

# IIIF Curation Platform: Creating and Sharing Virtual Image Collection on a Global Scale

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## 1. Introduction

IIIF (International Image Interoperability Framework) [1] is a specification for image delivery, recently adopted by leading museums, libraries and archives on the globe for delivering their high quality images. It is estimated by the IIIF community that around 1 billion images worldwide were already delivered by IIIF, including the masterpieces of the humanity. IIIF is growing into a de-facto standard, is becoming an indispensable infrastructure for digital humanities research.

There is, however, one important weakness in the current IIIF specifications. Its design is provider-centric, not user-centric, so humanities scholars as users cannot take full advantage of digital transformation of research workflow, such as collect images, crop a part of images, create a virtual collection of images, and publish it as the evidence of research. In addition, IIIF is well developed for human consumption of IIIF content, but machine consumption of IIIF content is still in its early stage. This is similar to transformation from Web 1.0 to Web 2.0. During this period, unidirectional Web has evolved into a participatory platform on which user-generated content plays a major role. IIIF Curation Platform will play a similar role in the world of IIIF.

## 2. IIIF Curation Platform (ICP)

How can we add user-driven functionality to IIIF so that users can create their own virtual image collections? We carefully studied the current IIIF specifications, especially IIIF Presentation API, and realized that the fundamental concept of IIIF Presentation API is provider-centric in the sense that users cannot add any new elements without the

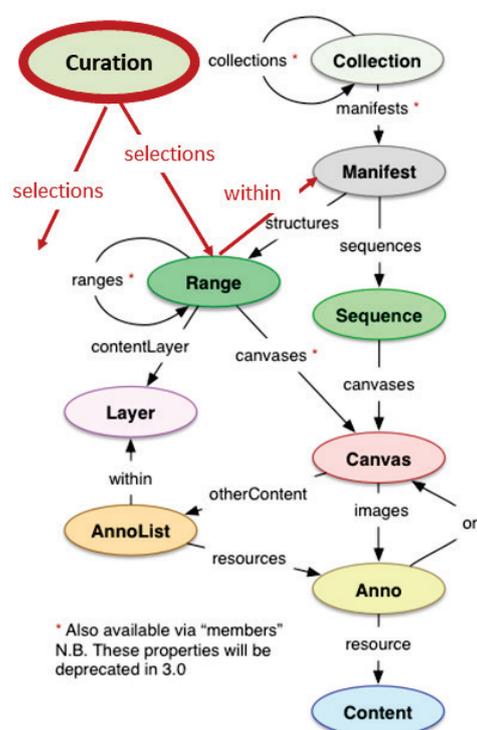


Figure 1: Relationship between IIIF Presentation API and Curation API. Curation API adds “curation” node from the outside, thus allowing traversal links to multiple canvases and manifests.

consent of the provider.

A solution to this problem is Curation API, which we proposed in November 2016 [2]. The basic idea is to build a new structure from the outside of the manifest, which is the root node in the IIIF Presentation API, and create an inbound link to an appropriate element within the manifest (Figure 1). The “curation” node is the basic unit of a virtual image collection, which contains links to canvases across manifests. This simple mechanism is the key to create a virtual image collection on a global scale, which was implemented in our first open source software, IIIF Curation Viewer.

The digital transformation of the workflow, however, needs the suite of software that supports all kinds of tasks. First, we developed JSONkeeper to support the storage of curation in the JSON format. Second, we developed IIIF Curation Manager and IIIF Curation Editor to manage and edit curations. Then we developed IIIF Curation Finder to support metadata-based search, such as facet search, for curations through API provided by Canvas Indexer, which is the backend search engine. This open source software suite, called IIIF Curation Platform (ICP) [3], covers the whole workflow for curations (Figure 2).

The design principle of ICP is a modular structure, such as micro service connected by REST style API, and plugin mechanism for client-side tools, so that users can arrange appropriate configuration to meet their needs. ICP also offers Docker installation so that users can easily start their own project on a Docker environment. With this installation style, we can imagine that in the future, we will see many user-driven creation of virtual image collections on ICP instances running on the cloud using Docker, and this user-driven world of IIIF will create new viewpoints and interpretations on IIIF content.

### 3. ICP Applications

ICP can be easily tested using our general-purpose demonstration service [3]. Users can create virtual collections on a global scale and share them with other people without any installation process. However, for digital humanities research, we need the collection of curations dedicated for a project or an application. To develop an application based on the collection of curations, we

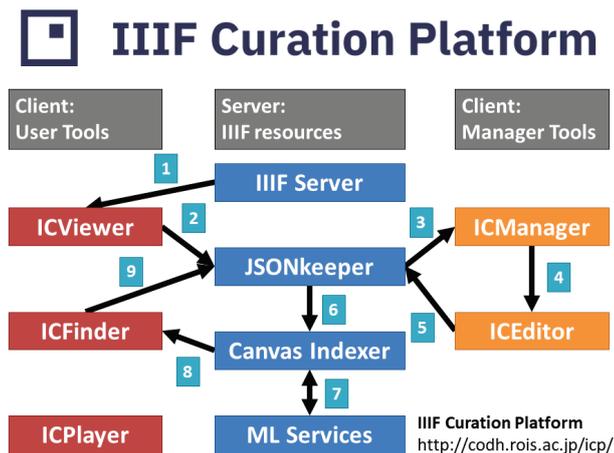


Figure 2: Example of configurations of ICP. Red and orange are client-side software, while blue is server-side software. They are connected with API.



Figure 3: Collection of Facial Expressions. Result of facet search using the tag “Ushiwakamaru.” These faces represent the same person, but from different books and scrolls delivered from different organizations.

