Reading Edo: Data-driven Approaches for Japan Studies

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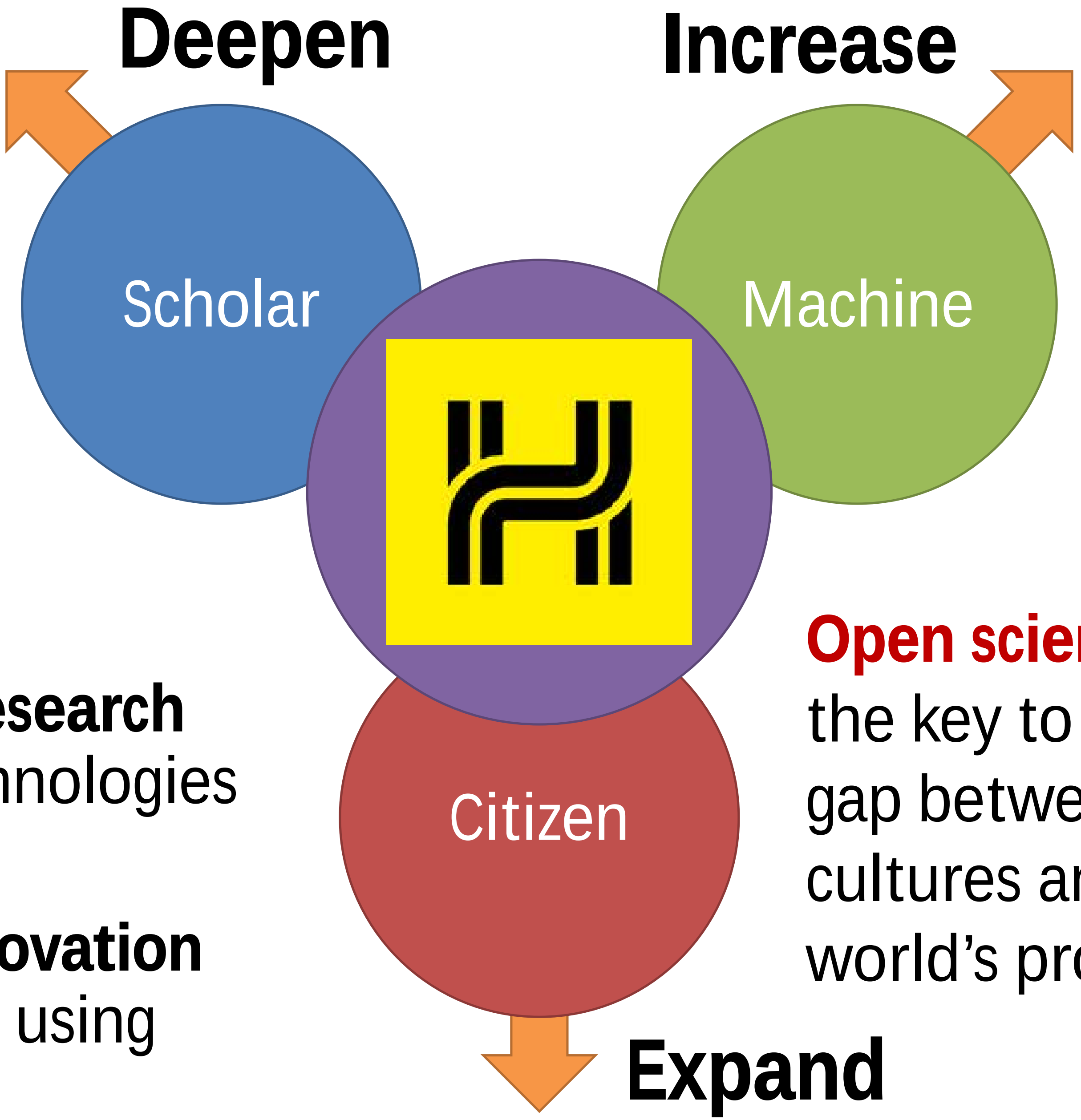
ROIS-DS Center for Open Data in the Humanities (CODH)

http://codh.rois.ac.jp/

1. Data-driven Humanities: **Innovation in humanities research** using computer science technologies and tools.

2. Humanities Big Data: **Innovation in non-humanities research** using humanities data.



Open science is the key to fill the gap between two cultures and solve world's problems.

Open Datasets

http://codh.rois.ac.jp/dataset/

Pre-modern Japanese Text (3126 books, 609631 pages)

Edo Cooking Recipes (103 egg dishes)

NIJI-NW Project

http://www.nijl.ac.jp/pages/cijproject/index_e.html

300,000 Pre-modern Japanese Books (before 1868) are being digitized and released as open data.

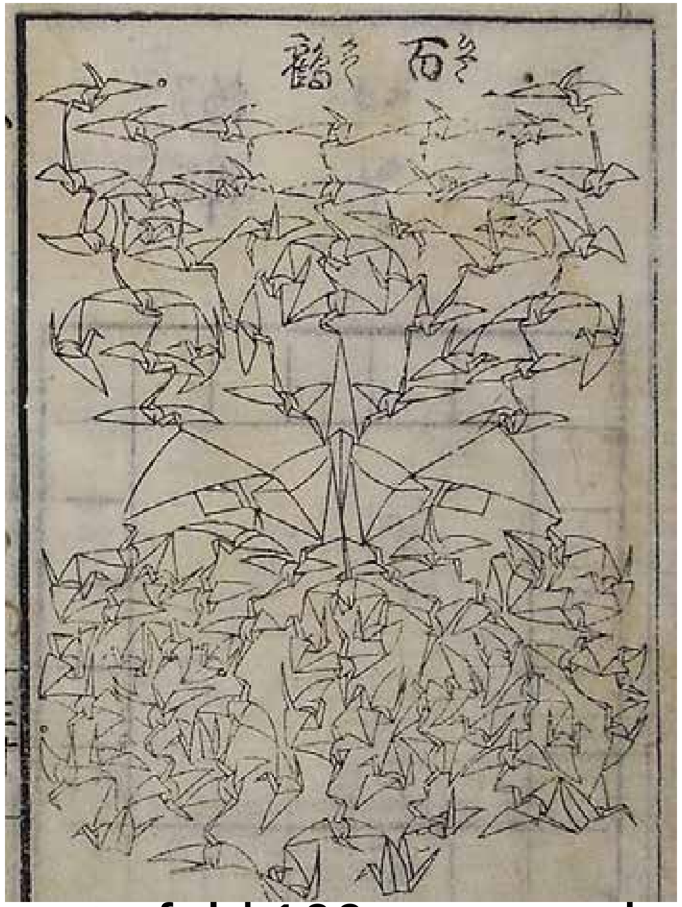
Japanese culture finally entered into the big data era...

AI Kuzushiji Recognition from the Dataset to the App

Collaborator: Tarin Clanuwat (Google Brain, formerly CODH)

Japanese Knowledge over 1000 Years

How to wear makeup



How to fold 100 cranes using one piece of paper

説物之部
茶運人形
全躰

How to build automata

Massive Documents vs. Few Readers

1 billion documents

Estimated number of old books and documents in Japan

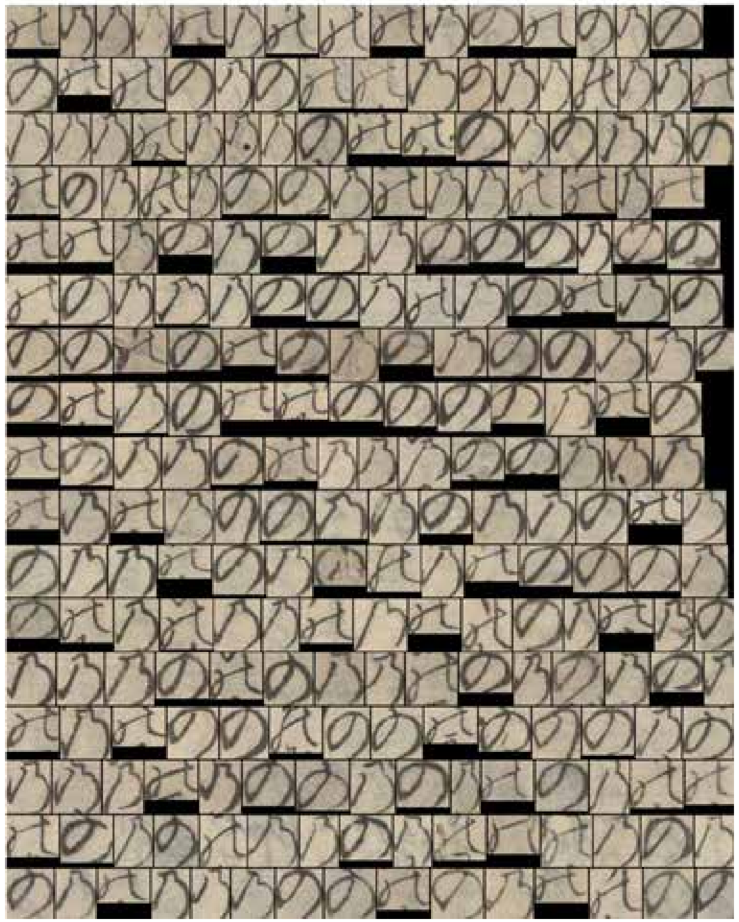
10000 readers

Estimated number of people with fluency in reading Kuzushiji

Kuzushiji Dataset

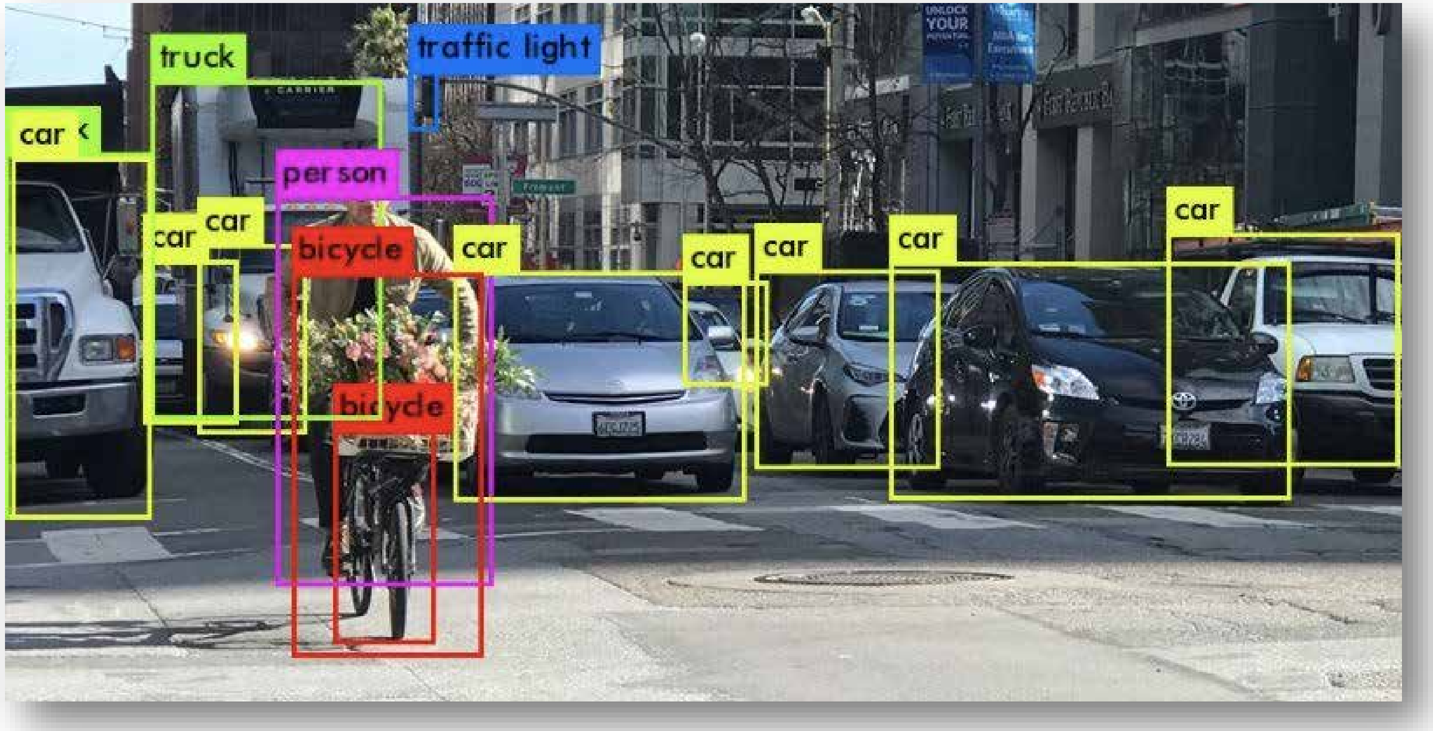
http://codh.rois.ac.jp/char-shape/

雨月物語 (1890)



- National Institute of Japanese Literature created and CODH curated.
- The open data consists of
  - Character types: 4,328
  - Character shapes: 1,086,326
- Download the Zip file and use it as training data for machine learning.
- The release of dataset stimulated research on AI kuzushiji recognition.

Computer Vision-based Object Detection

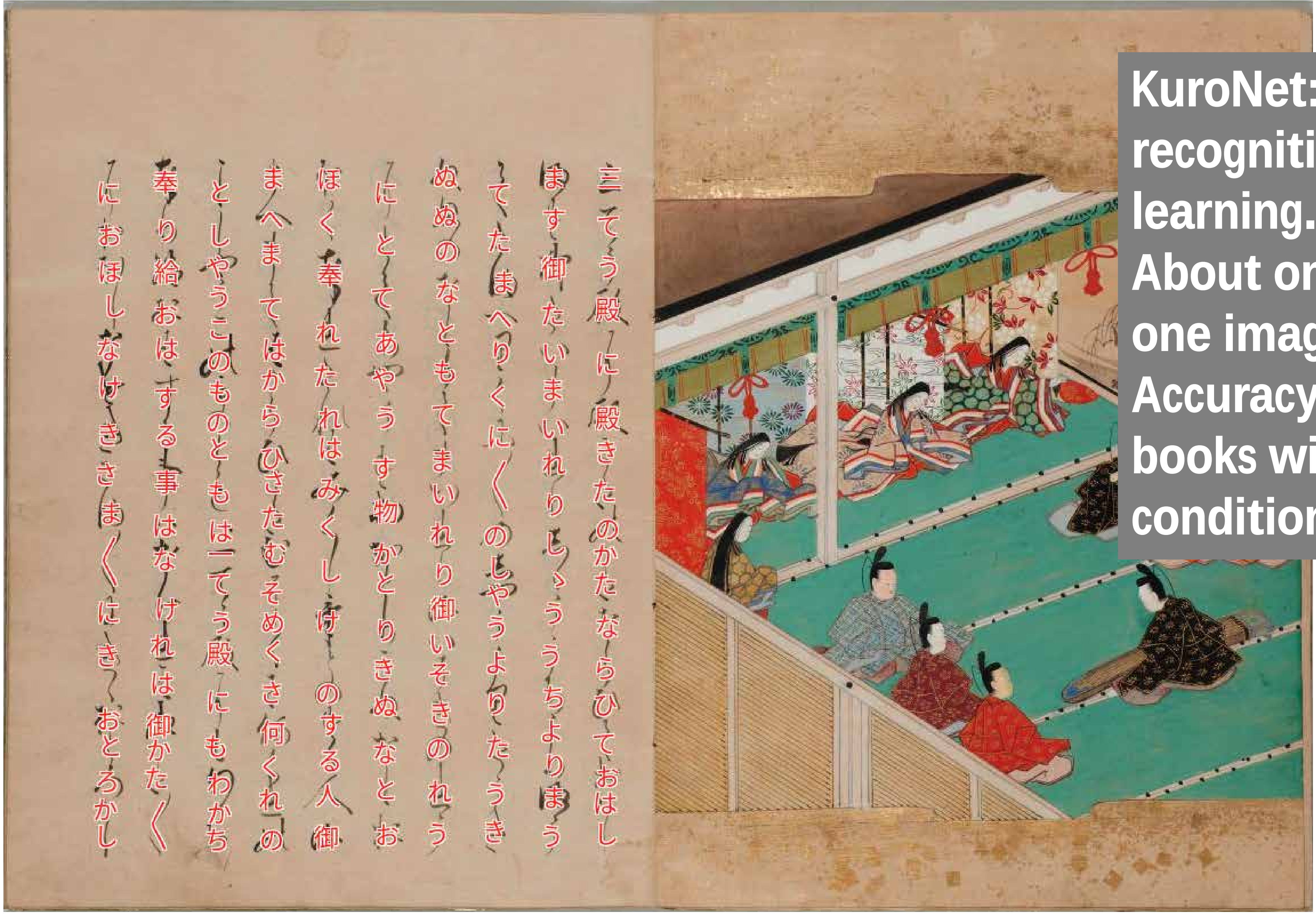


1. Object detection is a vibrant research area with industrial value such as autonomous driving.
2. **Can we apply this technology for kuzushiji?** A simple idea, but it was not possible before.

KuroNet: Kuzushiji recognition using deep learning.

About one second for one image.

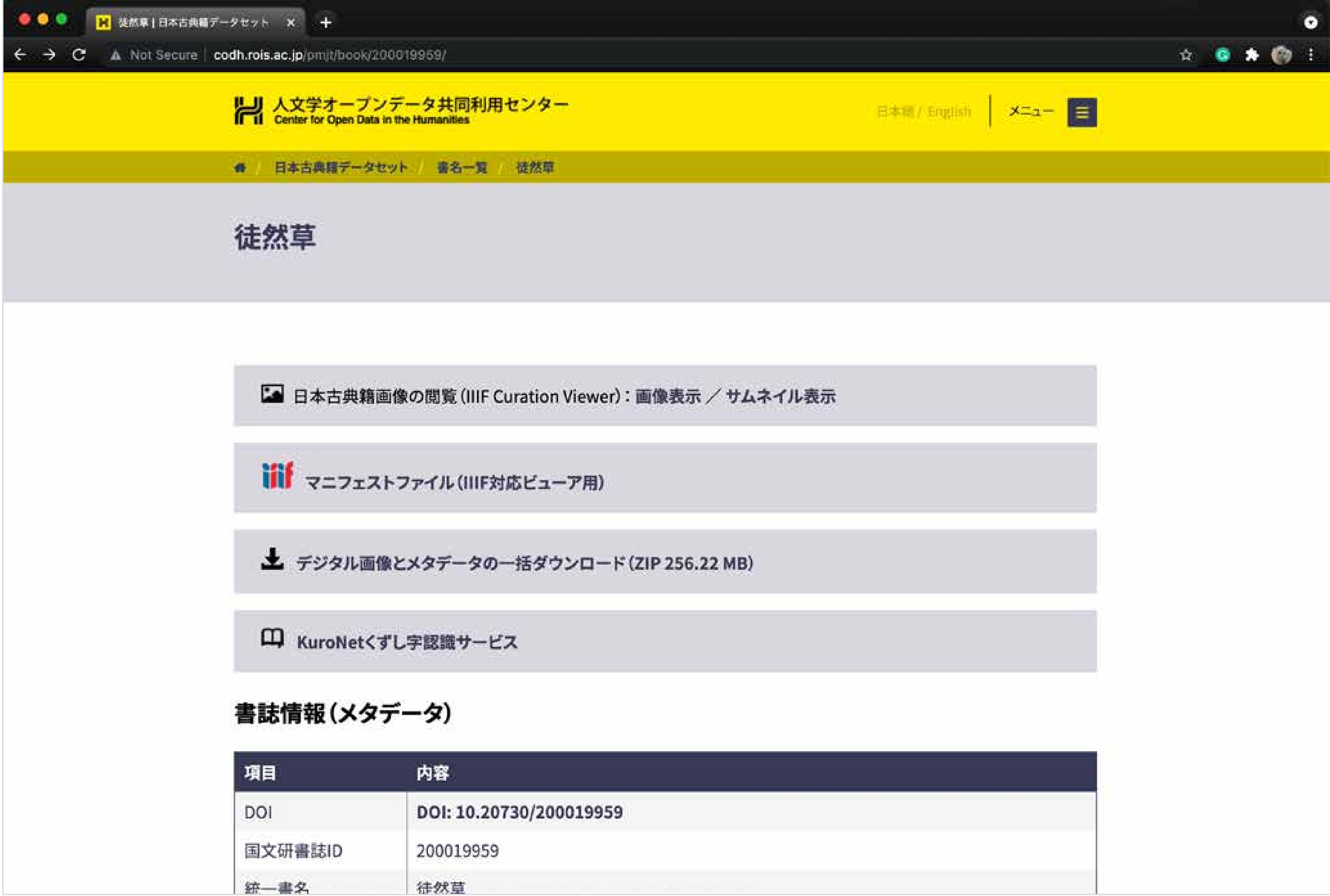
Accuracy is 95% for books with the best condition.



