means that a document in an NID collection can get more and more information content over time through annotations. In the case of larger holdings, annotations set in this way, such as links from one bookstore to another, will only rarely appear. It is an interesting task here to automate or semi-automate such links. Semi-automating means that the system suggests links, but one person decides whether they make sense or not. This process can be carried out through "metadata" added to the books or pages of books. New developments will increasingly use methods of AI, neural networks and language processing (NPL) to create links, as a continuous improvement of the basis existing in NID right now.

At least as important as the mentioned networking of materials is the networking of users with other users, experts and providers. It is obvious that registered users can be notified individually or as a group via short messages (emails) if they have given their consent. It seems particularly important that the user (registered or not) can send feedback on each page to the person...
responsible for the page / document and can expect a response (in which case the email address must be provided, otherwise the user remains anonymous). A feedback can be: An error message, the suggestion to add the statement so-and-so, a praise, a rebuke, whatever: Observe that an organizational unit that uses NID can be easily contacted at any time.

This aspect should not only be considered by organizations using NID, but in any large system. Have you ever tried to find a contact person at a company with a large website because you had a suggestion or question? There is usually no e-mail address (and if so, it is from a central office that has to forward the request to the right place instead of being able to send it there straight away).

If you are lucky you can find a phone number. If you call, you are on hold for minutes, and the person who answers at the end maybe does not understand the problem hence forwards the call (next hold), ...

NID shows all major companies in the world how to proceed: Each area in the website should allow a person responsible to be contacted anonymously, or with the request for feedback [02].

Another possibility that NID offers seems particularly important to us: Every user can start a discussion on every page. In the simplest case, this can just be a question that someone hopefully can answer. It is nice that the question and answer remain visible to all users. On every book page you can get an overview of all the topics that are discussed in the book.

3. Other properties of NID

One of the important properties of multimedia materials that are managed with NID is the possibility of full-text searches. This is not limited to "real" texts, but also includes texts that are parts of images. This is because NID is based on the IIIF standard [3]. This standard assures that book pages are always interpreted as "pictures", even if they are pure text pages.

IIIF is now being looked after and expanded by an international consortium that includes the largest libraries in the world. This means that NID users have particularly easy access to materials in other IIIF-using libraries, be it those of Stanford University, the Bavarian National Library and many others.

It is particularly important to be able to use the full-text search not only on one book but on several books at the same time. E.g. there are often multi-volume
books in a library, or in a company application several manuals that deal with a

In addition to the full-text search, it is also possible and useful to search in a

Each NID installation has also automatically assigned a simple wiki system in

NID allows several pages from different NID or IIIF compliant servers to be
displayed on the screen at the same time. This way you can display descriptions

Via a "console", NID offers a comprehensive list of administrative tools for

NID documents can be provided with a table of contents (ToC) that is not only
to be found at the beginning of the document like a classic table of contents,
but can be opened on every page. NID offers several aids to create such a table
of contents, see [10].

All user interfaces are available in any language. English is used in the examples
in Section 7 and in the terminology in this paper, but of course German in the
German version of this article [03].
4. Four particularly important application scenarios for NID

4.1 NID as a digital library

Much on this was reported in Section 3, so that only further possibilities are discussed here. With most NID documents, it is possible for an authorized person to set a parameter so that a PDF version of the document can be downloaded or printed out. This may make sense in some cases (like downloading e-books in other systems), but note that this only means the "book itself" with text and images, but without annotations. Therefore, for example, videos, interactive media, clickable links or special software is then not available.

Libraries are often used as a reference for the creation of new works, whereby small parts of the documents used have to be cited. There are various ways of citing: NID offers the user the option of selecting one and thus saving himself the perhaps complicated reformatting.

NID also offers the option of selecting any rectangular section from a screen content and addressing it via a link, or even saving and using it as an image. In the latter case, there is a high risk of copyright infringement, because documents can often be used as a whole with a suitable license, but parts or modifications of them cannot! The Creative Common license CC BY NC ND e.g. does not allow any changes or commercial use and the source and author must be named. [05]

4.2 NID for organizational knowledge management, knowledge sharing and knowledge growth

One of the possibilities that makes NID particularly interesting for such applications is the fact that questions or discussions can be asked in a document such as a manual that only a certain group (e.g. all members of an organizational unit) can see and use it. Within such a group, you can also set up sub-groups with special rights.

