Automated recognition of geographical named entities in titles of Ukiyo-e prints

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This paper investigates the application of Natural Language Processing as a means to study the relationship between topography and its visual renderings in early modern Japanese ukiyo-e landscape prints. We introduce a new dataset with titles of landscape prints that have been annotated by an art historian for any included place-names. The prints are hosted by the digital database of the Art Research Center at the Ritsumeikan University, Kyoto, one of the hubs of Digital Humanities in Japan. By applying, calibrating and assessing a Named Entity Recognition (NER) tool, we argue that 'distant viewing' or macroanalysis of visual datasets can be facilitated, which is needed to assist art historical studies of this rich, complex and diverse research material. Experimental results indicated that the performance of NER can be improved by 30% and reach 50% precision, by using part of the introduced dataset.

CCS Concepts: • **Applied computing → Digital libraries and archives**; • **Computing methodologies → Information extraction**.

Additional Key Words and Phrases: Ukiyo-e prints, named entity recognition, natural language processing, art history

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1 INTRODUCTION

Japanese early modern woodblock prints, so-called ukiyo-e or 'pictures of the floating world' produced between the seventeenth and mid-nineteenth century, are one of the most widely recognizable visual images today. Collections of prints are kept in almost all major museums across the world and exhibitions of prints attract large audiences. Among diverse topics depicted in these images, landscape prints remain the most popular as evidenced by the iconic "The Great Wave" (Kanagawa-oki nami-ura) designed by Katsushika Hokusai (1760-1849) in the 1830s and its global career. However, the understanding of these highly popular materials is still shaped by Western modern epistemologies that may not be well fitted for the analysis of pre-modern non-Western artefacts. Therefore, there is a need to approach Japanese early-modern prints from new perspectives that take as an analytical point of departure the objects themselves.

The recent development of diverse computational technologies, especially Machine Learning (ML) and Natural Language Processing (NLP), combined with the advancing digitization of prints and growing digital databases

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worldwide as well as the emergence of *open access* principles create an exceptional opportunity to engage with this type of inquiry. Particularly promising in this context is the analysis of large datasets of digitized objects that can facilitate discovery of visual patterns that are not possible to identify through a study of individual objects. These patterns interpreted through the lens of Art History can create the ground for a new historically contextualized classification of objects, based not on the existing epistemologies, but on newly discovered content-based characteristics of the objects. The combination of 'distant viewing' or macroanalysis of visual materials, and 'close reading' of the artefacts has a potential to develop a more nuanced understanding of Japanese early modern prints, expand and diversify functionalities of digital databases, and stimulate scholarly and public interests in the non-Western cultural heritage.

In this work we approached distant viewing by employing Named Entity Recognition (NER), an NLP technique used to detect named entities in texts. In principle, NER can be used to extract named locations from any text, including ones mentioned in the titles of Japanese early modern ukiyo-e landscape prints. Any extracted locations, then, may allow for a digital geospatial exploration of the studied prints, which is currently impossible. This spatiotemporal analysis can shed light regarding the geographical distribution of the sites depicted within the prints as well as regarding the frequency of the depiction of certain sites in relation to their production context (e.g., time, location and designer) contributing to a better understanding of Japanese landscape prints in general. In this context Named Entity Recognition (NER) has a potential to play an important role especially that the recognition of titles of artefacts as named entities is crucial for the study of cultural heritage. However, the scarcity of training data remains a challenge in the analysis of artworks [11]. This is especially relevant for the analysis of non-Western pre-modern artefacts such as Japanese early modern prints. The titles are rendered in pre-modern Japanese language used before the standardization of the language and script in the late nineteenth and twentieth century Japan. Another problem is ambiguity inherent to the artwork titles or lack of data. This all makes identification of titles, and in extension also place names featured in them, a challenging task. Therefore, before engaging in an advanced context-based analysis rooted in art-historical inquiry, this study focused on the assessment and customization of a NER system. In order to realize this goal we annotated the titles of a random sample of 100 records and we applied on them a well-known and well-performing, off-the-shelf NER system. We observed a surprisingly low performance, so we annotated another set of 100 records and we used them to fine-tune the system. Fine-tuning increased the results by 30%. These research results will function as a foundation for our subsequent work, in which we plan to use the suggested NER model in a semi-supervised setting, in order to annotate more data and improve further NER on titles of Japanese ukiyo-e prints.