三てう殿に殿きたのかたならひておはし
ます御たいまいれりしゝううちよりまう
てたまへりくにくのしやうよりたうき
ぬぬのなともてまいれり御いそきのれう
にとてあやうす物かとりきぬなとお
ほく奉れたれはみくしけのする人御
まへまてはからひさたむそめくさ何くれの
としやうこのものともは一てう殿にもわかち
奉り給おはする事はなけれは御かたく
におほしなけきさまくにきおとろかし

KuroNet Kuzushiji Recognition

http://codh.rois.ac.jp/kuronet/


徒然草 | 日本古典籍データセット
Not Secure
codh.rois.ac.jp/pmjt/book/200019959/
人文学オープンデータ共同利用センター
Center for Open Data in the Humanities
日本語 / English
メニュー
日本古典籍データセット / 書名一覧 / 徒然草

徒然草

日本古典籍画像の閲覧（IIIF Curation Viewer）：画像表示 ／ サムネイル表示

マニフェストファイル（IIIF対応ビューア用）

デジタル画像とメタデータの一括ダウンロード（ZIP 256.22 MB）

KuroNetくずし字認識サービス

書誌情報（メタデータ）

項目	内容
DOI	**DOI: 10.20730/200019959**
国文研書誌ID	200019959
統一書名	徒然草

kaggle Kuzushiji Recognition

http://codh.rois.ac.jp/competition/kaggle/

Playground Prediction Competition

Kuzushiji Recognition

Opening the door to a thousand years of Japanese culture

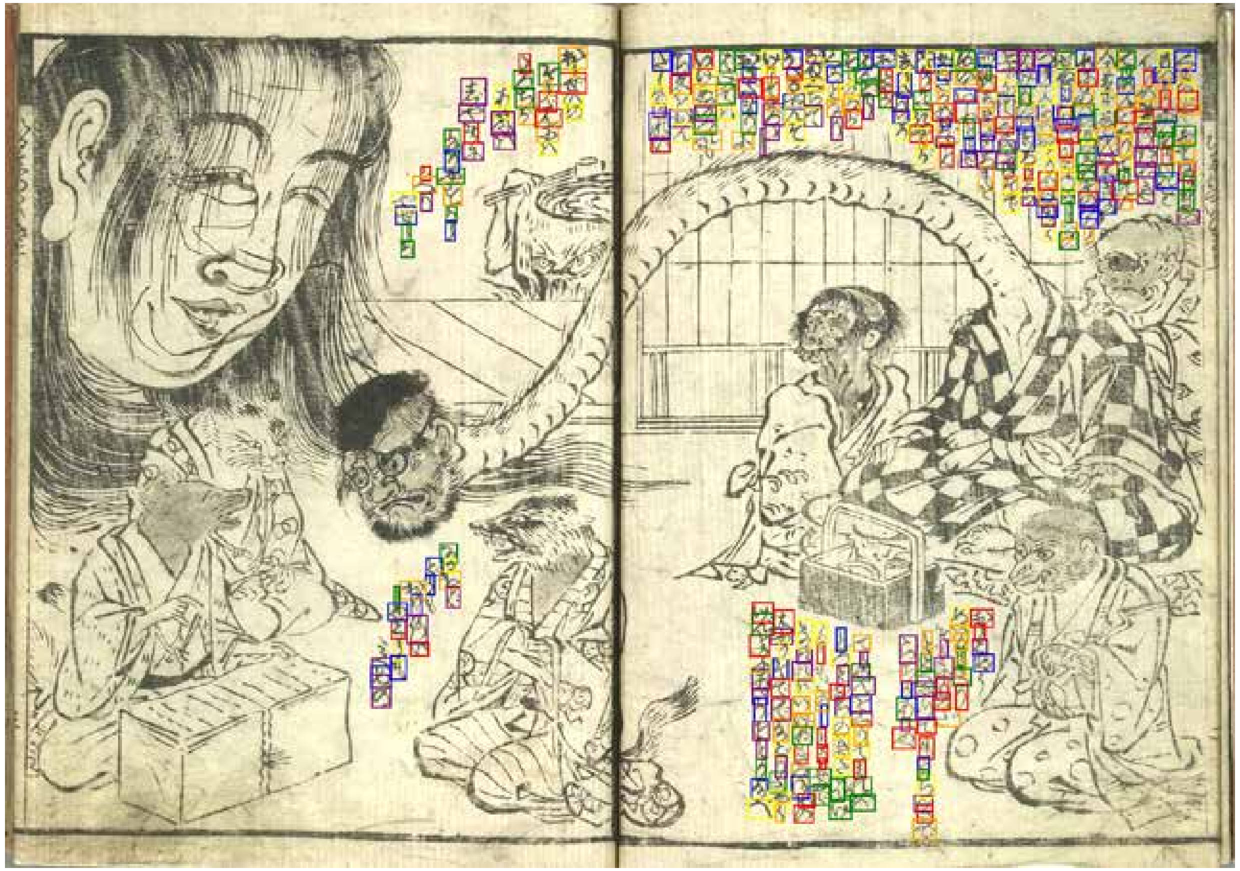
ROIS-DS Center for Open Data in the Humanities · 293 teams · 5 days ago

$15,000 Prize Money

Kaggle is the largest **AI competition** platform.
Our competition was the first in the humanities domain.

- Period: July 19 to October 14, 2019
- Teams: 293
- Members: 338
- Submissions: 2652

Result of the Competition



The winner model (tascj team) was applied to an image from Waseda University Kotenseki Database

The top accuracy was 95%

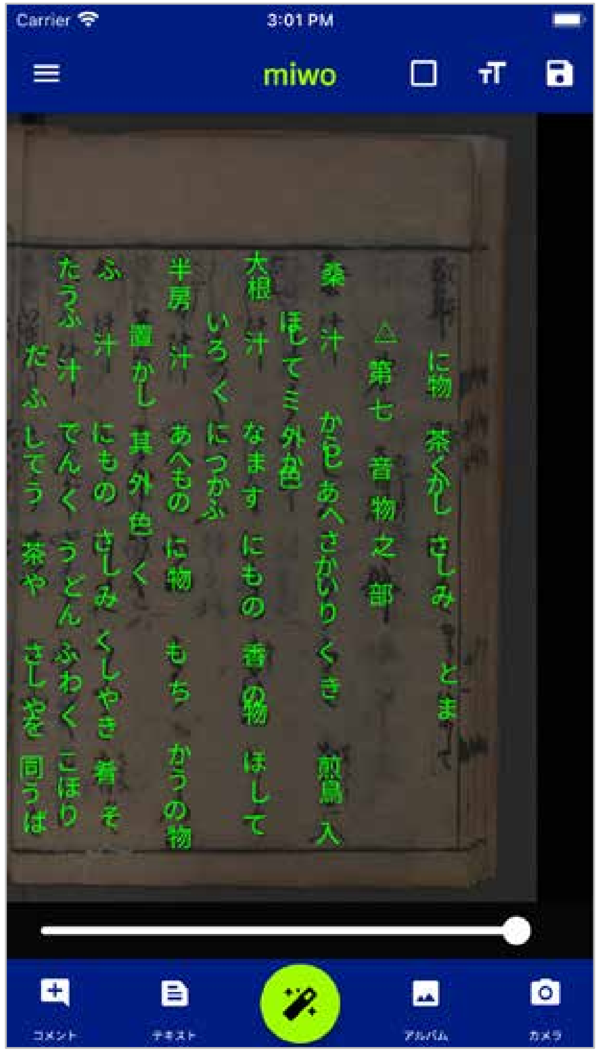
1. All winners do not read kuzushiji, but have developed good machine learning models.
2. This is because the domain knowledge was embedded in the dataset.

miwo – App for AI Kuzushiji Recognition

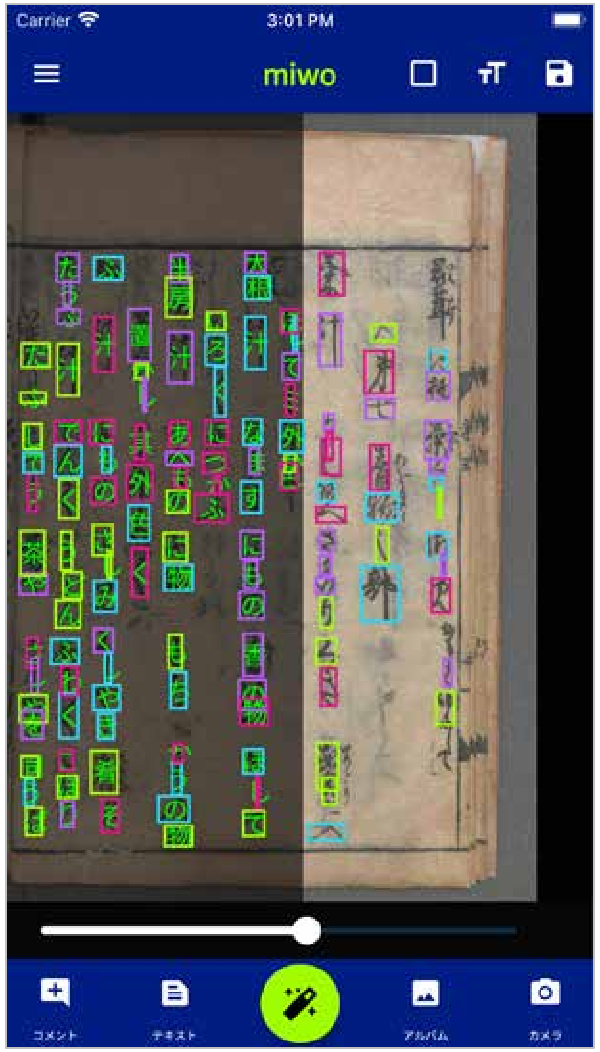
http://codh.rois.ac.jp/miwo/

1. The name comes from the 14th chapter of The Tale of Genji “miwotsukushi,” referring to waterway signs.
2. Just as the miwotsukushi is a guide for boats in the sea, we aim to make our "miwo" app as a guide for traveling the ocean of historical documents.

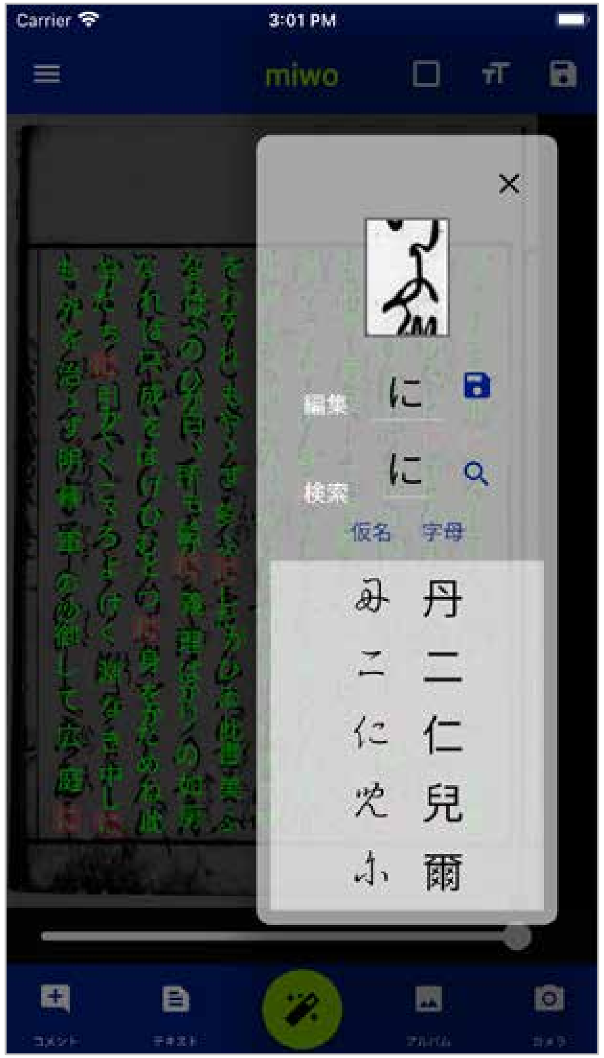
miwo app prototype version at the KeMCo Museum (April 2021)



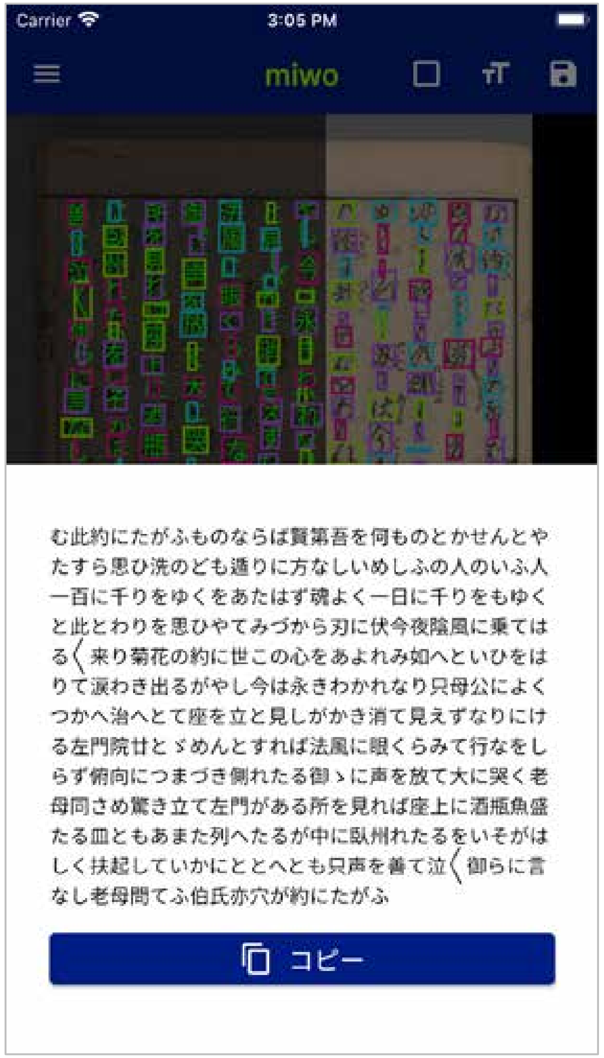
Show a recognition result in characters



Show a recognition result with bounding boxes



Modify the error with reference to root characters.



む此約にたがふものならば賢第吾を何ものとかせんとや
たすら思ひ洗のども遁りに方なしいめしふの人のいふ人
一百に千りをゆくをあたはず魂よく一日に千りをもゆく
と此とわりを思ひやてみづから刃に伏今夜陰風に乗ては
る〈来り菊花の約に世この心をあよれみ如へといひをは
りて涙わき出るがやし今は永きわかれなり只母公によく
つかへ治へとて座を立と見しがかき消て見えずなりにけ
る左門院廿とゞめんとすれば法風に眼くらみて行なをし
らず俯向につまづき倒れたる御ゝに声を放て大に哭く老
母同さめ驚き立て左門がある所を見れば座上に酒瓶魚盛
たる皿ともあまた列へたるが中に臥州れたるをいそがは
しく扶起していかにととへとも只声を善て泣〈御らに言
なし老母問てふ伯氏赤穴が約にたがふ

Generate the text output from the recognition result

Impact and Future of Kuzushiji Recognition

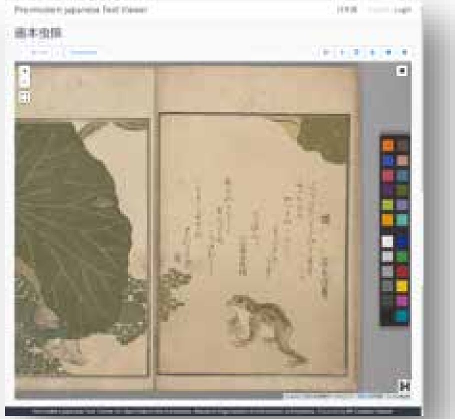
1. The miwo app was downloaded more than **42,000** times, and more than **337,000** images were recognized.
2. The daily uploaded images is constantly above **2,000** images, which indicates steady demand from the public.
3. Future of kuzushiji recognition is the full-text search engine of historical documents (we'll call it "**tsukushi**").
4. The full-text search engine will be the driver of digital transformation in the humanities research.

Bukan Complete Collection

Collaborator: Kumiko Fujizane (National Institute of Japanese Literature)

Textual and Non-textual Digital Humanities

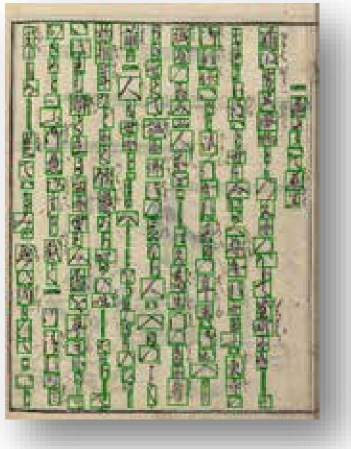
Images



Photographs

Maps

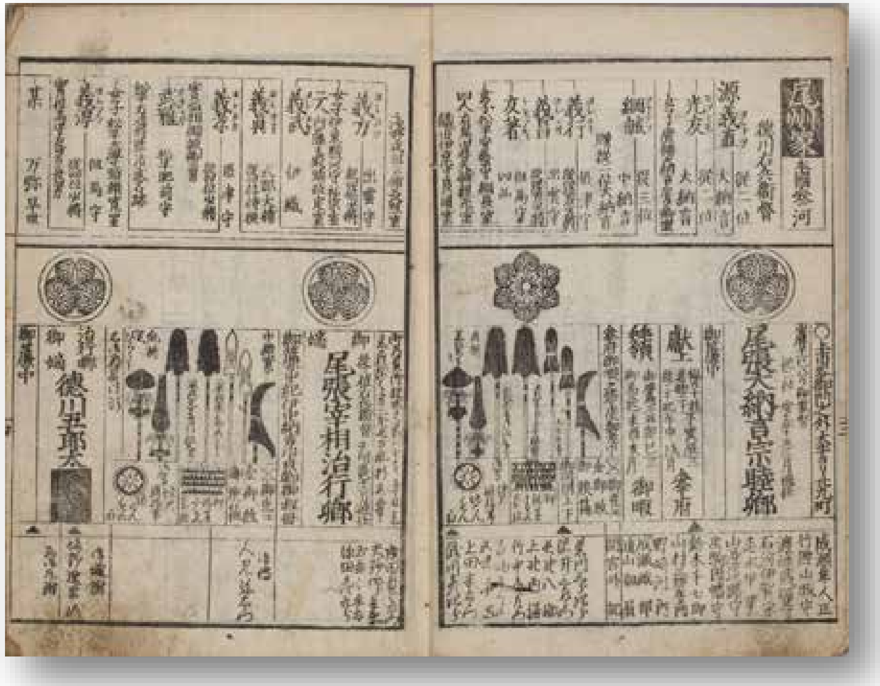
Characters



Digital humanities is not only about text.

Structured and unstructured data (visual and spatial sources) requires its own analysis and interpretation framework.

What is Bukan「武鑑」？



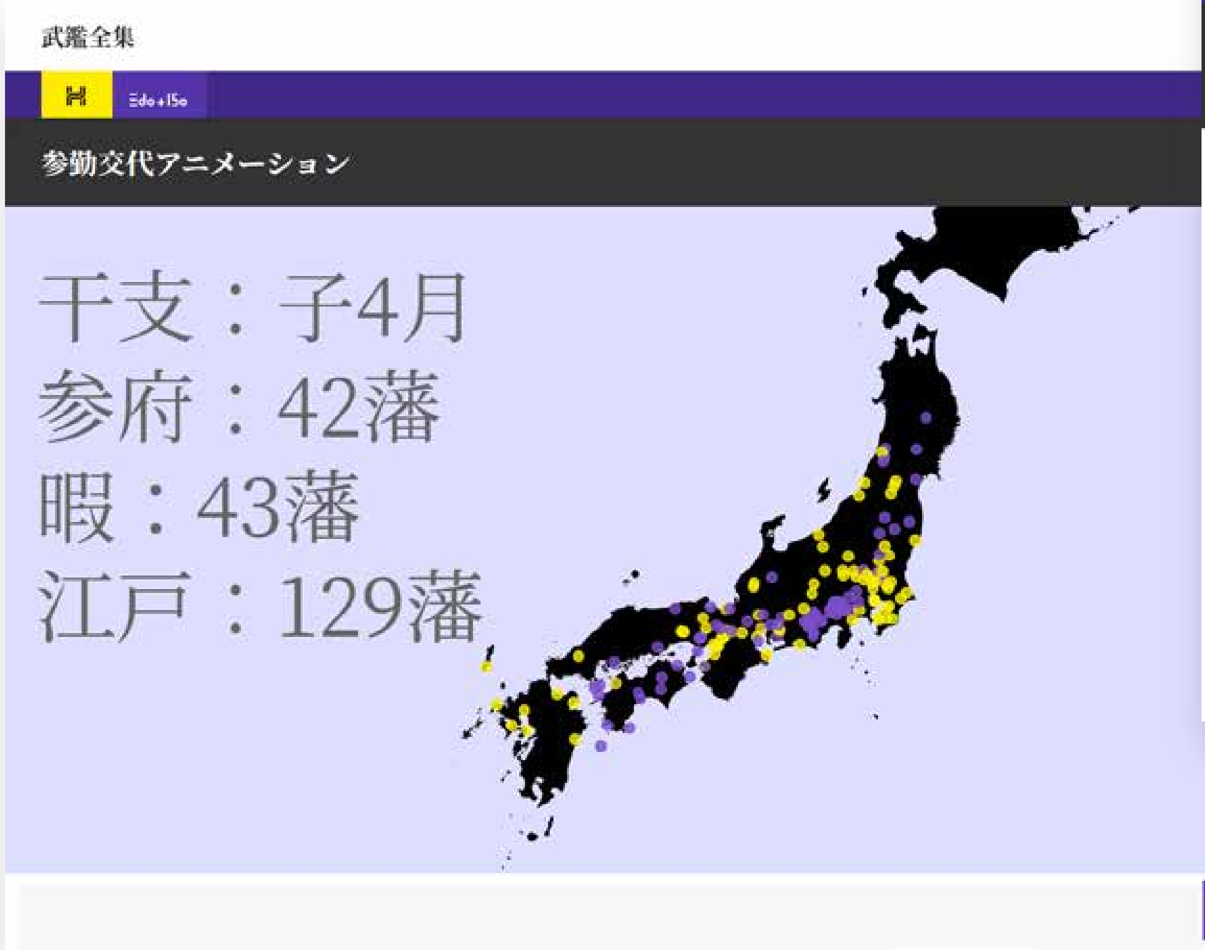
Kansei Bukan (1789), Dataset of Premodern Japanese Text (NIJL)
http://codh.rois.ac.jp/pmjt/book/200018823/

1. Bukan is a “data book” of Daimyo and personnel in the Edo Bakufu compiled in a structured format.
2. Published for 200+ years before 1867, until the end of the Edo Period.
3. Long-seller books with practical usage.
4. The frequency of updates had increased to a few times a month at the peak.