It is particularly interesting that an NID document can complement communication media such as Webex [06] or Zoom [07] very much:
These communication platforms, which are so popular in times of COVID, have little temporal stability or usability. You can save a long Zoom Meeting as such, but it is hardly possible to find something there later, or ask a question, etc.

After such a meeting, it makes sense to put short minutes as a document in the NID system and thus offer the opportunity to discuss further, to ask questions, to provide additional sources, and more.

An organization-internal collection of important documents in NID with corresponding comments on the one hand preserves the knowledge beyond the time of a person's departure, and on the other hand is particularly valuable for newcomers, because those who do not understand information can get help from others using the question and discussion facility.

4.3 E-learning features

Face-to-face teaching or teaching using communication tools such as Zoom etc. is meaningfully supported by NID documents that allow questions and discussions.

Particularly important for e-learning, NID allows quizzes to be set up. NID offers two fundamentally different options: test quizzes and information quizzes.

A test quiz consists of one or more questions, with one or more correct or incorrect answers being offered for each question. The (in this case) registered user chooses the answers that he thinks are correct. At a later point in time, NID enables for persons with special rights to determine for each person that has taken part in the quiz how many questions were answered correctly and how many incorrectly. Thus, this is then primarily used to evaluate the performance of the user (e.g. as part of an examination or instead of an examination), but can also lead to adjustments to the quiz in some cases.

An information quiz also consists of one or more questions, each with one or more answers. The aim is not to test users, but to inform them: If they give a wrong answer, it is explained why it is wrong, what the correct answer would be, often with a link to information that explains the situation in more detail. In this way, it can be recognized at the end of a section, for example, whether a user should continue, or not, if he has misunderstood a lot so that it makes sense to repeat certain passages first or to receive additional information.
NID is also well suited for seminar-like work, where the active participation of the user is important. A lecturer offers students material in the form of NID books, which the users are supposed to supplement through research. This process can take several months. At the end, the lecturer can determine for each participant what new contributions this user has made: It is precisely the value of those contributions that is used (or is also used) for the assessment of the student.

4.4 Report on news in any organization

Many organizations have a kind of “newsletter” that is made available to a large group of readers. Those reports are typically sent as a file, or pointer to a web-page. It is recommended to have those newsletters available as NID documents. Thus, information does not just go one-way, but feedback can be obtained (feedback not going to ONE person or group that will be overloaded, but to persons responsible for certain issues only), discussions can be started, material can be added, etc.

Information should not go one way, but allow serious interaction between providers of information and users, and between users. NID is the first such system supporting this easily.

5. Experiments and plans for the future

NID is a system that can be used for many tasks and has many possible applications by now. Nevertheless, it is constantly being further developed with innovative features and for new applications, some of which are available for testing purposes.

Among other things, this includes the extraction of important terms or phrases in pages of documents, which can make it easier to find information, and which are particularly important for semi-automatic linking of book pages. Methods of AI and NPL [12] are used to recognize important words or phrases, see also [10] or the example in Section 7.

Everyone is familiar with the search for similar images, for example using Google Images [13]. However, one cannot only search for images based on similarity, but also because they fall into a certain category. For example, you could be interested in all pages of a book that show a bottle, no matter how big, what color, etc.
One can currently search for 80 image categories, see the NID book [14] or the examples from it in Section 7.

NID uses a state-of-the-art computer vision method to detect and locate objects in given image of book or document page. The system identifies the class of object (person, vehicle, animal furniture etc.) and its location specific coordinates in image. The accuracy of found object location and its class name tag determines the performance of used algorithm and associated per-trained knowledge model. The knowledge model and performance of object detection algorithm can be further fine-tuned as per requirement and different use cases. The present NID software uses YOLO (You Only Look Once) [17] algorithms and deployed with a pretrained general purpose COCO [18] image dataset. The pretrained model included with standard NID version can detect 80 object classes [19]. When Object detection is applied to book which is being indexed in NID library, the full-text search results include the detected objects in book images. As an example of this feature the NID demo library showcases a demo document containing random images without description or text. Different objects in book can be searched and located using the pretrained model annotation tags [14].

One of the major projects is to implement a semi-automatic linking of NID books with other information (potentially also outside the NID books) and vice versa: Semiautomatic means that based on similar words or phrases (using synonyms, stemming, etc.) links are suggested, which a person then accepts as meaningful or not.