2 THE CORPUS

2.1 Digital Art History

Data mining and knowledge discovery from large and complex data sets, including visual images, have advanced significantly in the past several years. Although Digital Art History emerged in the late 1990s and access to large digital image collections is steadily growing, the study of art images in the context of big data and application of predictive analytics has been advancing slowly [5], [28], [16]. This is especially the case for non-Western art, which has received relatively little attention to date, especially in the Anglophone world. Different factors are responsible for this situation, ranging from material and financial conditions for research to geo-politics of national identification and international relations. In this situation, computational technologies and analytics of large cultural data sets across different geo-political, cultural and chronological boundaries offer methodological solutions and intellectual incentives to respond to the call for pluralistic art studies ([19]). On the other hand, the development of Digital Art History, which reveals a profound change in the character of knowledge, raises questions about the relationship between human activities and metric evaluation [2]. Scholars emphasize that the digital research of cultural heritage needs to be informed by a professional art historical knowledge and rigorous

scholarly methodology that acknowledges the mediation and situatedness of knowledge production, or it risks producing findings of uncertain cognitive value [1]. The main focus of the debate, and a question which still remains open, is not what art history can do with the digital, but what "important art historical questions can be addressed with the help of digital tools" [15]. However, although there is little doubt that the intellectual problem rather than methodology ought to be at the center of the discussion, it is also necessary to acknowledge that digital methods used in Digital Art History have not yet been customized to investigate non-Western cultural data, and that the first step in this process should be devoted to the development, customization and testing of methodological instruments capable of developing of the new knowledge. Therefore this project conducted by our interdisciplinary team consisting of data scientists and art historian specialized in Japanese art has two main goals: customization of computational research tools and addressing pertinent art historical research questions.

2.2 Ukiyo-e landscape prints

Early modern visual culture in Japan spanning between the seventeenth and mid-nineteenth century saw the emergence of a rich printed culture, which encompassed both printed books and single prints executed in a woodblock printed technology. This phenomenon was facilitated by a vibrant commoner urban culture developing in the largest Japanese cities: Edo (today's Tokyo), Kyoto and Osaka. So-called ukiyo-e or 'images of the floating world' executed mainly in prints but also in painting mediums and visualized popular entertainment of the era such as kabuki theatre and red-light-districts (including pictures of actors and beauties), scenes from history and folk tales, erotica, fauna and flora etc. The nineteenth century saw the raise in popularity of landscape images created by some of the most famous designers such as Katsushika Hokusai and Utagawa Hiroshige (1797-1858) [10]. These images produced in thousands presented scenic visions of rural Japan, the hilly countryside populated by people occupied with daily work, harvest, fishing and traveling.

These prints played a key role not only in the history of Japanese art but also the emergence of Western modern art in the second-half of the nineteenth century, when they inspired artists such as Vincent van Gogh (1853-1890) or Claude Monet (1840-1926) in France and across Europe and North America [26]. However, despite their global historical and artistic significance as well as their seemingly straightforward subject i.e. landscape, the social functions of these images are little understood. The problem is that Japanese pre-modern visual culture is rooted in an entirely different episteme. Although today images featuring different scenic views of natural environment are called 'landscapes' (fūkei), the concept of landscape is a modern invention in Japan. In fact, the notion of 'landscape' appeared in Japan only in the late nineteenth century. [14] identified the 'discovery of landscape' (fūkei no hakken) as the apex of the cultural appropriation of Western modernity, as fūkei transformed the way of viewing and understanding the world. Cartesian mind-body dualism shaped modern understanding of landscape as ontologically separate from the human perceiver, a neutral external background. Modern artistic conventions such as linear perspective and realism gave the subjective viewer the power to control the landscape and identified looking with scientific objectivity [21].