Reference: Kumiko Fujizane, 2008

Bukan Complete Collection

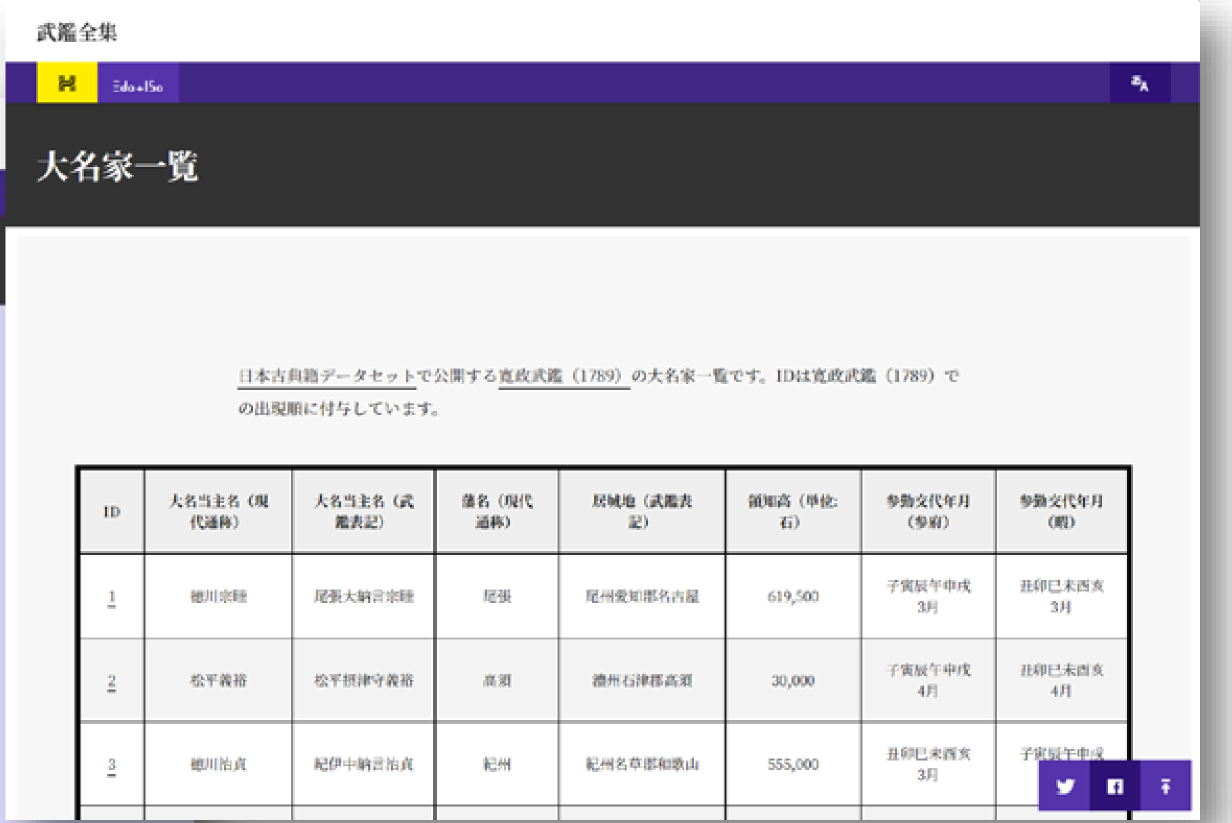
http://codh.rois.ac.jp/bukan/



武鑑全集

参勤交代アニメーション

干支：子4月
参府：42藩
暇：43藩
江戸：129藩



武鑑全集

大名家一覧

日本古典籍データセットで公開する寛政武鑑（1789）の大名家一覧です。IDは寛政武鑑（1789）での出現順に付与しています。

ID	大名当主名（現代通称）	大名当主名（武鑑表記）	藩名（現代通称）	居城地（武鑑表記）	領知高（単位:石）	参勤交代年月（参府）	参勤交代年月（暇）
1	徳川宗睦	尾張大納言宗睦	尾張	尾州愛知郡名古屋	619,500	子寅辰午申戌 3月	丑卯巳未酉亥 3月
2	松平義裕	松平摂津守義裕	高須	濃州石津郡高須	30,000	子寅辰午申戌 4月	丑卯巳未酉亥 4月
3	徳川治貞	紀伊中納言治貞	紀州	紀州名草郡和歌山	555,000	丑卯巳未酉亥 3月	子寅辰午申戌

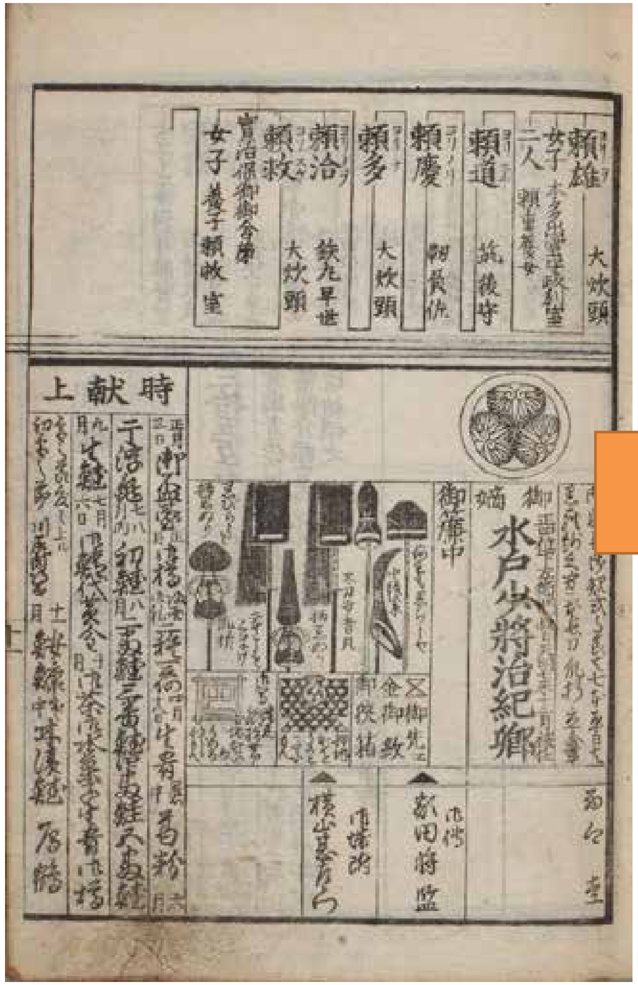
List of Daimyos

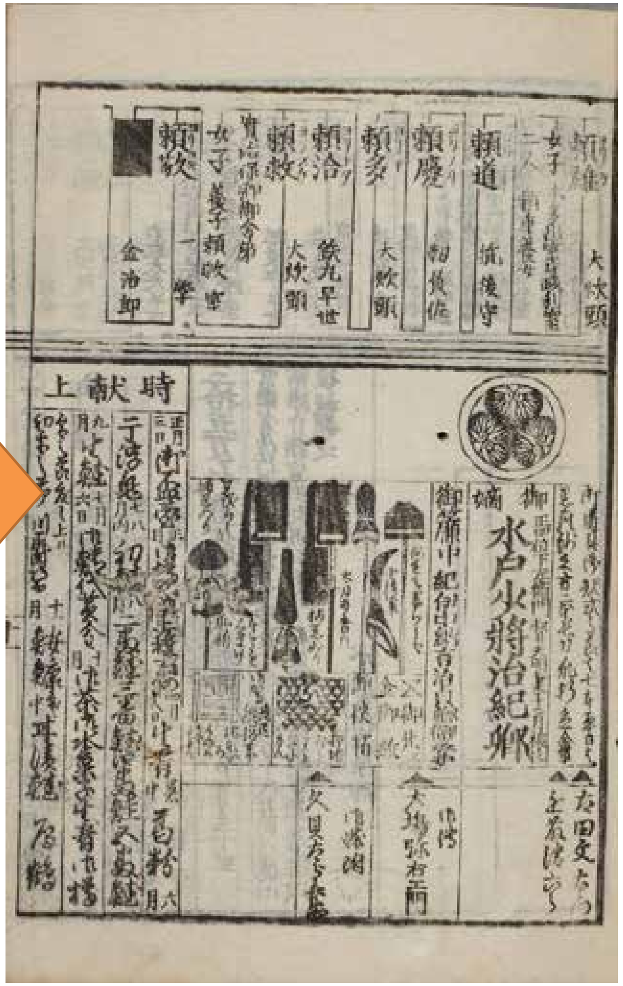
Sankin Kotai Dynamic Map

Differential Transcription

Question: how can we transcribe books over 200+ years?

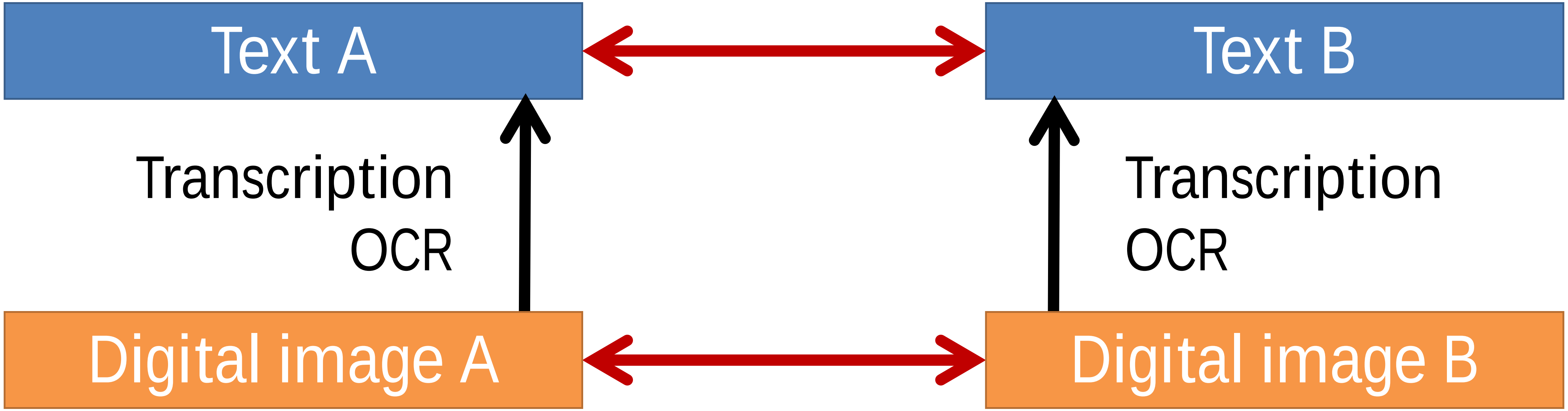
Solution: detect and transcribe the difference to create time-series data.





Text-based and Image-Based Difference

Text-based difference = many tools available



Text A

Text B

Transcription
OCR

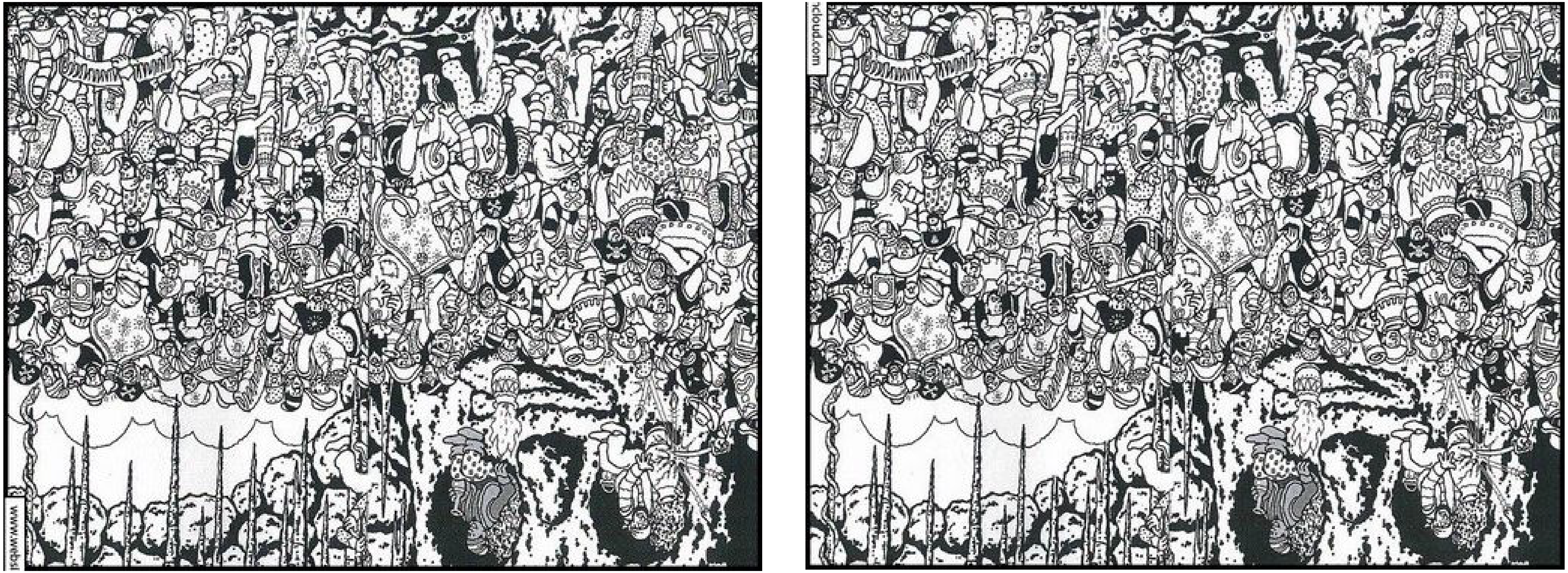
Transcription
OCR

Digital image A

Digital image B

Image-based (non-textual) difference =
no standard tools available (side-by-side comparison)

Visual Comparison = Find the Difference!

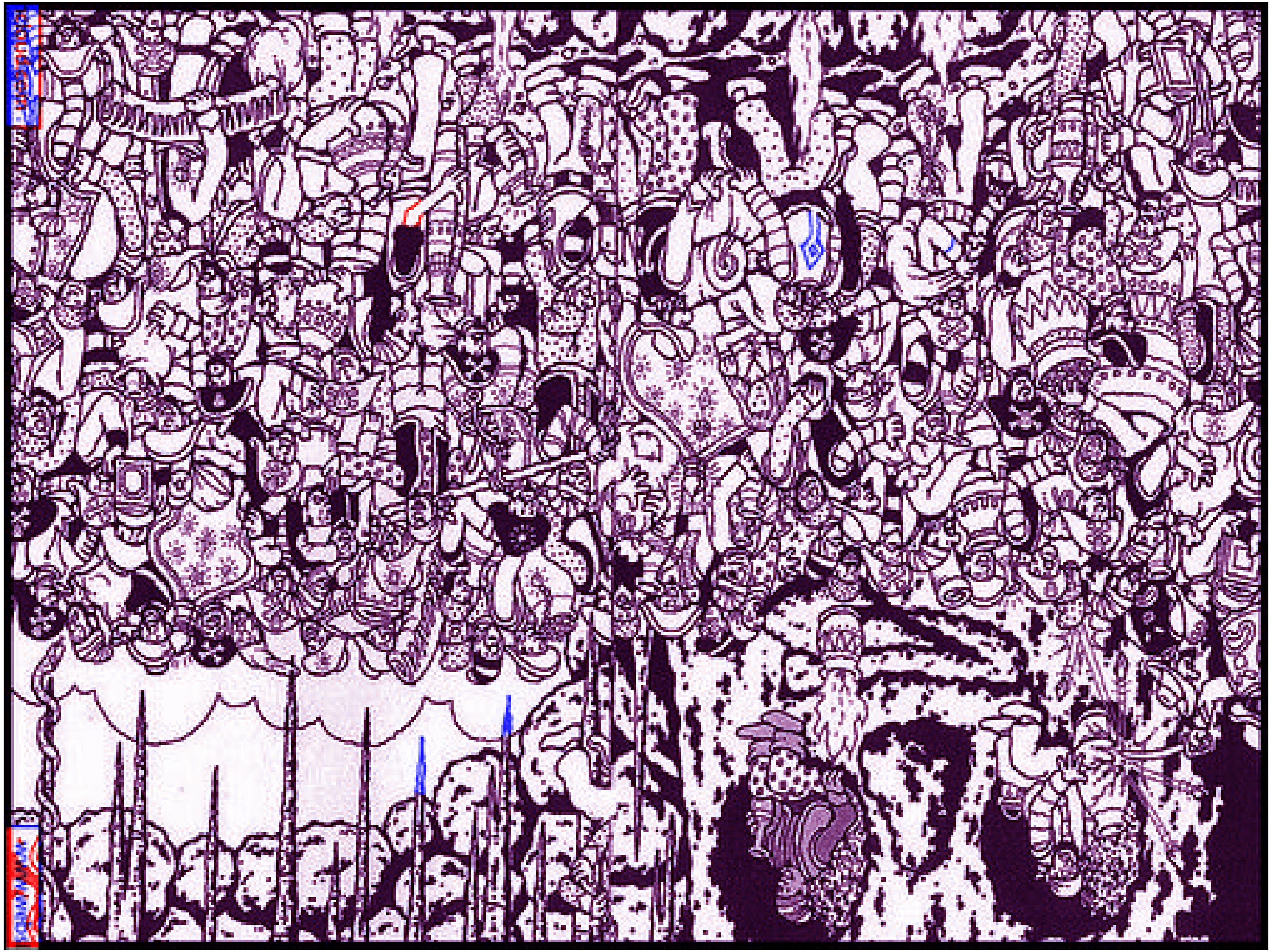


https://www.activities.websincloud.com/finddifferences/whereswally/21.html

Answer

http://codh.rois.ac.jp/differential-reading/file/

Red and blue colors were used to emphasize the difference.

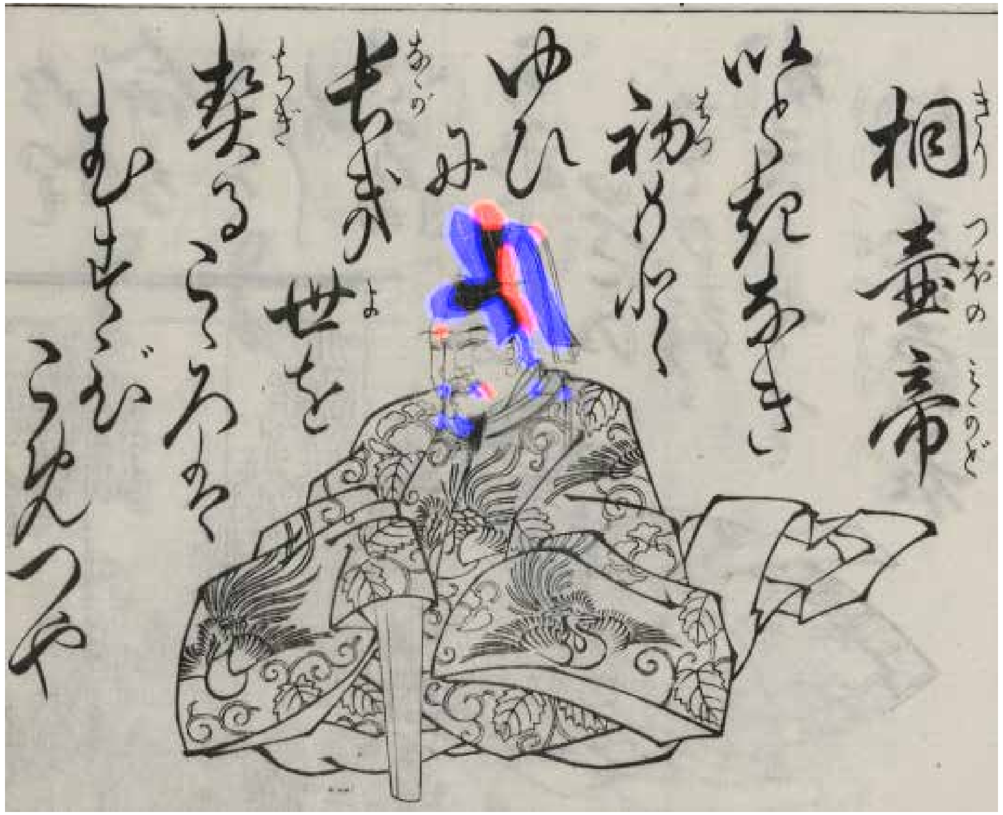


Differential Reading

1. **For humans**: visual comparison requires an effort comparable to playing games.
2. **For machines**: visual comparison is an easy game using a computer vision-based image matching algorithm.
3. Let’s turn a difficult task (reading difference) into an easy one with the help of machines.
4. **Differential reading**: A new mode of reading books focusing on difference between editions (versions).