In connection with this, an expansion of the full-text search (from word-oriented to phrase-oriented) makes much sense. Even aspects of sentiment analysis [16] could later also be consider. I.e., for example, you might not be looking for "electric cars" but "arguments against electric cars" or "arguments for electric cars".

In addition, there are many aspects, such as the installation of your own chat rooms in addition to the discussions (limited to columns of text), a simplified handling of short documents (because a separate entry page seems excessive for a little-page document), additional functions for administration and much more.

6. Technology behind NID
NID software is developed using modern programming tools, platform independent frameworks and components. This means that the system can be deployed on major server operating systems. This includes Windows based server (even Client OS) platforms, and Unix/Linux (Ubuntu, CentOS, Debian servers already tested).

In order to deploy NID server following Opensource/Free software, DB and development components are required to be installed.

1. Development: Microsoft dotnet (core) 5.0 framework, OpenJDK 11, Python3
2. DB: MySQL 8 Community Server
4. Web/Reverse Proxy: Nginx, IIIF Image server

The system can make use of open certificate authority Let's Encrypt. The NID team offers installation support via SSH/RDP access besides provision of detailed installation guide for few common server platforms. For proper online operations of the server, it is recommended that server has a stable internet connection, live IP address and associated fully qualified domain name (FQDN).

The minimum hardware needed to run a moderately used NID server includes a modern generation Core-i5/i7 processor system with +16 GB of RAM and preferably high speed I/O storage (SSD in case of standard system) of +1 TB. The RAM, Processing and storage needs to be enhanced in case of larger libraries and greater system users.

Details in the Installation Manual [15], available for anyone seriously interested in installing NID.

7. Examples of concrete applications

In this section we show typical examples from existing applications of NID documents, each with very brief descriptions. We recommend that you go to https://austria-forum.org/af/AEIOU/NID-Books and open that page in a window A, in another window or screen B you have the following section. Then please follow step by step what is described next in window B by actually doing it in window A.
We start by explaining many of the possibilities of NID using a book in one of the collections. To do this, we go to the lower English part of https://austria-forum.org/af/AEICU/NID-Books (Fig. 7.01) and click on the Graz University of Technology entry there in which gives us something like Fig 7.02.

**Fig. 7.01**

**Fig. 7.02**

**Note:** If you got something like Fig. 7.02 but a „German version“ you change the language to English by clicking at the uppermost rightmost icon on the page next to „Bücher“. Now you choose the language English. After closing that window (click at the X on right upper corner) you will have the English version similar to the one depicted in Fig 7.02.

On the page where a part is shown in Fig 7.02, 15 books rotate in the top bar. If we click on the book about Nikola Tesla and the Graz Tech, we get Fig 7.03 with various information about the book and a review, of which the first lines can be seen. If we enter the book we see Fig. 7.04. (You can also search for the book using the categories below and additional ones, or the using the search field by entering author, title of the book and other parameters). If we follow the link "Read in the book" as shown in Fig. 7.03 we get a page as shown in Fig. 7.04.

**Fig. 7.03**

**Fig. 7.04**

If we take a closer look at page in 7.04, we find light blue rectangular outlines around the building, Nikola Tesla, Graz and TU Graz, i.e. there are annotations here. If we move the mouse e.g. to Graz we get the first frame of a movie on Graz (Fig.7.05) which we could look at, if we move it to Nikola Tesla his picture appears like in Fig.7.06.
Let us scroll in the book (using ▶) to the first real text page, the middle of the top of which as shown in Fig.08. There we see a row with several options at the top right and columns with menu entries at the far right. Clicking on the entry "Feedback" opens a window like in Fig. 7.07. This entry allows to send any text anonymously to a person responsible for the book or to ask for an answer by giving an email address, but then not anonymously. (To close the window click at “Cancel”).

Interesting in the options bar in Fig.7.08 is the entry "Discussions". Clicking on this option gives a list of all discussions that currently exist in the document, in this book at the present time there are two discussions, see the list in Fig. 7.09.

If you select "AC versus DC" you get the discussion as shown in Fig. 7.10. The discussion here is only a question, which then triggered a discussion. You can scroll to the end of this discussion in this window.

You can also contribute to the discussion by typing a comment in field provided.
After a short period as a direct employee of Thomas Alva Edison in New York, Tesla founded the Tesla Electric Company with help from financial backers. Here, he continued his own research and realized his ideas. As a result, he filed a total of seven patents at the New York patent office in 1887.