In contrast to this, the pre-modern period (namely, before 1868) images of the natural environment often took the form of meisho-e (pictures of famous places) [13]. The topography or even locality of particular views was not necessarily relevant, as the concept of meisho derives from utamakura (lit. poem pillow), rhetorical figures that tie seasonal images with particular places [12]. This phenomenon has been explained in relation to the culturality of pre-modern notions of nature in Japan ([22]). However, this does not explain the sudden popularity of meisho prints in the first half of the nineteenth century, which saw one of the most disastrous environmental and social catastrophes in Japanese history, the Tenpō Famine (1833-37). Interestingly, this sudden flourishing of landscape in single prints and printed illustrated books especially in the 1830s coincides with some of the worst environmental and social disaster of the time, namely the crop failure that led to a colossal social disturbance. This popularity is commonly explained in the context of the representational paradigm, and points to a boom in

Fig. 1. Utagawa Hiroshige (1797-1858), Seta sekishō (Sunset Glow at Seta), from the print series Ōmi hakkei no uchi (The Eight Views of Ōmi, 1834-35), 23.3 cm x 35.5 cm, multicolour woodblock print, the Metropolitan Museum of Art, New York (OA). A poem is written inside the box in the upper left corner and the title is written on its right, inside the red rectangle. The artist's signature and seal are in the bottom right corner.

travel [25]. But it is doubtful that people would have travelled during these crises. Hence, the social function of the images, and their role in defining contemporary spatialities, remains unknown. Paradoxically, the natural and social catastrophe is not visible in them. The print shown in Fig. 1, designed by Utagawa Hiroshige, is a good example of the genre. The print was deigned ca. 1834-35 and appeared within the woodblock print series "Ōmi hakkei no uchi" (The Eight Views of Ōmi). The inscription in the square cartouche in the upper left corner features the poem: "Tsuyu shigure/ moru yama tōku/ sugikitsutsu/ yūhi no wataru/ Seta no nagahashi", which has be translated as "The long bridge at Seta, over which crosses the setting sun, passing far beyond the mountains, dripping with autumn dew" [4]. The image presents a view of the famous Seta Bridge, which connects the two banks of the Seta River in the southeast part of Lake Biwa. A tranquil landscape view features the lake with a few sailing boats and Mt. Mikami in the background. Although Mt. Mikami is not very high at only 432 m., it has served as a prominent literary topos. Its cultural significance is demonstrated by its imposing presence in the view, which challenges the representational quality of the image [6]. Its form and proportions have been modified to liken it to the venerated Mt. Fuji, which is some 350 km away. These conceptual connections resulted in Mt. Mikami's alternative name Ōmi Fuji or "Fuji of Ōmi Province". The image curates reality on at least

one more level. Despite being produced at the peak of the Tenpō Crisis, which heavily affected the province, it shows an idyllic view of the countryside with no sign of natural, social or political disturbance. This situation raises the question of the function of pastoral landscape images at the time of the unprecedented socio-ecological crises, the relationship between landscape imagery and the world and their role as representations of particular topography and places. Understanding of these issues necessitates identification of the nature and extent to which they refer, depict and distort topography. As this is a complex issue the research needs to be divided into several analytical steps. First of all, it is necessary to establish: what places are depicted and what places are not featured in the images; how are these places distributed across Japanese topography and in relation to changing socio-cultural, political and economic contexts;and how their distribution change in time and depending on the designer, publisher, format etc. Answering these questions require analysis of a very rich and diverse research materials including thousands of objects in different formats and styles (e.g. single prints and printed book illustration). Therefore, considering the scope of the data and the nature of the inquiry computational methods offer a potential to assist art historical inquiry.