Image Collation for Differential Reading

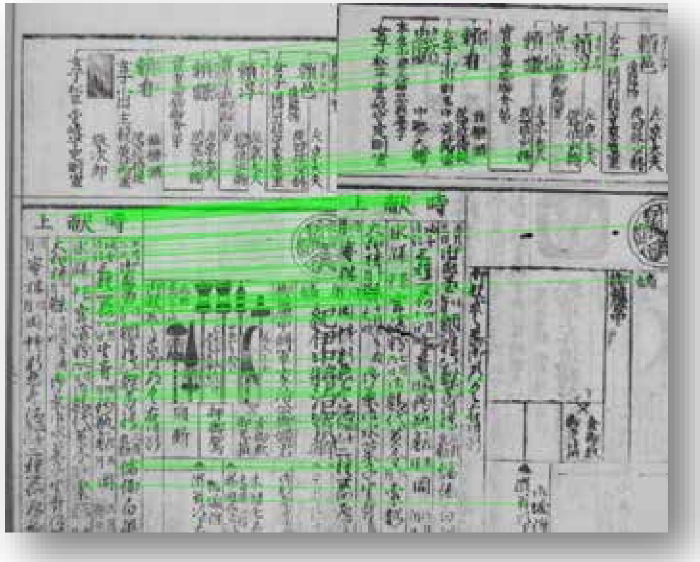
http://codh.rois.ac.jp/differential-reading/



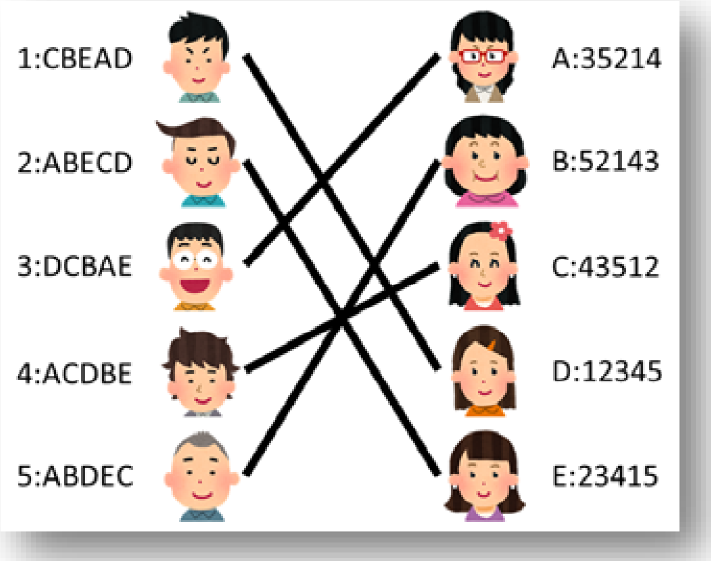
Genji Hyakunin Isshu Comparison,
University of Tokyo Library.

1. A JavaScript-based tool "vdiff.js" for comparing images.
2. Anyone can upload two images (or specify URLs).
3. The system can automatically match two images and emphasize the difference.
4. When the system fails, you can manually improve the matching.

Large-Scale Book Collation



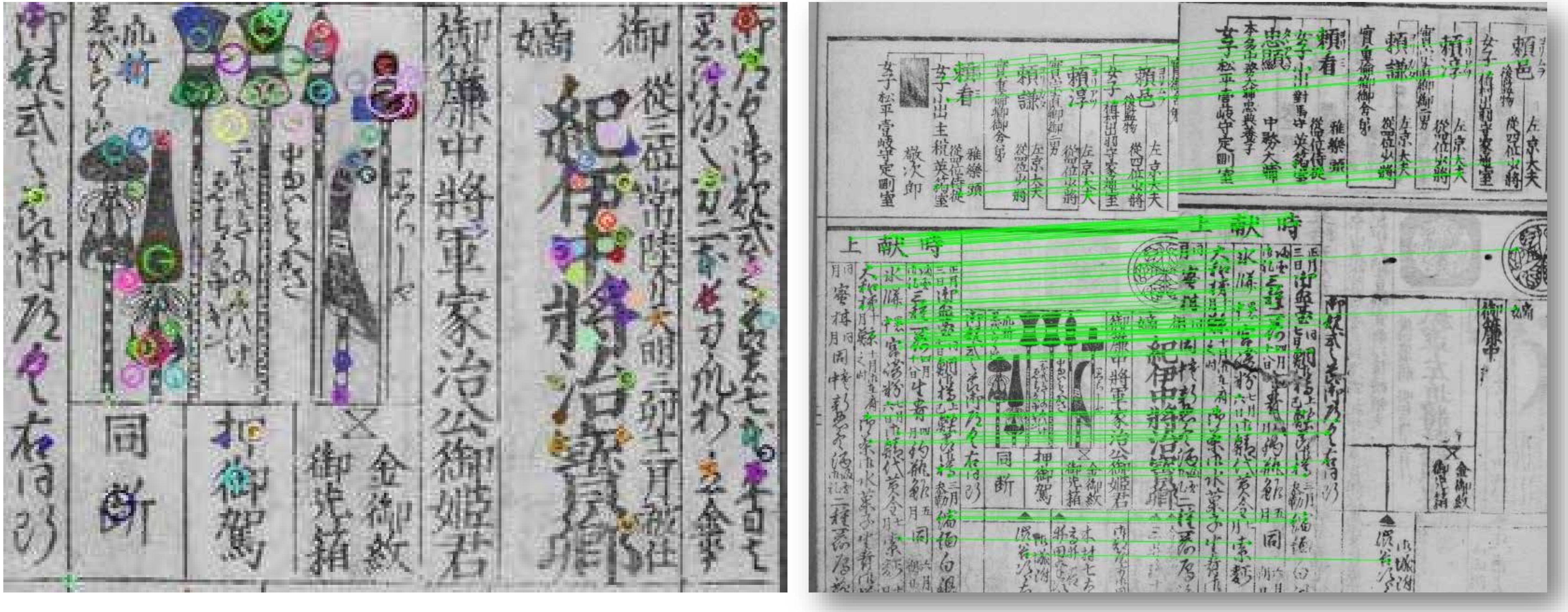
1. Page collation: image matching using keypoints.



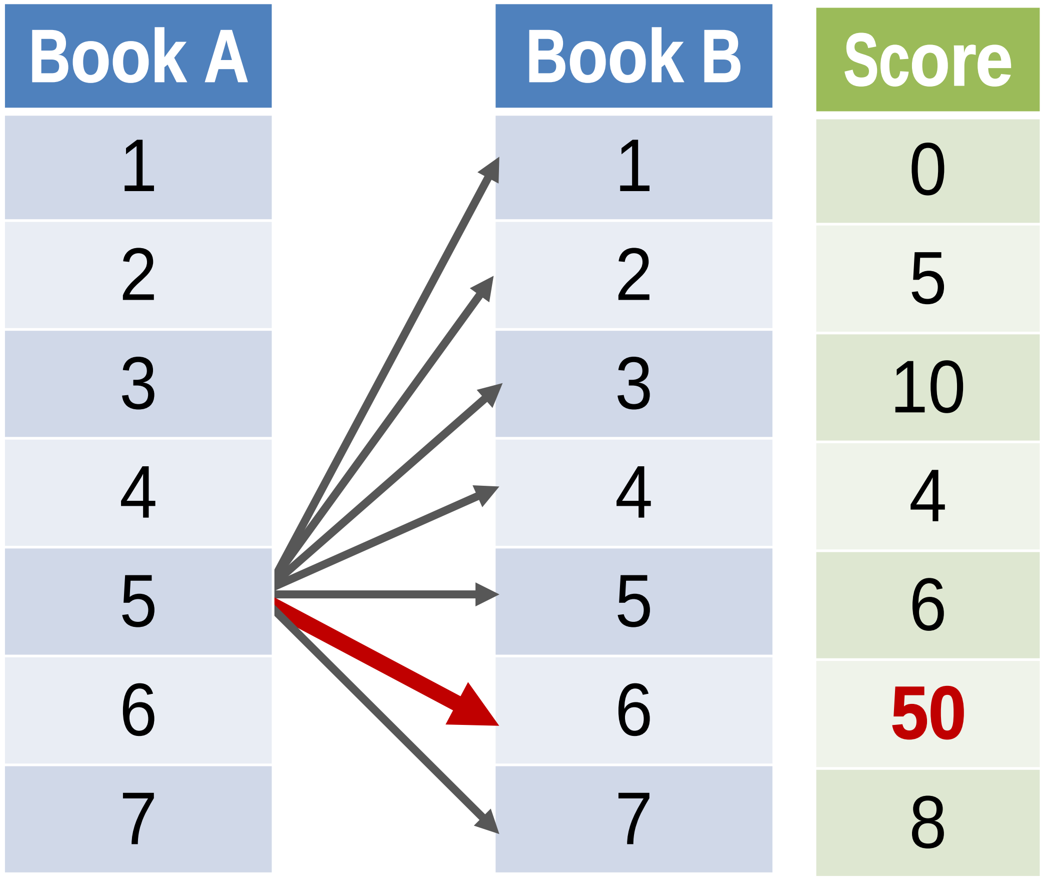
2. Book collation: stable marriage algorithm based on page collation.

3. Woodblock tracking: The same woodblock is estimated and connected across books.

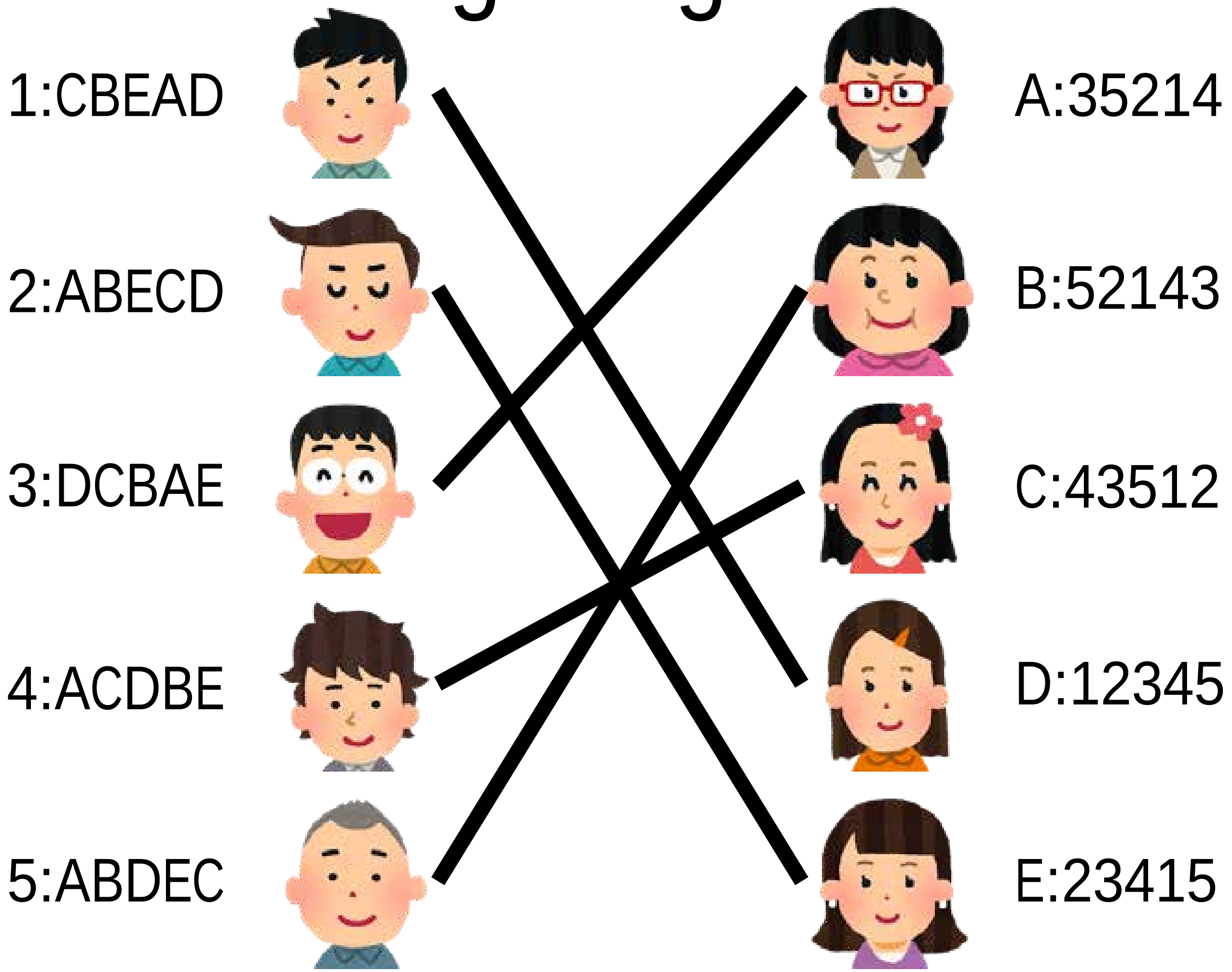
Page Collation – Keypoint Matching



Book Collation – Stable Marriage Algorithm



Book A	Book B	Score
1	1	0
2	2	5
3	3	10
4	4	4
5	5	6
6	6	**50**
7	7	8



1:CBEAD

2:ABECD

3:DCBAE

4:ACDBE

5:ABDEC

A:35214

B:52143

C:43512

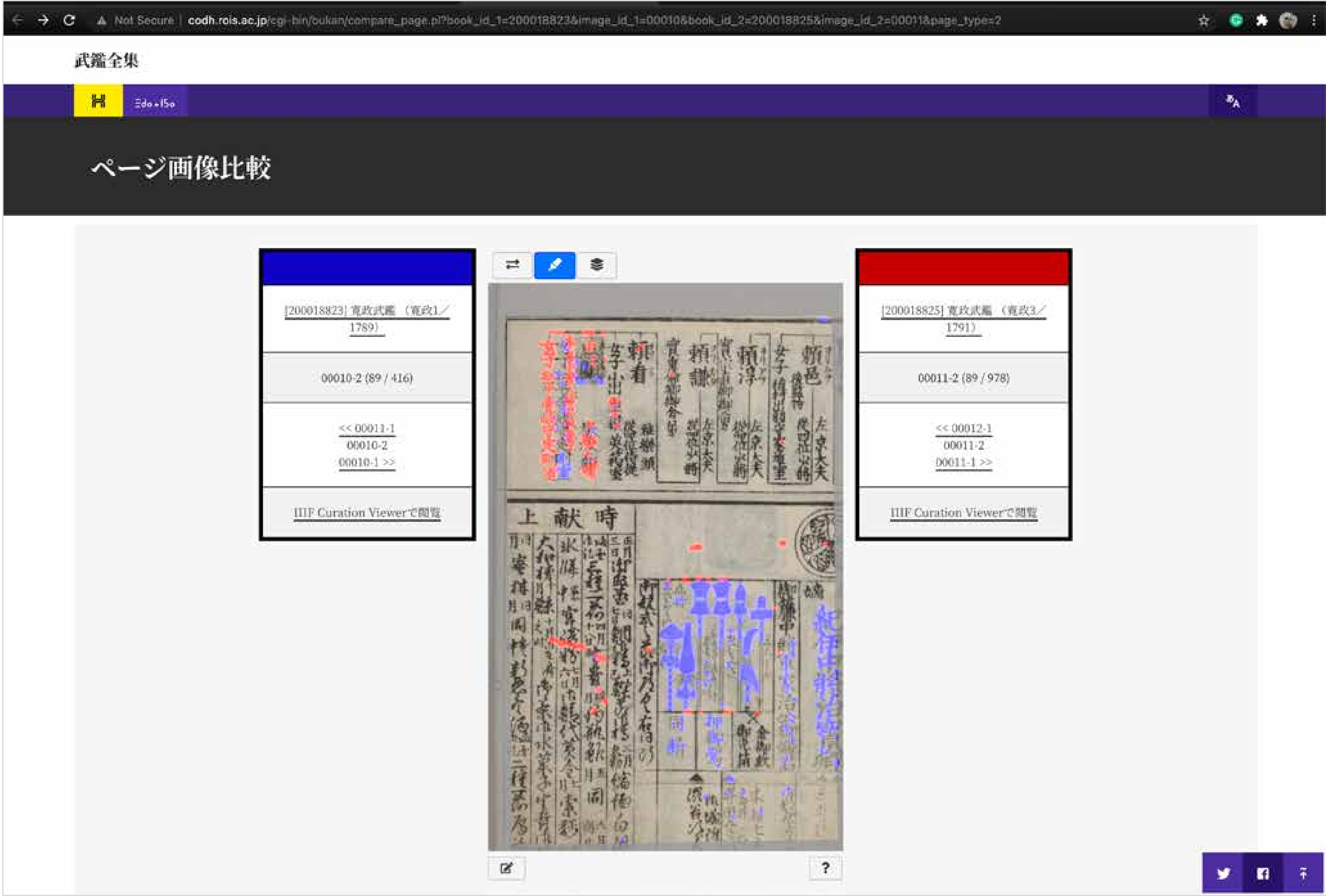
D:12345

E:23415

Image source: Irasutoya

Page-by-Page Collation – Visualization by vdiff.js

http://codh.rois.ac.jp/software/vdiffjs/



Not Secure | codh.rois.ac.jp/cgi-bin/bukan/compare_page.pl?book_id_1=200018823&image_id_1=00010&book_id_2=200018825&image_id_2=00011&page_type=2

武鑑全集

ページ画像比較

[200018823] 寛政武鑑（寛政1／1789）

00010-2 (89 / 416)

<< 00011-1
00010-2
00010-1 >>

IIIF Curation Viewerで閲覧

[200018825] 寛政武鑑（寛政3／1791）

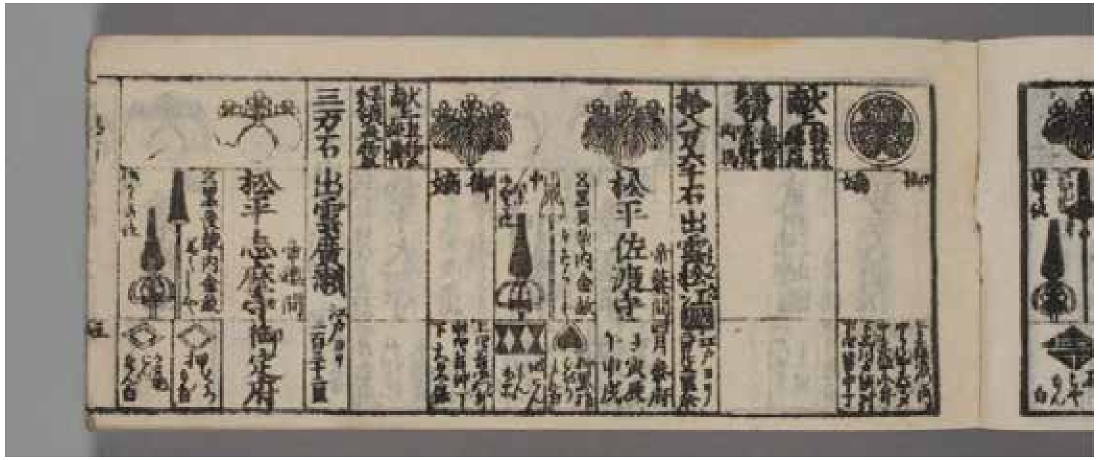
00011-2 (89 / 978)

<< 00012-1
00011-2
00011-1 >>

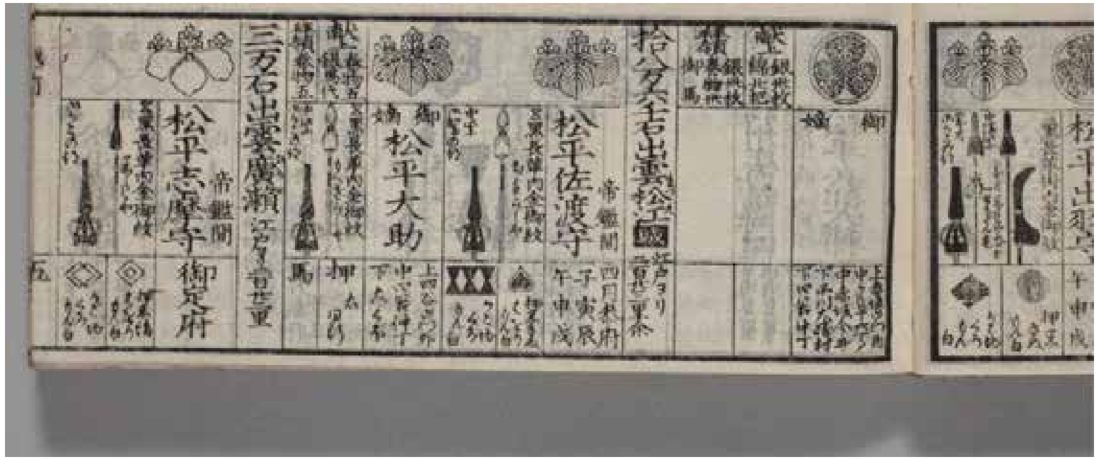
IIIF Curation Viewerで閲覧

Woodblock Tracking

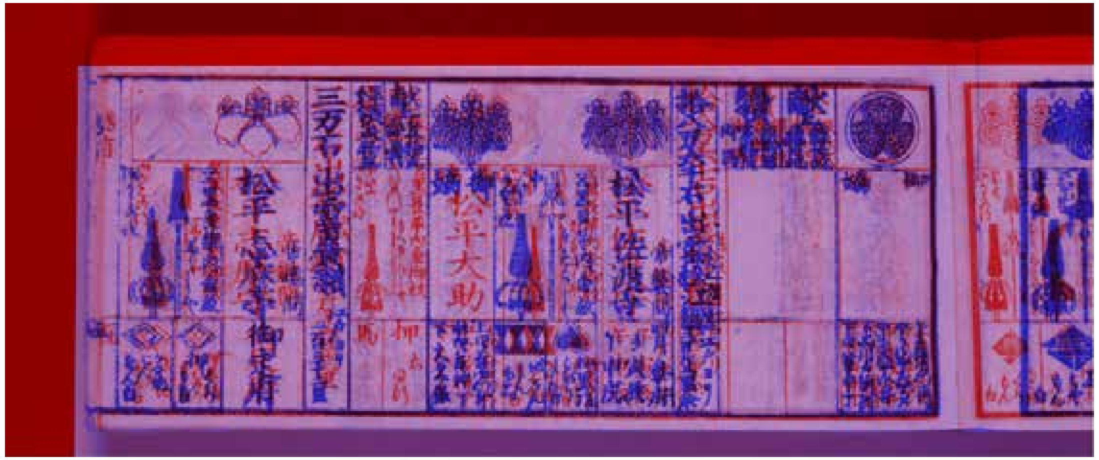
http://codh.rois.ac.jp/bukan/diff/woodblock/



袖珍武鑑 （文化６／1809） [200019413]



袖珍武鑑 （天保１２／1841） [200019430]



The same woodblock can be tracked to analyze the evolution of information on the woodblock.