In the figure shown here, it is important to note that the word "discussions" is colored blue. The word "Discussions" is present on every page in the list of options at the top right (see example 7.09) but it is blue only if a discussion exists on that page. Such a discussion can also be started anonymously, as Fig. 7.10 shows.

We will come back to the menu options on the upper right part of NID pages later, but let's first look at the menu items on the upper left part of NID pages, Fig. 7.12.

The entry "Annotation tools" is only active if you are logged in (login by menu item in the pages top right). So at this time it is not the case. "Image manipulation" allows adjustment of colors, brightness, etc. Everyone should try this out for himself. The Table of Contents menu item shows one if one has been created for the document: This is convenient because it can be used at any point in a document and exists in the document in question (try it out!). The Search menu item allows a full text search within the selected document. If you search for Tesla in the book in question, the first search results are shown in Fig. 7.13.
If one chooses the first contribution which links to page 14 you get a page part of which is shown in Fig. 7.14. If you move the mouse to the red bordered area a new window appears with a link that leads to the Main achievements of Nikola Tesla, see Fig. 7.15.

![Image](image1.png)

Now let's look at how annotations come about. Fig. 7.11 shows the word "Annotation tools" as it appears in the upper left corner of each page. But it is only active if you log in with the menu item "Login" (see Fig. 7.08). (The first time you log in, of course, registration is required, as usual). This changes the appearance of Fig. 7.11. This is clearly shown in the change from Fig. 5.16 to Fig. 5.17.

![Image](image2.png)

By the way, the menu in the upper right part of the page no longer shows "Login", but "Sonja-Logout" as Fig. 7.18, because the login was done as Sonja, who of course can logout at any time.

The simplest way to make annotations is to use the pencil in Fig. 7.17 which indicates an annotation by a light blue outline of a any spot on a page. But you can use many other alternatives, other shapes, other colors, other stroke widths etc. via "More" (try it!, or read about it in the User Manual, literature entry [09]).

We now want to add an annotation to page 14 of the book (this is the page of which a part is shown in Fig. 5.15. You can go to it by typing in the field left of “Discussions” the page number you want to go to, i.e. now 14 and then hit the return key).

To do this, we click on the pencil and now draw a rectangle over the part of the page that should indicate an annotation. We select the third paragraph of this page. This also automatically opens a form where you can select which type of annotation you want, see Fig. 7.20.
There are several alternatives for inserting annotations.

If you only want to write some text as annotation, then just type it (or copy a previously created file), and finish with clicking Save.

If you want to make a link, then click on the Link-Icon and copy the URL into the URL field. It will also appear automatically in the text field. It is useful to replace that text by indicating to users what they can expect when following the link.

If you want to insert a picture then you select the picture icon and can either enter a URL or you can load an image directly. The same is true of videos.

For this and more complex objects see the user manual [09].

In Fig. 7.21 we have entered a link to an article in the Wiener Zeitung and in Fig. 7.22 we show what one would get by following the link.

Fig. 7.21 shows the link form in which we have entered a link to the Wiener Zeitung in the URL field, but in the “Text to display” we have entered information for users of what the link would show. The creation of the annotation is completed by clicking “OK” and then “Save”.

If the link is actually followed, the result is a window, whose beginning can be seen in Fig. 7.22. By closing that window you are on the page where you inserted the link.
Let us return again to page 14 of the book, of which the upper right part is shown in Fig. 7.23. Here there is the menu item "Change Layout", one of the most innovative options of NID. This option allows to arrange the pages of various documents on one screen page and to edit them. The menu item (Fig. 7.23) allows for example to add to the page on the right a separate area coming from a NID document of any (!) IIIF compatible library. A click on "Add Slot Right" results in Fig. 7.25.

![Fig.7.23](image1)

![Fig.7.24](image2)

At the same time, it also imparts those qualifications which are important for professional use outside the university. The right to confer academic degrees which is reserved for the universities (and recently also universities of applied sciences) emphasises this exceptional status.

It seems now entirely appropriate to cultivate an awareness of tradition at Graz University of Technology and show solidarity with people who have contributed to this development. This will be illustrated by three persons:

- Solidarity with the founder of the Joanneum, Archduke Johann, known as 'the Habsburg green rebel' according to H. Magenschab [4] since he founded the nucleus of today's 'Alma mater Joanneum'.
- Solidarity with the university employees who once worked here and who established today's reputation. As a representative of them, Richard Zsigmondy, university assistant and Privatdozent (similar to adjunct professor)...