Traditionally this study has been done in the analog space, starting from photocopying facial expressions of the material, cropping them by scissors, and pasting them on another paper to make a collection of images for side-by-side comparison [6]. On the other hand, ICP offers a digital workflow for the same task. By taking advantage of easy-to-use user interface and global interoperability, facial expression images can now be collected from a number of IIIF-enabled libraries and museums.

The workflow for facial expression images is summarized as follows. (1) For each element of the curation, we add metadata (tag), such as gender, direction, and target of the face, using IIIF Curation Viewer. (2) Curation is stored in JSONkeeper. (3) Canvas Indexer harvests curations from JSONkeeper to make a search index. (4) IIIF Curation Finder provides facet-based search through Canvas Indexer API. Facet search is useful for quickly understanding the statistical characteristics of each tag, such as gender balance and preferred direction of the face (Figure 4).



Figure 4: Facet search of Collection of Facial Expressions. The number on the right side of the tag shows the statistics of tags. Tags in Japanese.

need to set up a dedicated ICP instance for the application.

“Collection of facial expressions” [4,5] is one good example of this use case (Figure 3). It is created for the study of art history to compare the drawing style of facial expressions in Japanese old pictorial books and scrolls.

Moreover, users can dig into the detail of images to understand the context of appearance in the original material.

Another interesting result was obtained from automatic image tagging by machine learning. Automatic tagging software [7] was trained on general photographs, not on facial expression images on Japanese old pictorial books and scrolls, so this is not an intended use for the software. The result was interesting, however. For example, the tag “circle” detected circular shapes on faces (Figure 5). If we argue the “correctness” of the

result, this result may not be directly useful for the study of art history, but it offers a chance of serendipity enabled by machines, because human annotators will never pick up this feature for tagging. This result suggests that ICP has potential to allow machines to participate in the platform and to ask machines to do what humans are difficult to do, such as massive processing or serendipitous encounter, which expands the possibility of digital humanities research.

#### 4. Discussion

In digital humanities research, a fundamental question is the value of machines in comparison to humans. This question also applies to ICP, because curation, or a virtual collection, could be created using hand copy, scissors and paste. However, the advantage of ICP is that it can expand to a global scale because the speed is much faster in the digital world, and thanks to interoperability, one tool fits all IIF images worldwide. This difference in time and space makes not only quantitative difference but also qualitative difference, because humanities scholars can study more and more images collected from the world. In addition, reducing time for creating the collection means that humanities scholars can spend more time on studying the collection itself. In addition, the digitized workflow of ICP can also contribute to the reproducibility of research, because the evidence of research can be easily shared in the form of curation.

Another viewpoint to evaluate the value of ICP is the metaphor of “distant reading” [8] and its combination with “close reading” in the study of images. As we accumulate more curations into ICP, where metadata is either annotated by humans or given by machines, the collection of curations can show the characteristics of curations. For example, IIF Curation Finder’s facet search shows a number of images having each tag, which indicates the quantitative characteristics of the collection. More complex analysis and visualization tools can be developed on ICP for the distant reading mode. At the same time, because a curation has a link to an original canvas, we can move from the statistics view to the individual image view,

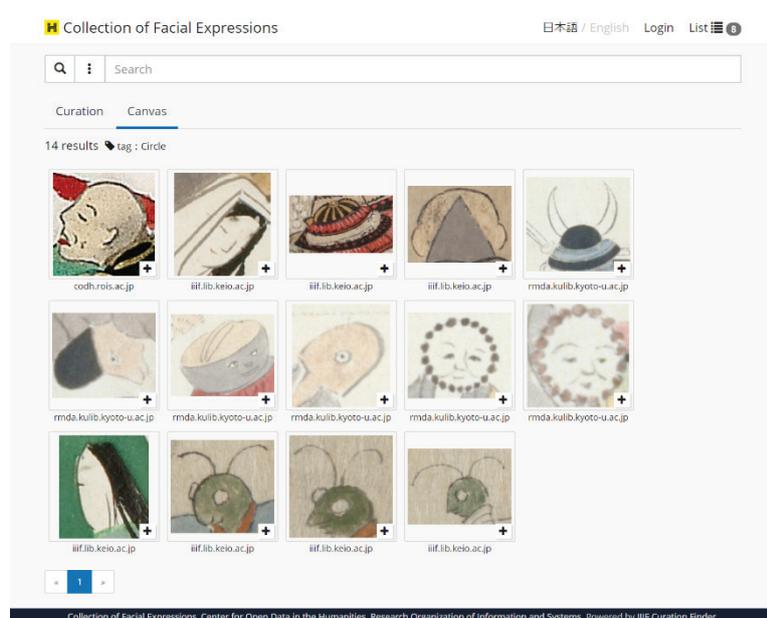


Figure 5: The result of tag “circle” using machine learning-based automatic image tagging at “Collection of Facial Expressions.”

and study the detail of the image by taking advantage of zooming functionality in IIIF in the close reading mode. Switching frequently between distant reading and close reading modes is a new type of workflow in image-based humanities research, and we will explore this direction in future work.

## 5. Conclusion

We introduced IIIF Curation Platform for creating and sharing virtual image collection on a global scale. This workflow is significantly different from a typical use case of IIIF that starts from a standard viewer, such as Mirador [9] and Universal Viewer [10], to access an image provider service, and ends with human consumption of images by browsing and occasionally saving them. This use case, however, does not exploit the full potential of interoperability for digital humanities research. As proposed in this paper, user-driven functionality allows scholars to create their own virtual image collection for their study, while machines can also participate in this platform to enhance the findability of the collection. We therefore believe that ICP is the first step to realize IIIF-based research platform. The next challenge is to realize authentication / authorization mechanisms to apply open-close strategy that changes over research phases. Another challenge is to develop more plugins that meet the specific needs of research domains.

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