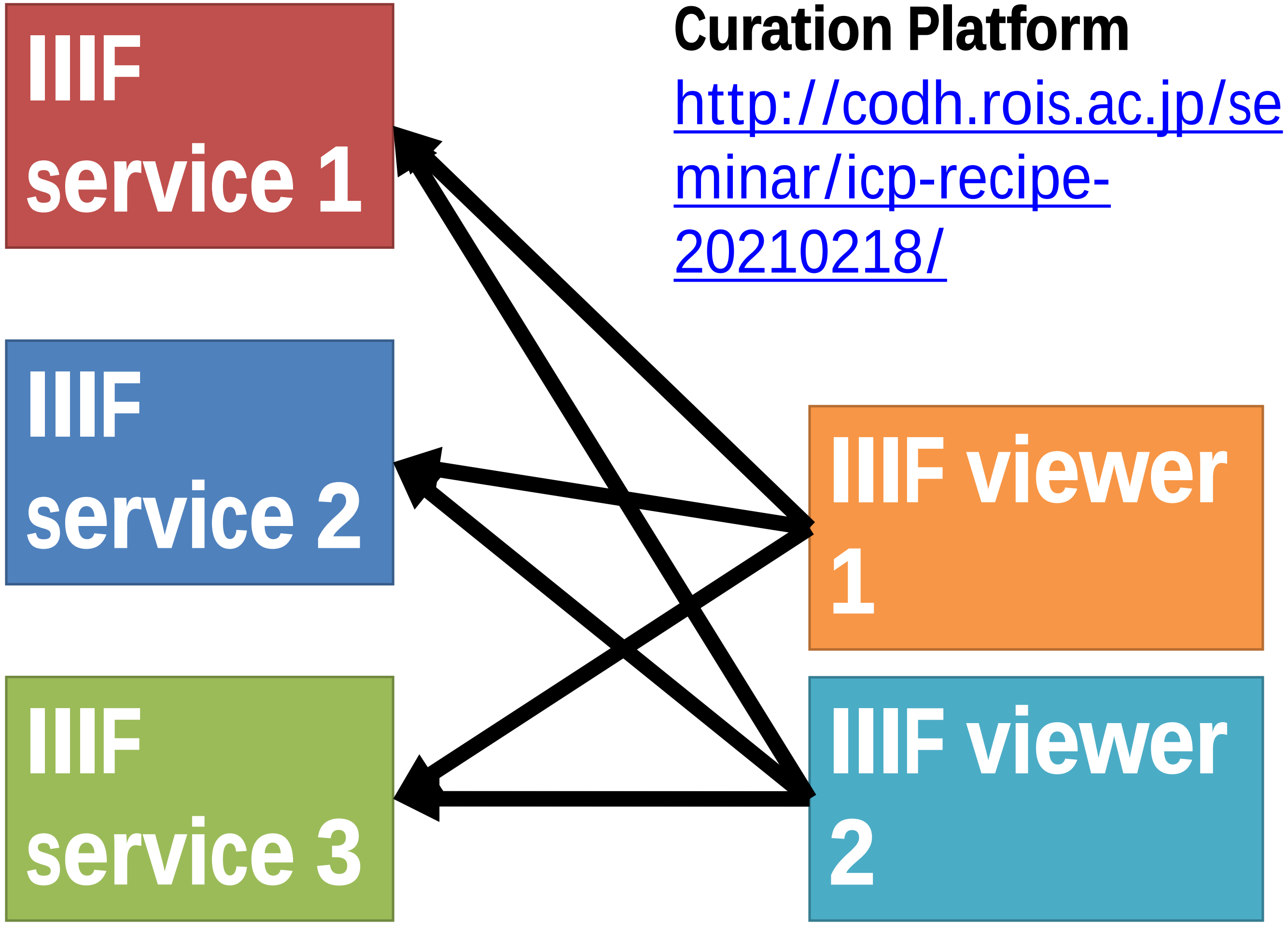
KaoKore and IIIF Curation Platform

Collaborator: Chikahiko Suzuki (CODH), Jun Homma (FLX Style), Yingtao Tian (Google Brain)

What is IIIF ("triple-I F")?

IIIF = International Image Interoperability Framework

Web: HTML
Images: IIIF

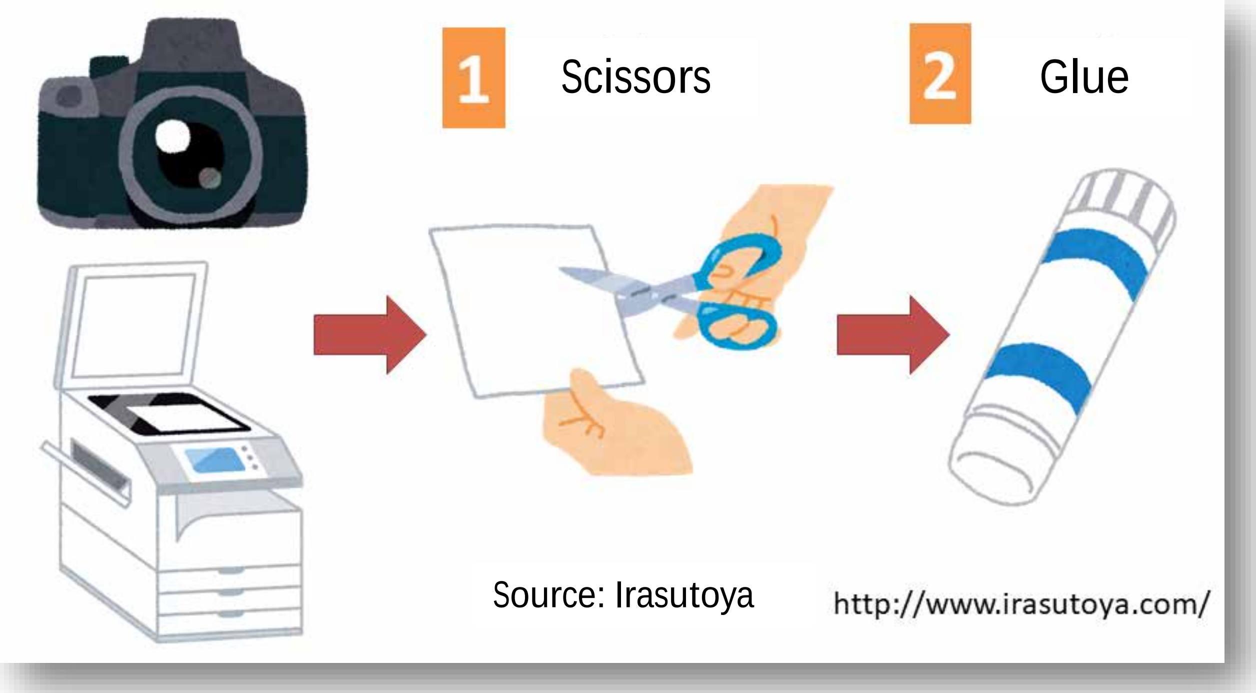


14th CODH Seminar - 100 Recipes for IIIF Curation Platform
http://codh.rois.ac.jp/seminar/icp-recipe-20210218/

What is Curation?

"Curation" is a word that originally means activities at museums such as collecting materials and exhibiting artworks.

1. Collect materials under a certain theme.
2. Arrange them in an appropriate order (layout).
3. Present or share the result as a new material.



Source: Irasutoya

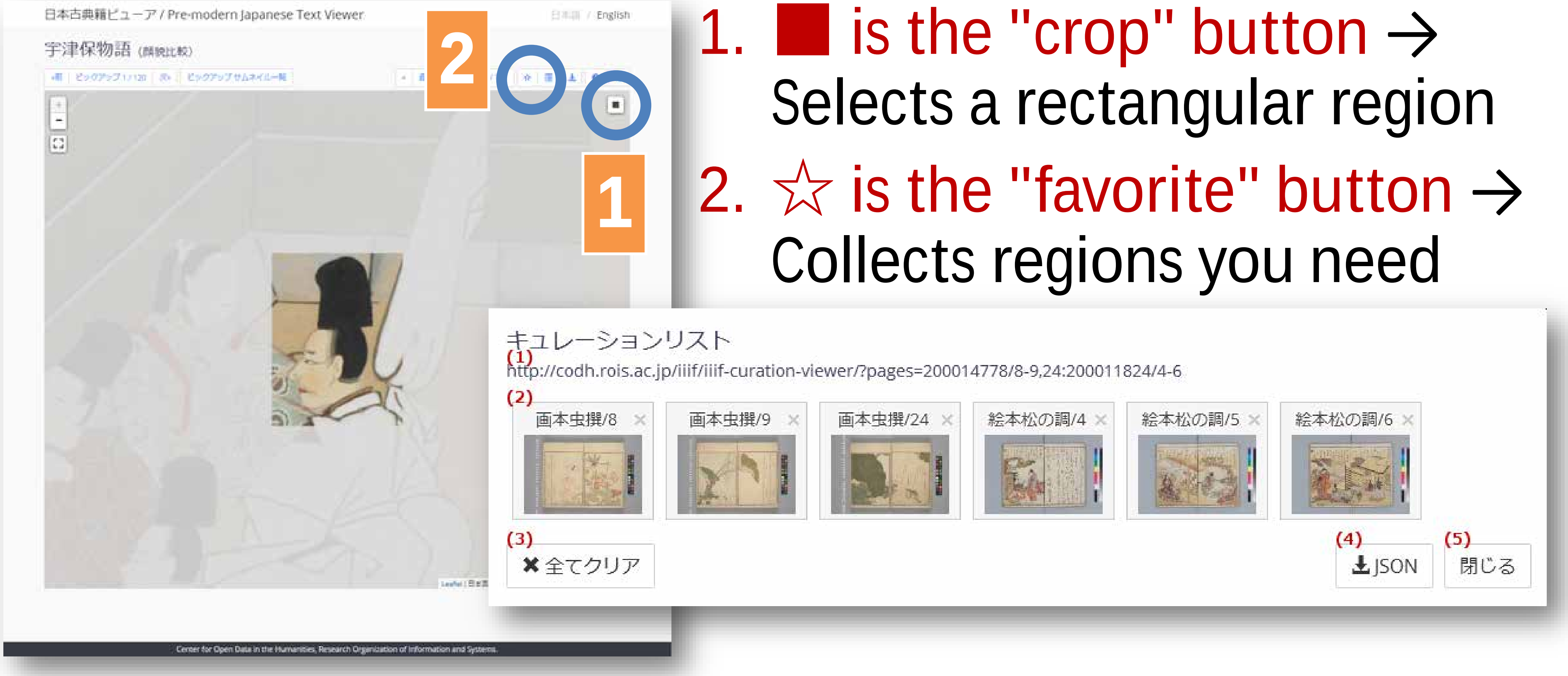
http://www.irasutoya.com/

IIIF Curation Viewer

Developed by CODH since 2016

http://codh.rois.ac.jp/software/iiif-curation-viewer/

1. ■ is the "crop" button → Selects a rectangular region
2. ☆ is the "favorite" button → Collects regions you need



日本古典籍ビューア / Pre-modern Japanese Text Viewer

日本語 / English

宇津保物語

Center for Open Data in the Humanities, Research Organization of Information and Systems.

キュレーションリスト

(1) http://codh.rois.ac.jp/iiif/iiif-curation-viewer/?pages=200014778/8-9,24:200011824/4-6

(2)

- 画本虫撰/8 ×
- 画本虫撰/9 ×
- 画本虫撰/24 ×
- 絵本松の調/4 ×
- 絵本松の調/5 ×
- 絵本松の調/6 ×

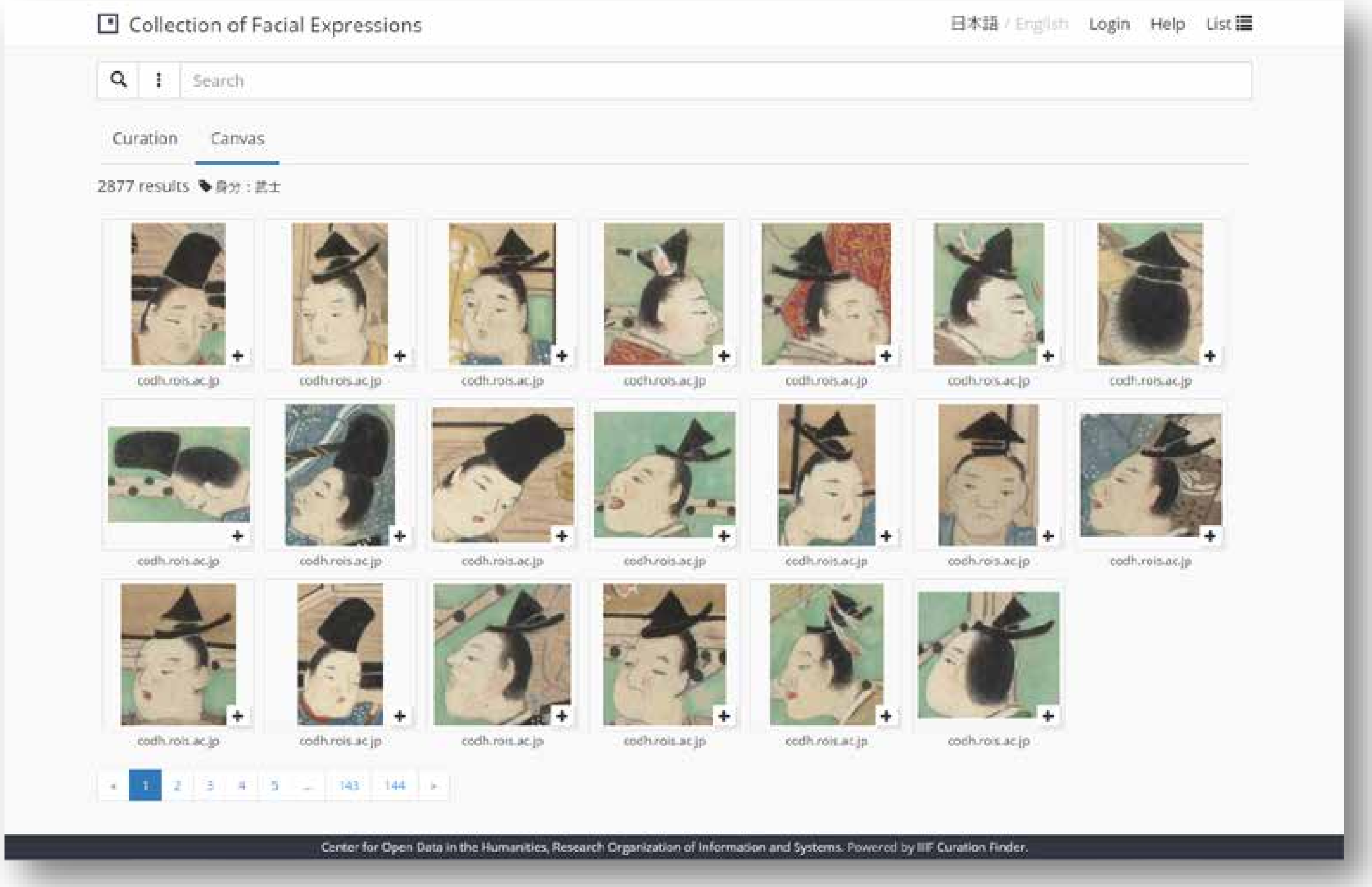
(3) ✖ 全てクリア

(4) JSON

(5) 閉じる

Collection of Facial Expressions (KaoKore)

http://codh.rois.ac.jp/face/



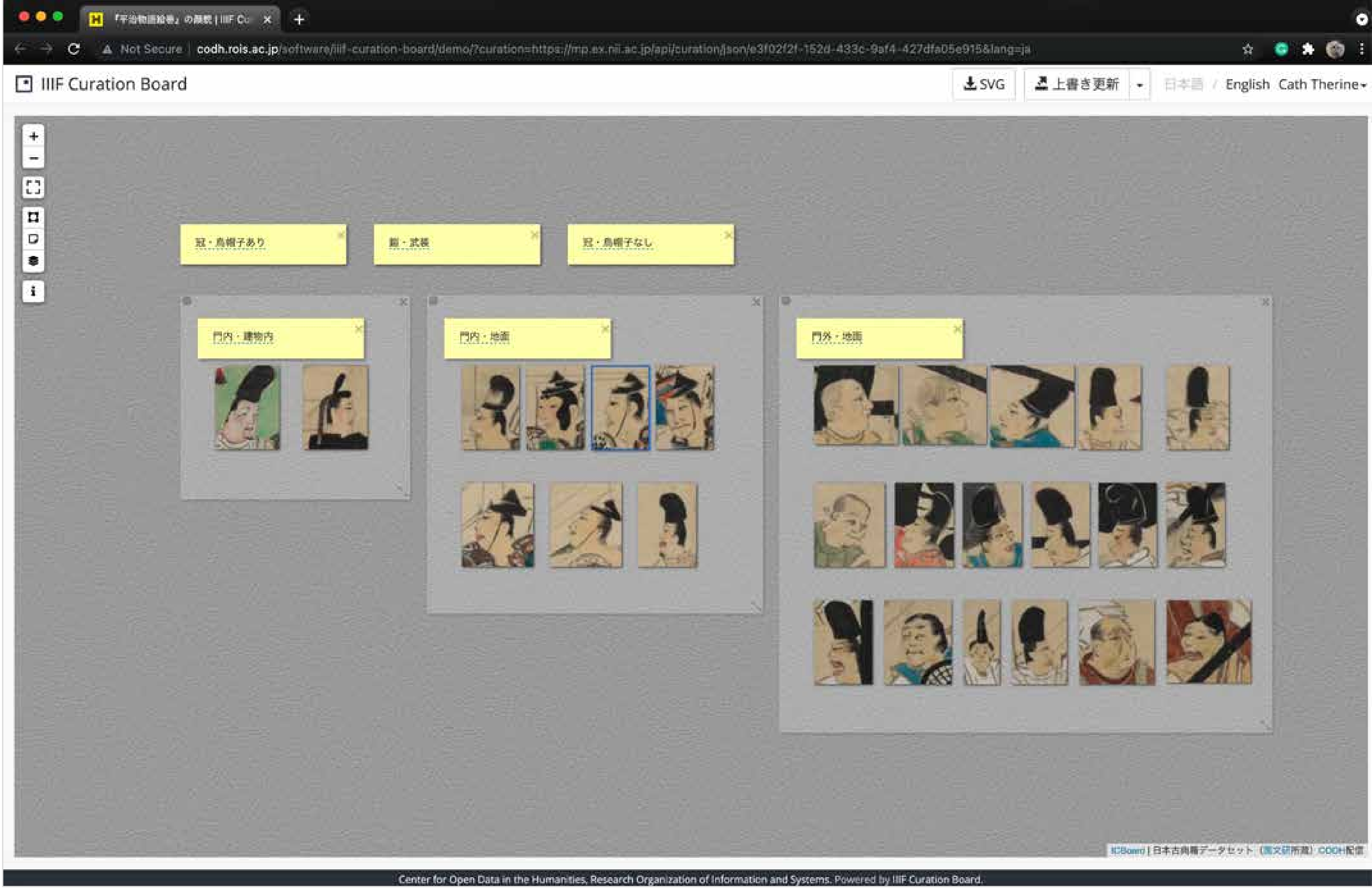
2877 results 身分：武士

Center for Open Data in the Humanities, Research Organization of Information and Systems. Powered by IIIF Curation Finder.

1. **IIIF Curation Viewer** for cropping and collecting a part of images.
2. **IIIF Curation Finder** for searching the collection by metadata.
3. **IIIF Curation Board** for analyzing the collection for art history research (**digital humanities**).

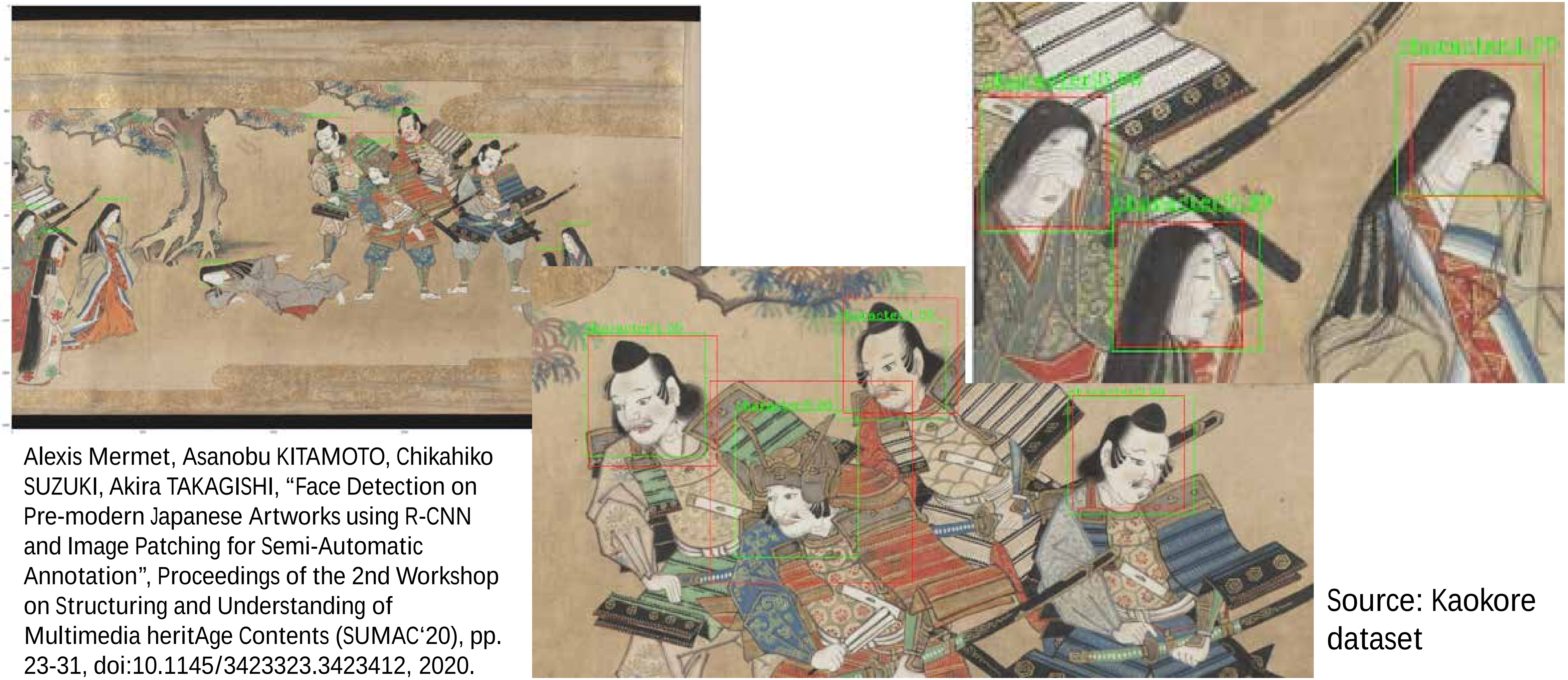
IIIF Curation Board

http://codh.rois.ac.jp/software/iiif-curation-board/


『平治物語絵巻』の顔貌 | IIIF Cu
Not Secure
codh.rois.ac.jp/software/iiif-curation-board/demo/?curation=https://mp.ex.nii.ac.jp/api/curation/json/e3f02f2f-152d-433c-9af4-427dfa05e915&lang=ja
IIIF Curation Board
SVG
上書き更新
日本語 / English
Cath Therine
冠・烏帽子あり
髷・武装
冠・烏帽子なし
門内・建物内
門内・地面
門外・地面
ICBoard | 日本古典籍データセット（国文研所蔵）CODH配信

Center for Open Data in the Humanities, Research Organization of Information and Systems. Powered by IIIF Curation Board.