![Fig.7.25](image3)

If you click on the + in the Add Item field, you will first receive the offer to add a page from the same book or book category, and then to manipulate it as desired (zoom, edit, scroll,...). In the present case, you will get the offer in Fig. 7.26, i.e. more pages from the book "Nikola Tesla and the Graz Tech".
We search the NID collections for more books by Nikola Tesla and we get many results. Five more NID books are displayed, see Fig. 7.27. We select any page from e.g. the first book and add it. The result can be seen in Fig. 7.28.

If the search does not return any results, you can search in the Bavarian State Library, which contains over 2 million IIIF-compatible works (https://app.digitale-sammlungen.de/bookshelf) to expand the search--- or use an object from any other IIIF compatible library. To do this, simply insert the link at "Add new object from URL."
The two books now placed next to each other can be browsed independently of each other, the pages can be shifted or zoomed, etc. In this way, one can compare different editions, or read a book in a language one does not understand well in one’s own language in parallel, examine pictures for imitations or similarities, and so on. It is obvious that there are many possible applications, especially in educational settings.

In section 4.3 it is mentioned that NID has two types of quizzes. Those that are used for testing, and those that provide information. A typical quiz question with information is shown in Figs. 27.29 - 7.31 below: Fig. 27.29 as a question, Fig 27.30 a user answer (Arab League). After "Submit" NID provides the information in Fig. 27.31 that all options except the first one are correct.

![Q. What is Morocco a member of?](Fig.7.29)
![Q. What is Morocco a member of?](Fig.7.30)
![Q. What is Morocco a member of?](Fig.31)

In the general description of NID many points were pointed out, of which two will also be illustrated with examples.

First, it is possible to extract meaningful terms from document pages using AI methods if it was processed for this purpose. This will be used in the future to "semi-automatically" link document pages that e.g. offer similar information. This aspect is illustrated with page 7 of an issue of IASA’s "Options" (https://nid.iicm.tugraz.at/Home/BookDetail/127) shown in Fig. 7.33, where by applying option A1 in the list of options at the top right (see Fig.7.08), information of interest is extracted from the subject page and shown in Fig. 7.33, and an analogous list from page 20 is shown in Fig. 7.34.

Second, if a book was also processed with the tools that determine image categories one can find with the search for e.g. “tie” all images with people wearing a tie. The result of the search for pages with images of the category tie can be seen on 7.36, excerpts of the two found images on Fig. 7.36 and 7.37.

For more extensive testing, a separate test book [14] (https://nid.iicm.tugraz.at/Home/BookDetail/305) has been compiled, where one can search for any of the 80 image categories available so far:

sofa, bottle, remote, aeroplane, kite, person, dining table, bowl, cake, microwave, refrigerator, backpack, knife, giraffe, spoon, chair, potted plant, handbag, umbrella, traffic light, vase, tie, backpack, cell phone, car, bicycle, fork, frisbee, toilet, sports ball, laptop, oven

Have fun testing!
Transcending the boundaries of science and policy

Fig. 7.32: The upper part of page 7 of (https://nld.iicm.tugraz.at/Home/BookDetail/127) where interesting terms ("tags") are extracted with option AI, which can be seen in Fig. 7.33, in Fig. 7.34 of page 20 of the same book.

Search in book

tie

Search results for: tie
Showing 1 - 2 out of 2
24  tie ...
25  tie ...

Opinion

Embrapa visiting scholar Mauricio Antonio Lopes writes about how policies informed by science are contributing to advances in Brazil’s agricultural sector.

Fig. 7.36

It is remarkable that even with the very small objects, the algorithm recognizes them as a "tie"!

Fig. 7.37
8. Literature:


[03] IIIF-Konsortium Homepage (https://iiif.io/)

[04] Die Vergrößerung des Wertes digitaler Dokumente (German version of current paper)

[05] CC BY NC ND (https://creativecommons.org/)

[06] Webex (https://www.webex.com/)

[07] Zoom (https://zoom.us/)


[18] COCO Dataset (https://cocodataset.org/)

[19] Object Classes available in Pre-Trained dataset included with NID; (https://tech.amikelive.com/node-718/what-object-categories-labels-are-in-coco-dataset/)