Face Detection by Machine Learning



Alexis Mermet, Asanobu KITAMOTO, Chikahiko SUZUKI, Akira TAKAGISHI, “Face Detection on Pre-modern Japanese Artworks using R-CNN and Image Patching for Semi-Automatic Annotation”, Proceedings of the 2nd Workshop on Structuring and Understanding of Multimedia heritAge Contents (SUMAC‘20), pp. 23-31, doi:10.1145/3423323.3423412, 2020.

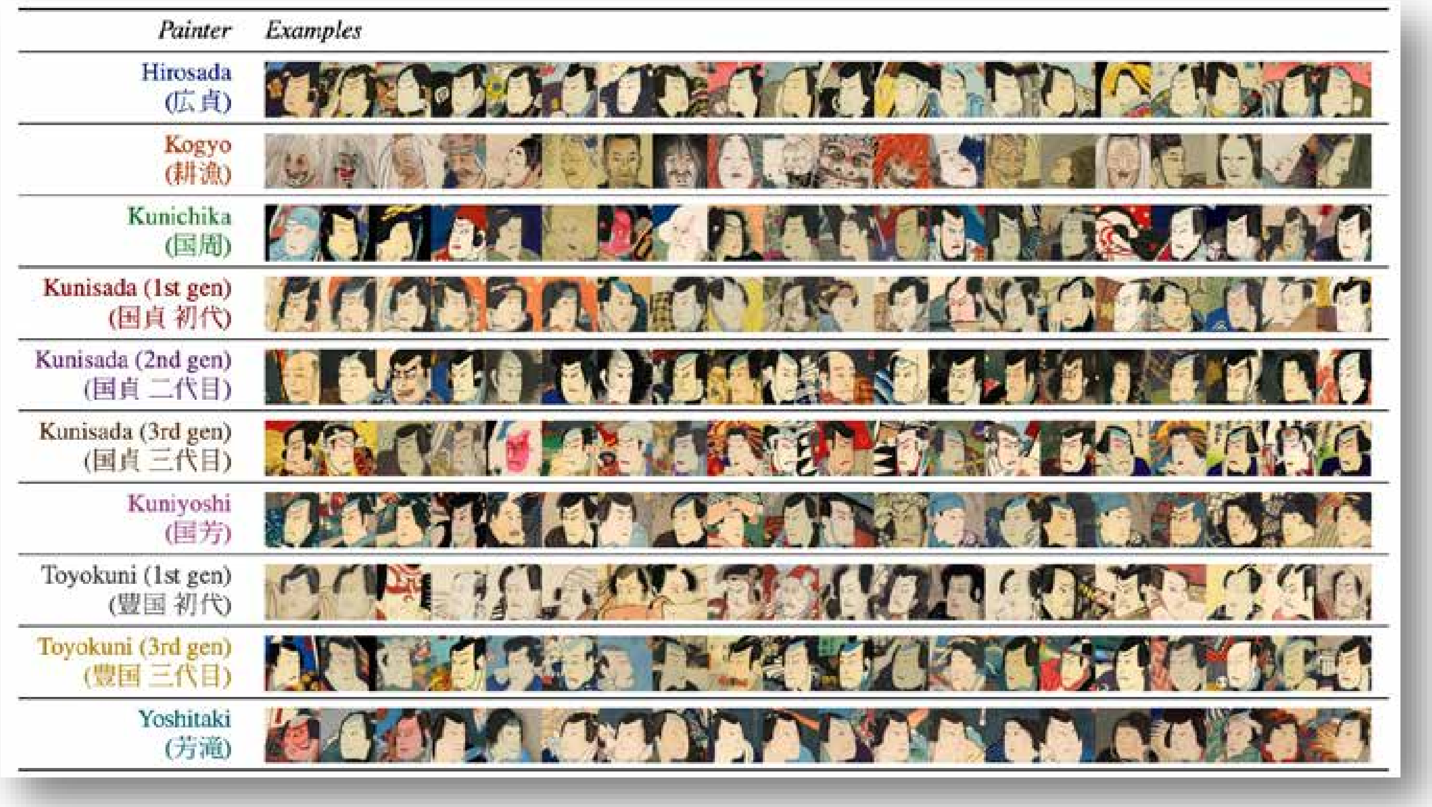
Source: Kaokore dataset

ML-assisted Annotation

1. Learning from the KaoKore Dataset, **about 80%** of the faces were automatically detected.
2. **About 70%** of the faces were automatically detected when applied to artworks from different time periods.
3. If **two thirds** can be detected by machines, the amount of work by humans is reduced to **one thirds**.
4. Art historians can analyze more data, and more data leads to richer evidence and higher reliability of the results.

Ukiyo-e Faces Dataset

http://codh.rois.ac.jp/ukiyo-e/face-dataset/



Painter	*Examples*
Hirosada (広貞)	
Kogyo (耕漁)	
Kunichika (国周)	
Kunisada (1st gen) (国貞 初代)	
Kunisada (2nd gen) (国貞 二代目)	
Kunisada (3rd gen) (国貞 三代目)	
Kuniyoshi (国芳)	
Toyokuni (1st gen) (豊国 初代)	
Toyokuni (3rd gen) (豊国 三代目)	
Yoshitaki (芳滝)	

"ARC Ukiyo-e Faces Dataset" (Created by Yingtao Tian, ROIS-DS CODH; Collected from ARC），https://doi.org/10.20676/00000394

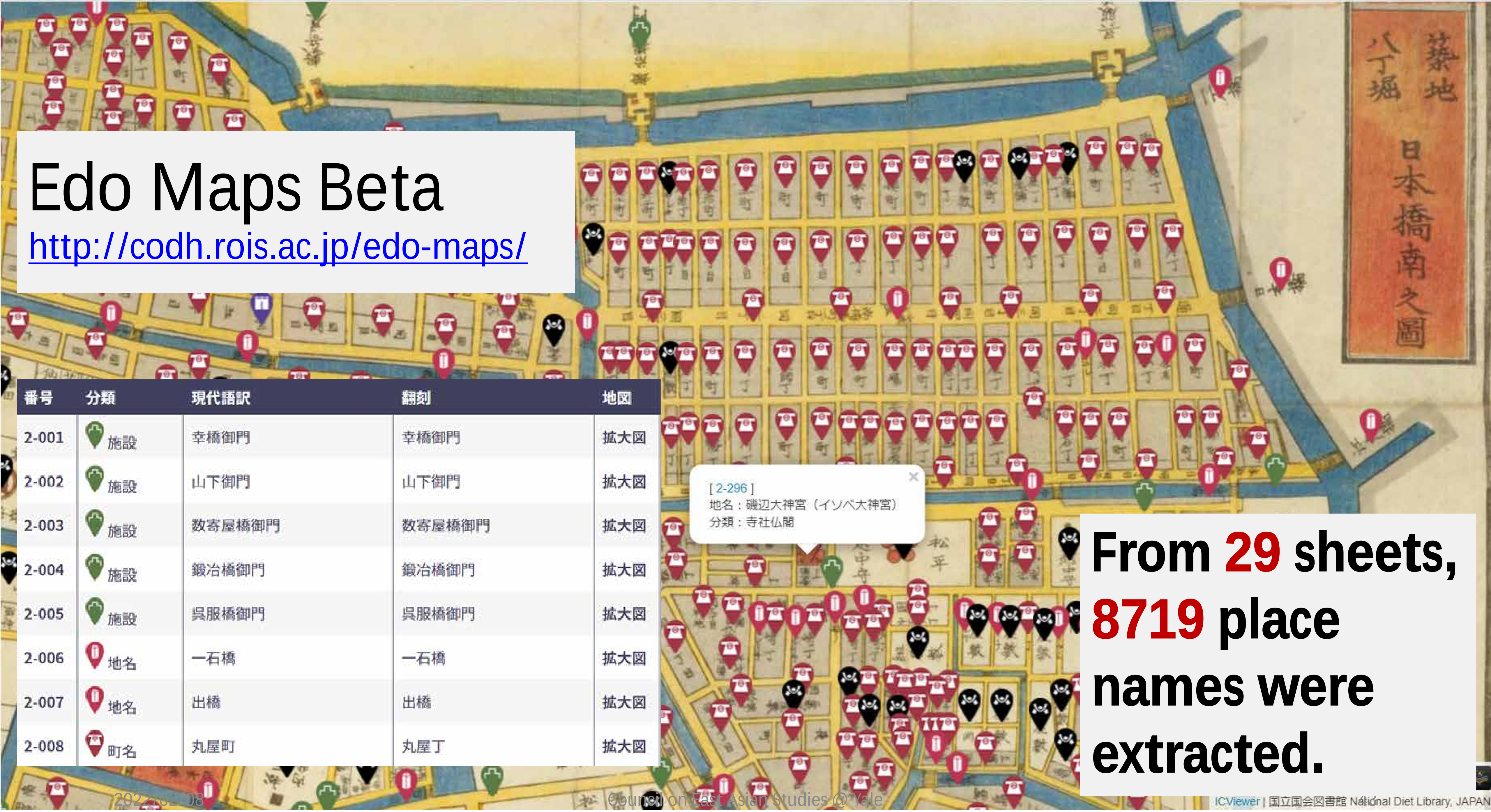
1. Art Research Center of Ritsumeikan University has Ukiyo-e Dataset.
2. ML researcher from Google Brain found that existing API can crop the faces.
3. A new dataset was released for visual Ukiyo-e research.

Edo Maps, edomi, and Historical Big Data

Collaborator: Chikahiko Suzuki, Mika Ichino (CODH)

Edo Maps Beta

http://codh.rois.ac.jp/edo-maps/



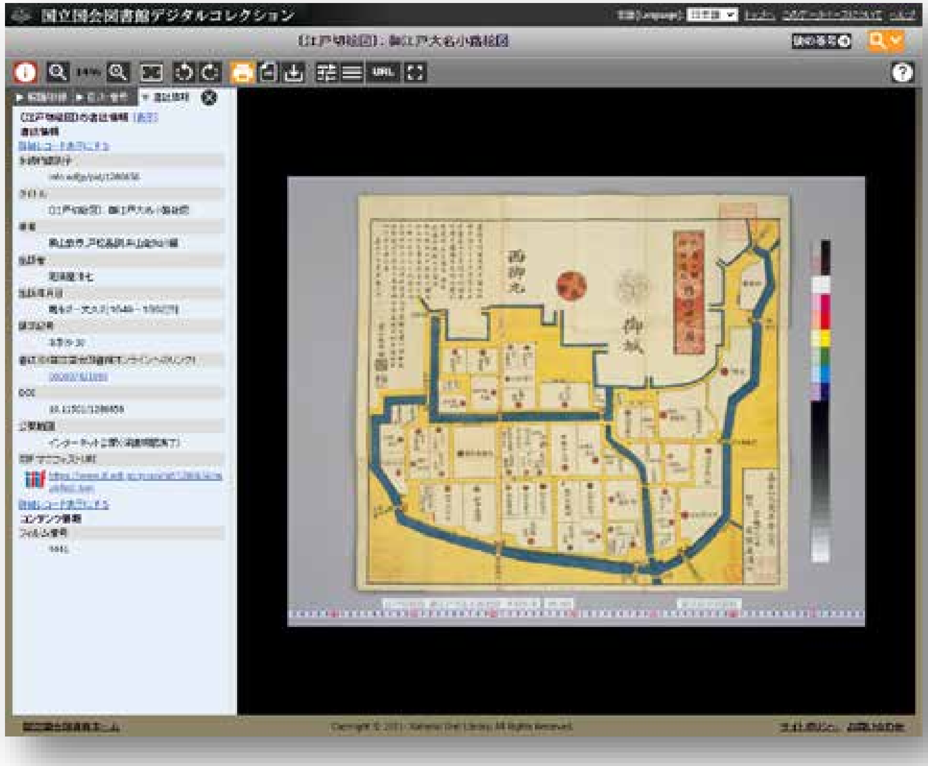
番号	分類	現代語訳	翻刻	地図
2-001	施設	幸橋御門	幸橋御門	拡大図
2-002	施設	山下御門	山下御門	拡大図
2-003	施設	数寄屋橋御門	数寄屋橋御門	拡大図
2-004	施設	鍛冶橋御門	鍛冶橋御門	拡大図
2-005	施設	呉服橋御門	呉服橋御門	拡大図
2-006	地名	一石橋	一石橋	拡大図
2-007	地名	出橋	出橋	拡大図
2-008	町名	丸屋町	丸屋丁	拡大図

[2-296]
地名：磯辺大神宮（イソベ大神宮）
分類：寺社仏閣

ICViewer | 国立国会図書館 National Diet Library, JAPAN

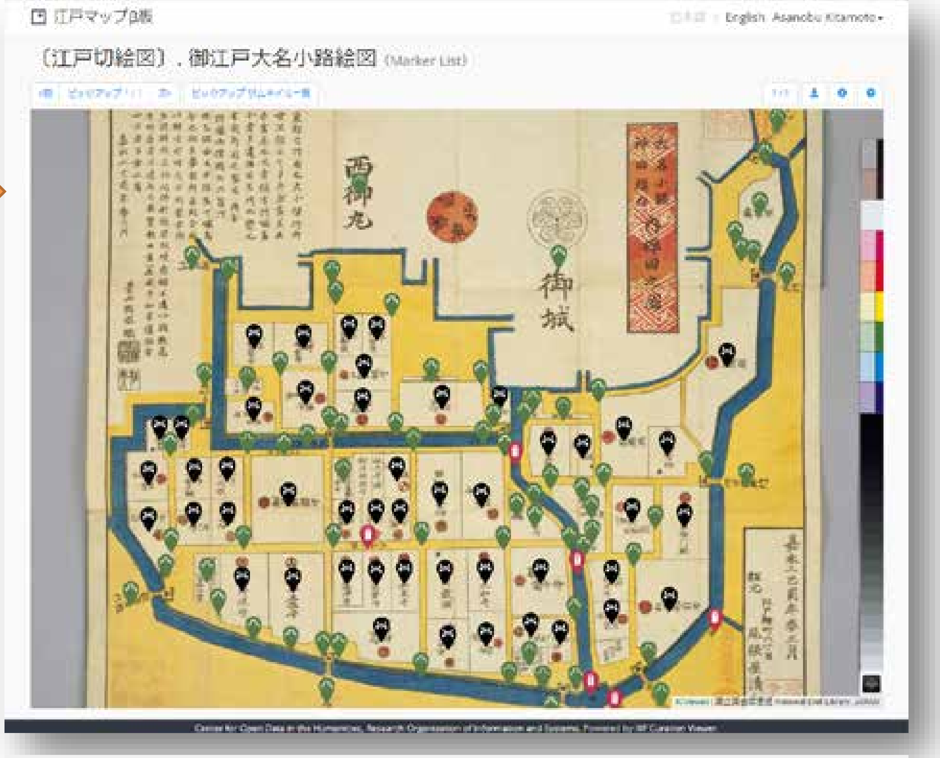
From 29 sheets, 8719 place names were extracted.

Annotating the Maps


国立国会図書館デジタルコレクション
〔江戸切絵図〕: 御江戸大名小路絵図

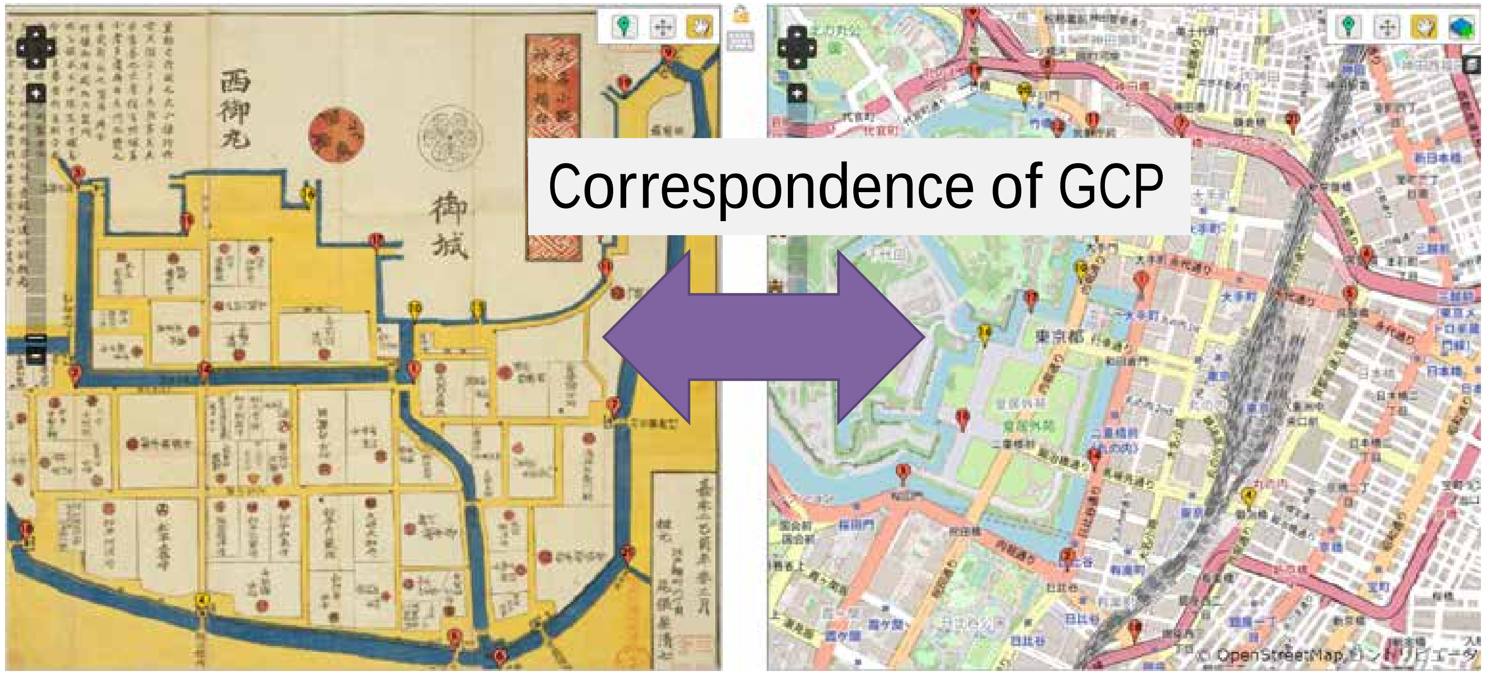
Edo Kiriezu Owariya Version (1849-1862) from the Digital Collection of National Diet Library. doi:[10.11501/1286656](https://doi.org/10.11501/1286656)

With IIIF, you can add value by annotating information without copying original images.



Read the image on the IIIF Curation Viewer, draw a rectangle to record the coordinate, transcribe characters, and save them using the IIIF curation format.

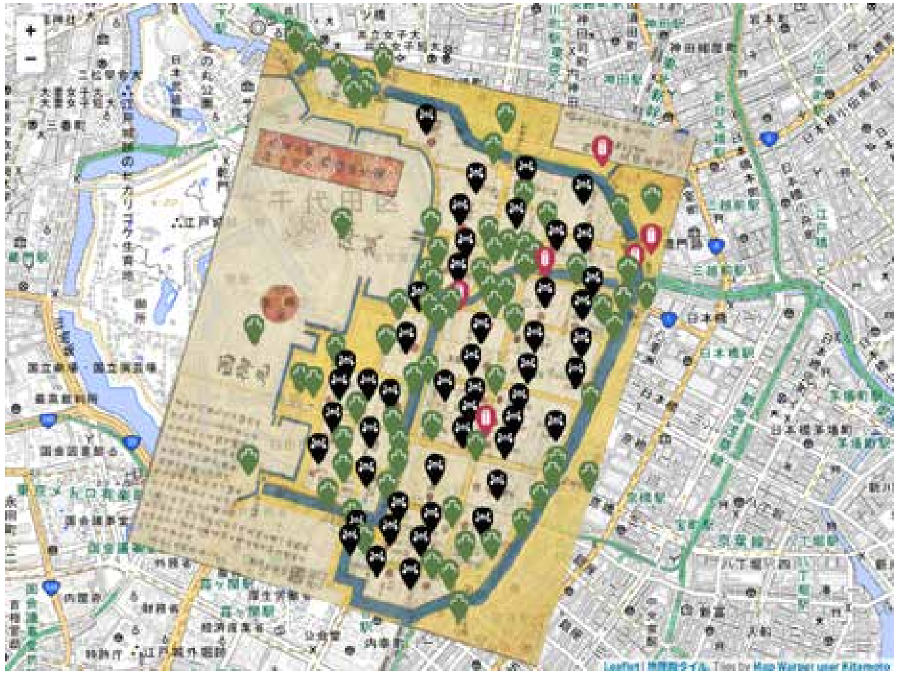
Georeferencing the Maps



Correspondence of GCP

National Diet Library
”Edo Kiriezu”

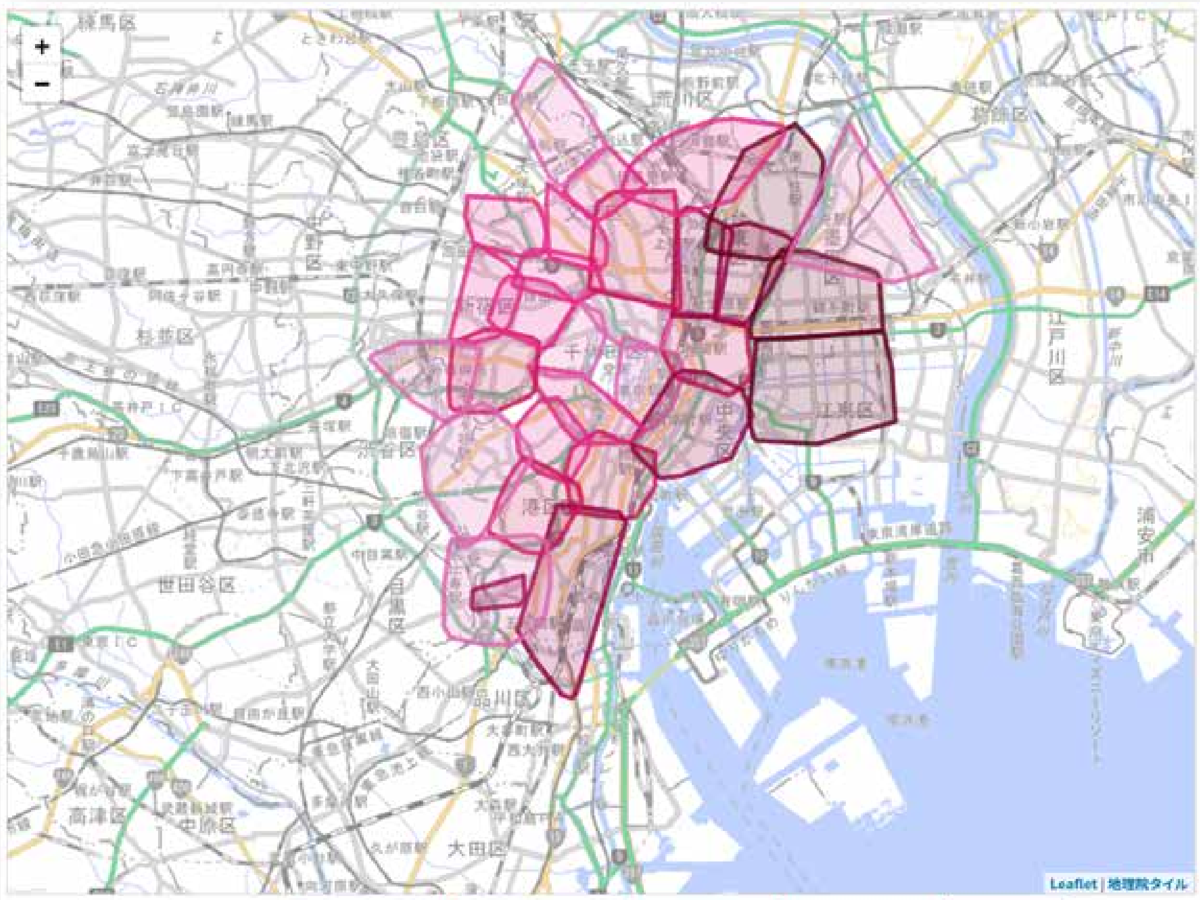
Ritsumeikan University
Map Warper for Japanese



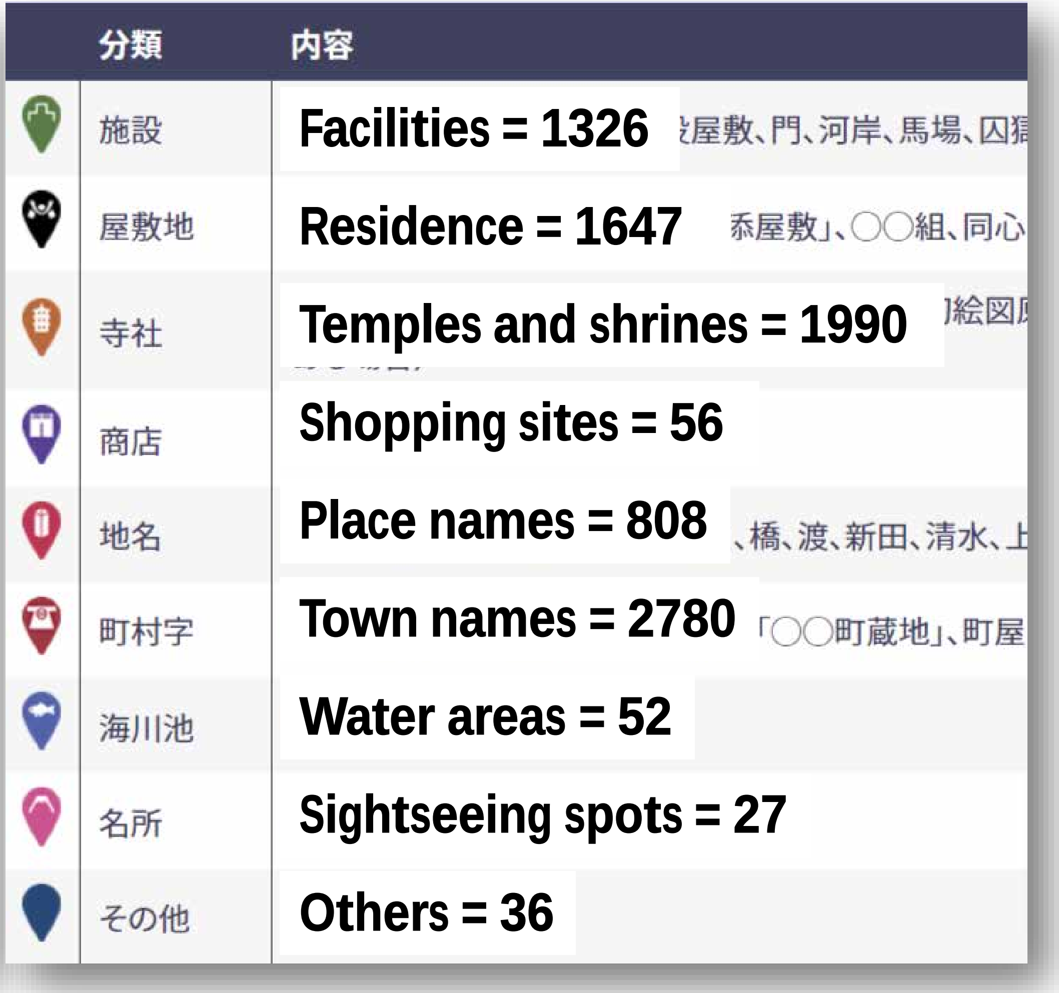
Edo Maps + Map Warper tile service

Overview of Edo Maps

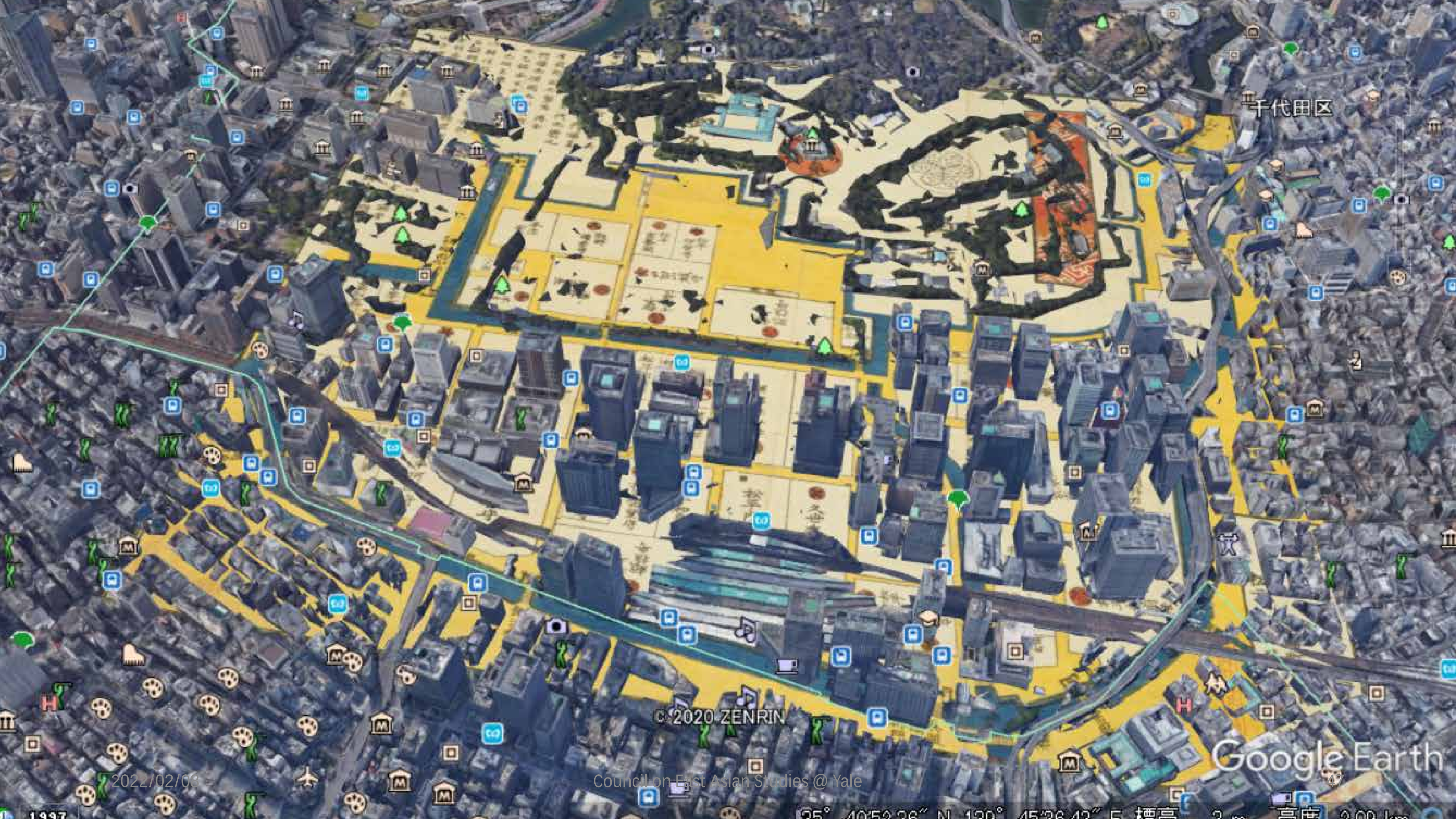
http://codh.rois.ac.jp/edo-maps/owariya/



領域の色は地名数に対応し、100件～199件 200件～299件 300件～399件 400件～499件 500件以上 とします。た

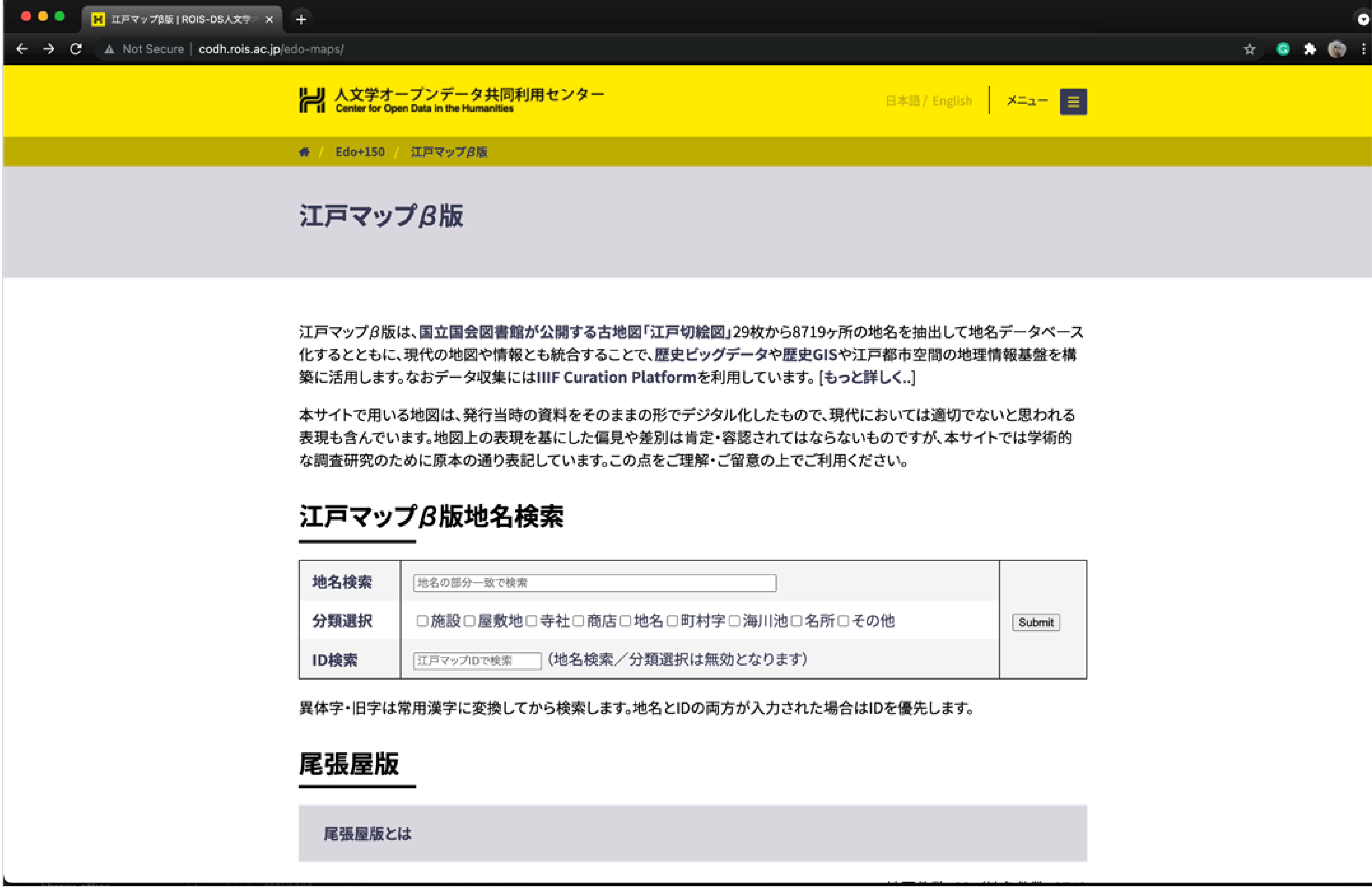


	分類	内容
●	施設	Facilities = 1326 屋敷、門、河岸、馬場、囚
●	屋敷地	Residence = 1647 屋敷」、〇〇組、同心
●	寺社	Temples and shrines = 1990 絵図
●	商店	Shopping sites = 56
●	地名	Place names = 808 、橋、渡、新田、清水、
●	町村字	Town names = 2780 「〇〇町蔵地」、町屋
●	海川池	Water areas = 52
●	名所	Sightseeing spots = 27
●	その他	Others = 36


千代田区
© 2020 ZENRIN
Google Earth
2022/02/08
Council on East Asian Studies @ Yale
1997
35° 40′52.26″ N 139° 45′36.43″ E 標高 3 m 高度 2.00 km

Edo Maps

http://codh.rois.ac.jp/edo-maps/



江戸マップβ版 | ROIS-DS人文学
Not Secure | codh.rois.ac.jp/edo-maps/
人文学オープンデータ共同利用センター
Center for Open Data in the Humanities
日本語 / English
メニュー
Edo+150 / 江戸マップβ版

江戸マップβ版

江戸マップβ版は、国立国会図書館が公開する古地図「江戸切絵図」29枚から8719ヶ所の地名を抽出して地名データベース化するとともに、現代の地図や情報とも統合することで、歴史ビッグデータや歴史GISや江戸都市空間の地理情報基盤を構築に活用します。なおデータ収集にはIIIF Curation Platformを利用しています。[もっと詳しく..]

本サイトで用いる地図は、発行当時の資料をそのままの形でデジタル化したもので、現代においては適切でないと思われる表現も含んでいます。地図上の表現を基にした偏見や差別は肯定・容認されてはならないものですが、本サイトでは学術的な調査研究のために原本の通り表記しています。この点をご理解・ご留意の上でご利用ください。

江戸マップβ版地名検索

地名検索	地名の部分一致で検索	Submit
分類選択	□施設 □屋敷地 □寺社 □商店 □地名 □町村字 □海川池 □名所 □その他	
ID検索	江戸マップIDで検索 (地名検索／分類選択は無効となります)	

異体字・旧字は常用漢字に変換してから検索します。地名とIDの両方が入力された場合はIDを優先します。

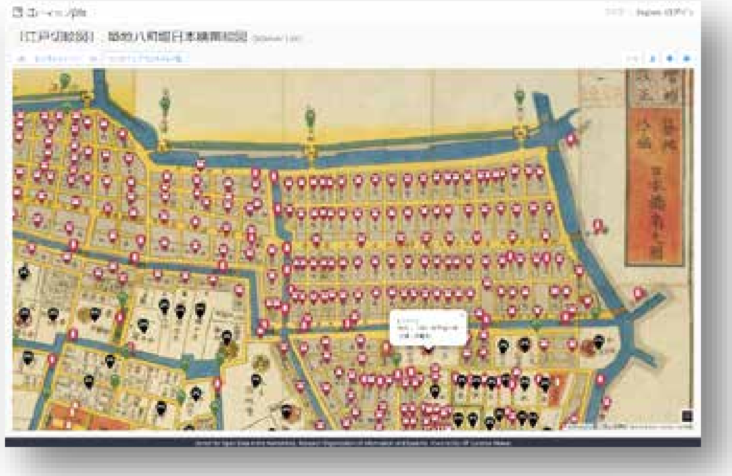
尾張屋版

尾張屋版とは

GeoLOD

https://geolod.ex.nii.ac.jp/

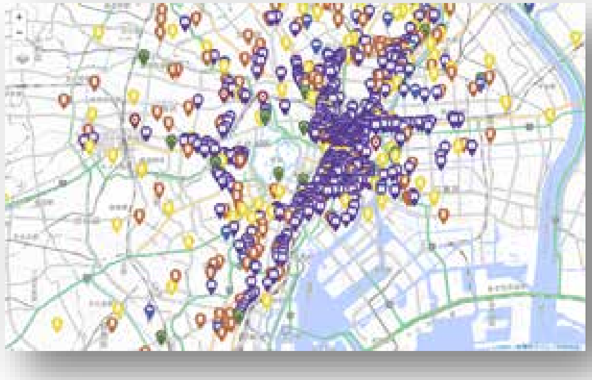
1. An identifier designed for toponyms (GeoLOD ID).
2. **IIIF canvas coordinate** is converted to **(lat, lng)** by georeferencing.
3. Metadata is integrated under an identifier.



Curations are converted to the gazetteer format for GeoLOD.

Name: Isobe Shrine
GeoLOD ID: G8AYsq
Lat: 35.676326
Lng: 139.774755

https://geolod.ex.nii.ac.jp/resource/G8AYsq



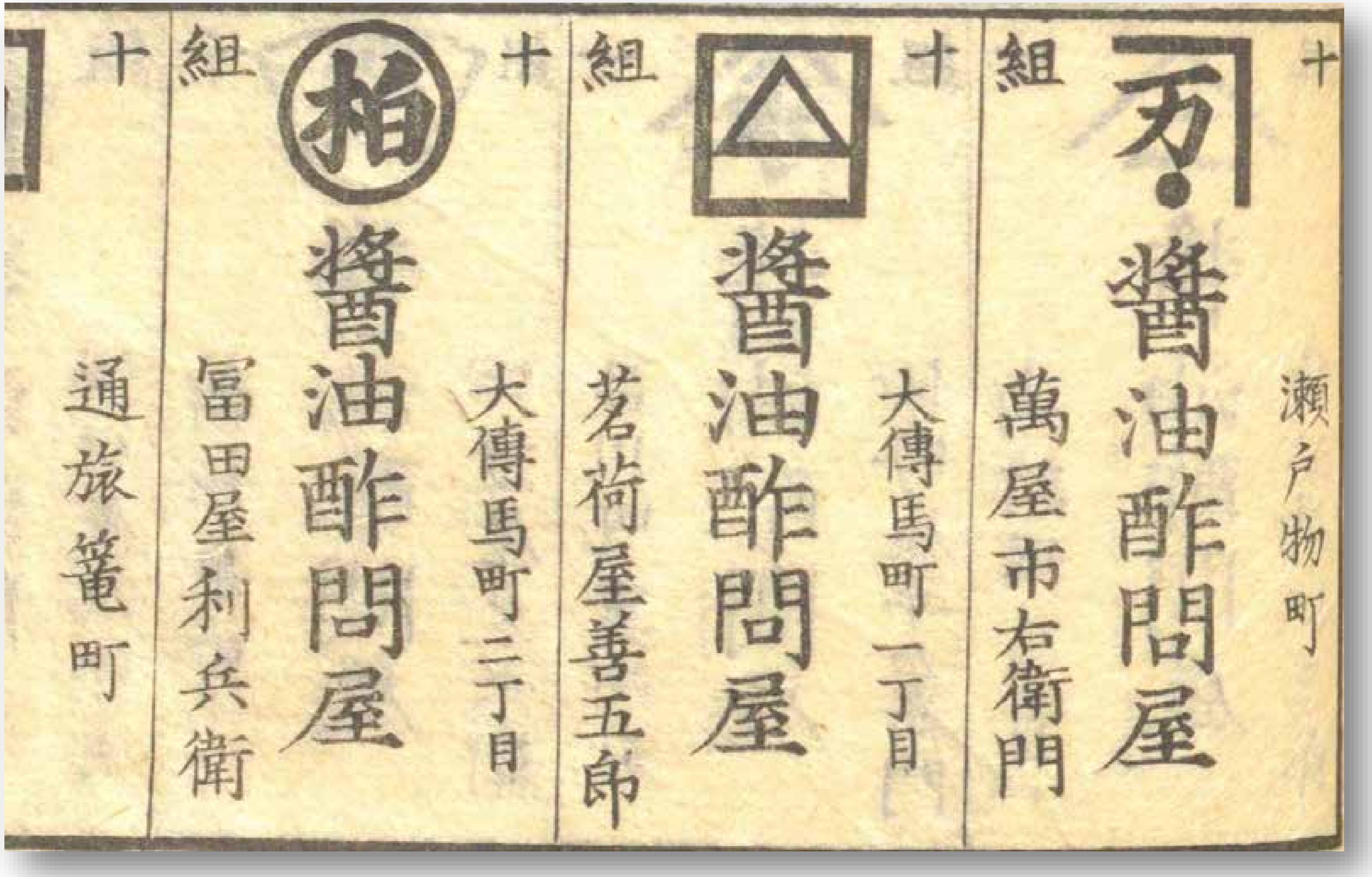
Edo Sightseeing Guide

http://codh.rois.ac.jp/edo-spots/

1. Selected two travel guidebooks for each century.
2. Used IIIF Curation Viewer to crop pictorial parts and added metadata by transcription.
3. Assigned GeoLOD and other identifiers.

Edo Shopping Guide

http://codh.rois.ac.jp/edo-shops/



十
瀬戸物町
醤油酢問屋
組
萬屋市右衛門

十
大傳馬町一丁目
醤油酢問屋
組
茗荷屋善五郎

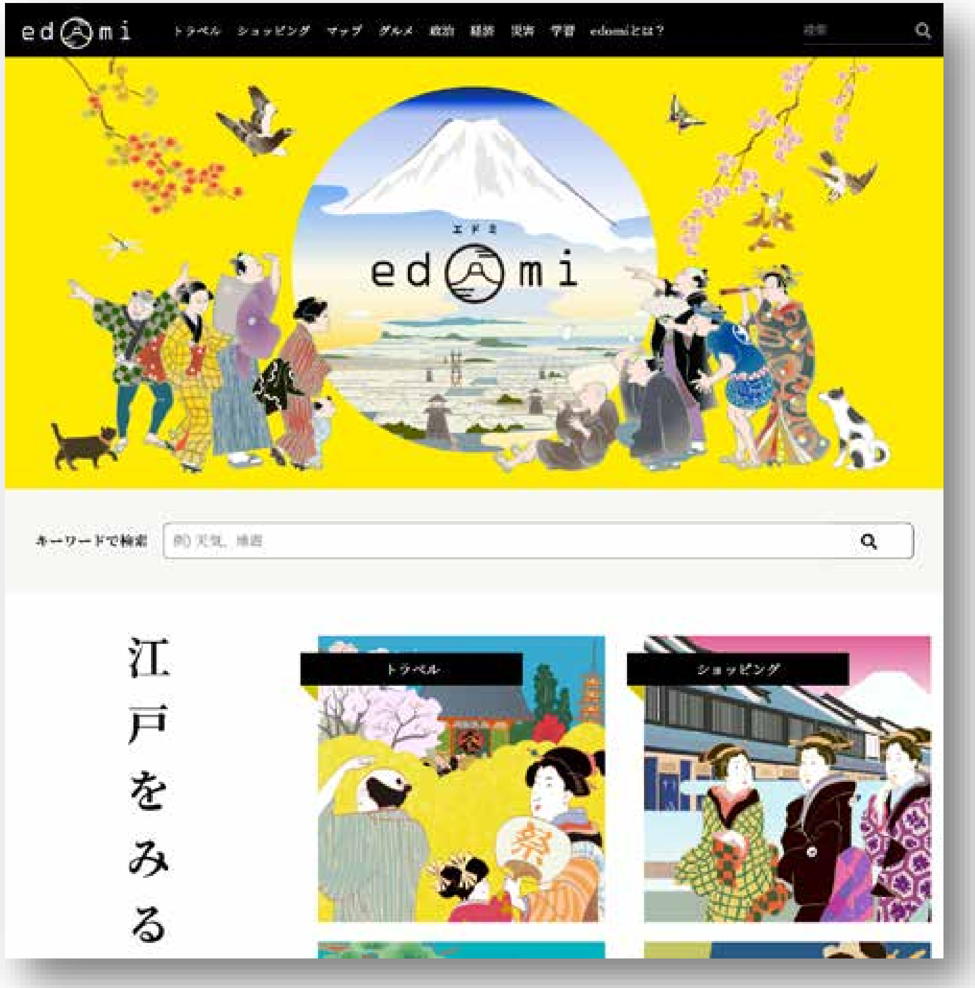
十
大傳馬町二丁目
柏
醤油酢問屋
組
冨田屋利兵衛

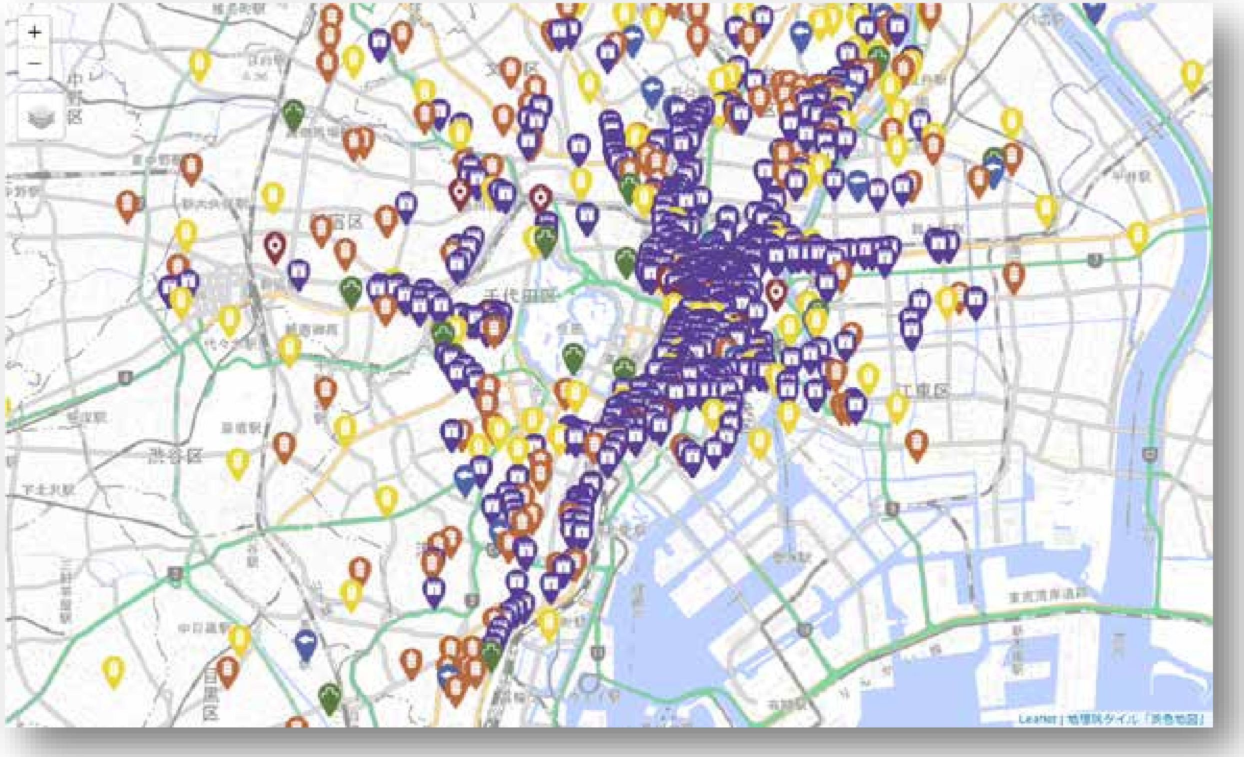
十
通旅篭町

1. Extracted the name and address of merchants from the shopping guidebook published in 1824.
2. Classified the type of merchants’ business according to **today’s classification system**.
3. Assigned GeoLOD and other identifiers.

edomi – Data Portal for the Historical Edo

http://codh.rois.ac.jp/edomi/





The distribution of geographic features (e.g. sightseeing spots and commercial stores) in the city of Edo.

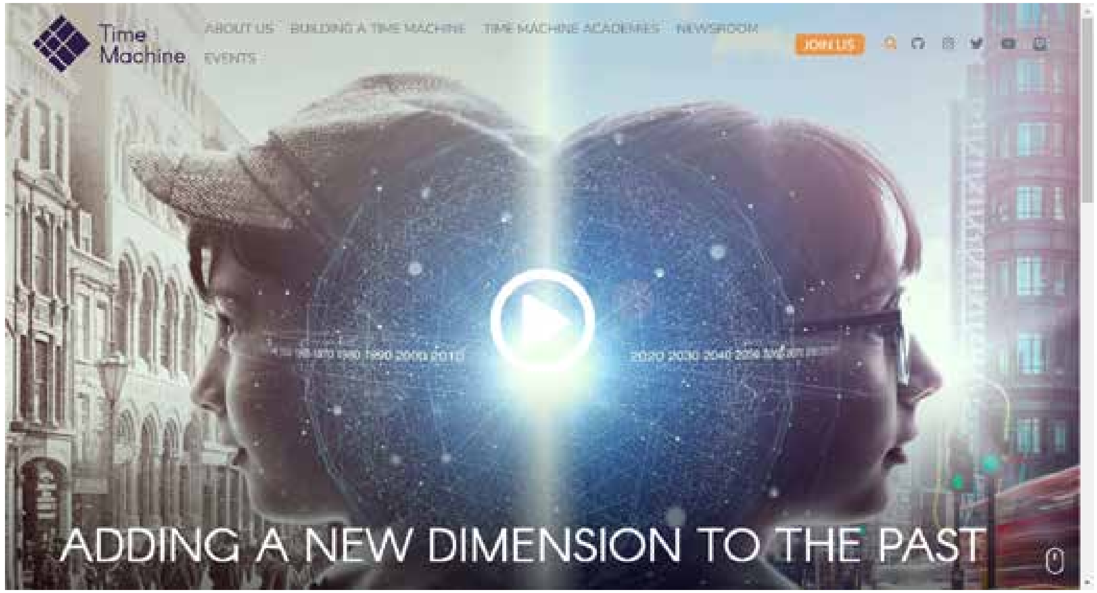
Look Back the History

Type	Number
Medicine	205
Household hardware	175
Household goods	130
Confectionary	116
Restaurant	102
Cosmetics	92
Toy	88
Grain	83
Medicine (wholesale)	71
Tobacco	69
Cloth	65
Dry foods	62
Publisher	60
Shoes	58

A mapping from the type of business in the shopping guide to the Japan Standard Industrial Classification (2013).

Experts try to understand the past as it was.

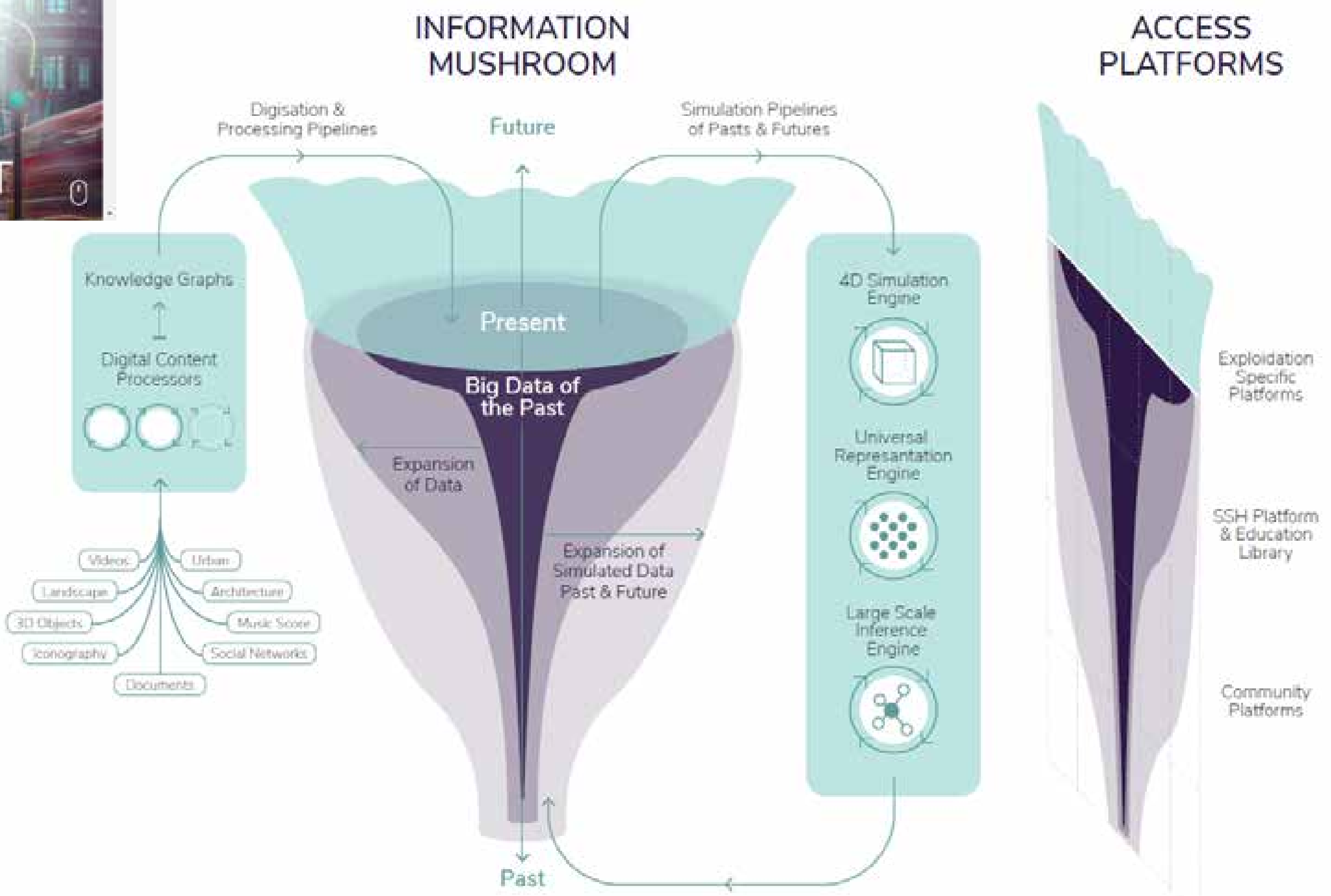
The general public wants to look back the history from the present.



Time Machine Europe

https://timemachine.eu/

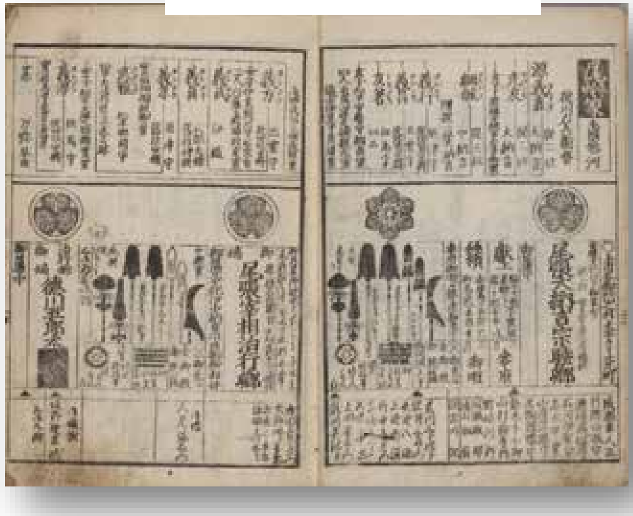
1. Big Data of the Past: create machine-readable data of the past using AI and simulation.
2. Developing new critical reflections on the past and future.


INFORMATION MUSHROOM
ACCESS PLATFORMS
Digisation & Processing Pipelines
Future
Simulation Pipelines of Pasts & Futures
Knowledge Graphs
Digital Content Processors
Present
Big Data of the Past
Expansion of Data
Expansion of Simulated Data Past & Future
4D Simulation Engine
Universal Representation Engine
Large Scale Inference Engine
Exploitation Specific Platforms
SSH Platform & Education Library
Community Platforms
Videos
Urban
Landscape
Architecture
3D Objects
Music Score
Iconography
Social Networks
Documents
Past

Historical Big Data

http://codh.rois.ac.jp/historical-big-data/

Historical sources



Nature data

Culture data

Weather

Earthquake

Eruption

Disease

Economy

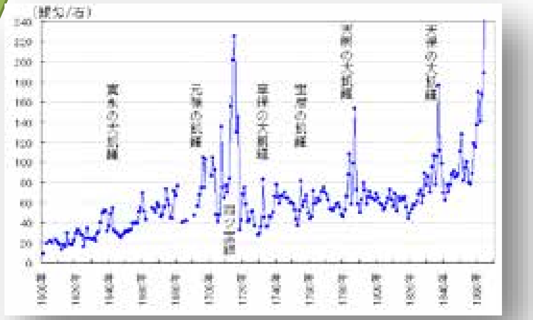
Population

Politics

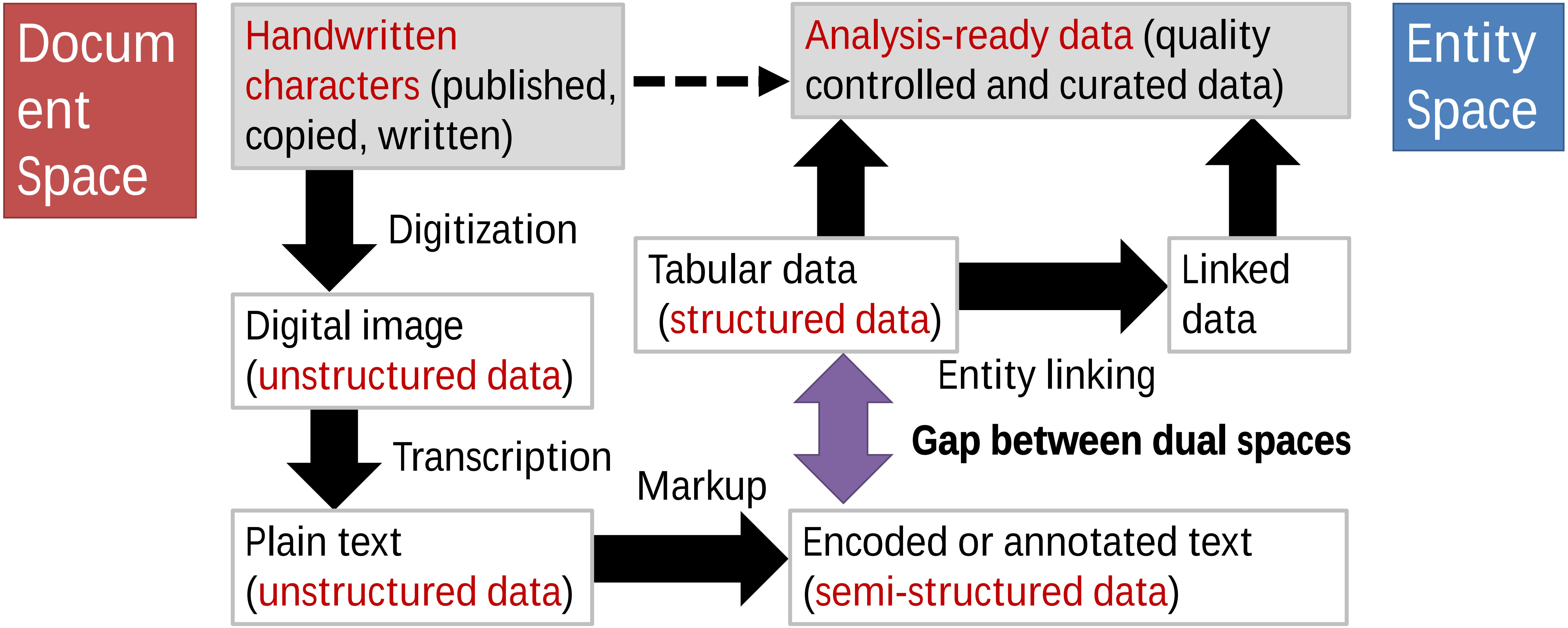
Culture

Data structuring workflow

Platform for the integrated analysis of HBD.



Data Structuring Workflow



Document Space

Handwritten characters (published, copied, written)

Digitization

Digital image (unstructured data)

Transcription

Plain text (unstructured data)

Markup

Encoded or annotated text (semi-structured data)

Gap between dual spaces

Tabular data (structured data)

Entity linking

Linked data

Analysis-ready data (quality controlled and curated data)

Entity Space

Data-driven Approaches for Japan Studies

1. **AI kuzushiji recognition** illustrates how a machine learning project can be started and developed into the real world.
2. **Bukan Complete Collection** shows how the idea of differential reading can reduce the burden of humans.
3. **Kaokore** demonstrates how interoperability such as IIIF plays a critical role in a digital humanities platform.
4. **Edo maps and historical big data** explores new possibilities for linking the past, present and future.

Acknowledgments and More Information

- The presentation includes research results from CODH researchers, Chikahiko Suzuki, Mika Ichino, and Tarin Clanuwat.
- IIIF Curation Platform was mainly developed by Jun Homma and Tarek Saier.
- Some results are based on the work of NII internship students.
- Many data are from National Institute of Japanese Literature.

Visit our Website http://codh.rois.ac.jp/

Collaboration is welcome.