2.3 Computational methods for image analysis

Diverse methodologies have already been used in the study of visual images. Several Machine Learning techniques have been employed to investigate the problem of style recognition in historical images, including both feature extraction and engineering [18], such as histograms of gradients, spatial envelopes, discriminative colour names, and predictive modelling [3, 24], e.g. SVMs, random forests, and neural networks. More importantly, existing literature demonstrates and argues that due to the curse of dimensionality and the inherent complexity of the problem, adding more features typically does not improve predictive performance. Towards this end, variants of convolutional neural networks have been used for automatic style and feature recognition, and have so far been achieving competitive performance against other state-of-the-art Machine Learning models [8, 23]. The main advantage of deep neural network models is that they can facilitate rich representations without compromising predictive performance, as they are capable of learning such representations at difference feature levels. More importantly, they have recently shown the ability to additionally extract features corresponding to semantic concepts, such as object categories, which can in turn improve the interpretability and understandability of the predictions [18]. There is little doubt that these innovative technological solutions can enrich art studies [20]. In this context Named entity recognition (NER) has a potential to play an important role especially that the recognition of titles of artefacts as named entities is crucial for the study cultural heritage. However, as argued by Nitisha Jain and Ralf Krestel current state of the art NER tools are not successful in identification of artwork titles. They point to the scarcity of training data as the state of the art NER systems are trained on a few well-known corpora such as CoNNL datasets and OntoNOtes. This hindrance is especially relevant for the analysis of non-Western pre-modern artefacts such as Japanese early modern prints produced before mid-nineteenth century. The titles are rendered in pre-modern Japanese language used before the standardization of the language and script in the late nineteenth and twentieth century. In premodern Japanese the Sino-Japanese characters could be used alternately depending on their phonetic value so the same word could be written in different characters. What is more, titles are usually written with characters only (without the use of phonetic alphabet intercepting the words), which makes divisions between words difficult to recognize by the computational analytical tools. Another problem is ambiguity inherent to the artwork titles or lack of data. Print titles are not always standardized across different collections and metadata feature different titles, either based on the titles inscribed in the prints or descriptive assigned by collectors, museum curators etc. This all makes identification of titles, and in extension also place names featured in them, a challenging task and necessitates dividing the study into several analytical steps. In this paper we are presenting the result of the first step of this inquiry in which we applied Named Entity Recognition for the automated extraction of place-names that are mentioned within the titles of the prints.

2.4 The ukiyo-e collection

The access to data was facilitated by the database hosted at the Art Research Centre at Ritsumeikan University, one of the leading Digital Humanities hubs in Japan and a collaborative partner of this project (http://www.arc.ritsumei.ac.jp/en/index.html). The Art Research Center was established in 1998. Its mission has been to conduct historical and social research and analyses of both tangible and intangible cultural heritage, namely visual and performing arts and crafts, as well as to record, preserve, digitalize, curate, analyze, and disseminate the research outcomes. Since the 2000s the Ministry of Education, Culture, Sports, Science and Technology (MEXT) recognized the Digital Humanities Center for Japanese Arts and Cultures (FY 2007-2011) as the Global Center for Excellence (COE). In 2014 the Center was designated a Digital Archive Research Center for Japanese Cultural Resources (FY 2014-2019) and recently it has assumed the role of the International Joint Digital Archiving Center for Japanese Art & Culture (ARC-iJAC) upon the MEXT accreditation. Importantly, the Art Research Center keeps rich digitalized collections of Japanese cultural heritage including 12,287 single ukiyo-e prints, Early Japanese Cooks Collections (218,088 items) including Hayashi Yoshikazu Collection, Fujii Eikan Bunko Collection, Sakurai Bunko Collection. The Center has also played a key role in the digitalization of Japanese artefacts worldwide and has collaborated in this respect with the leading research institutions and museums across the world as well as private collections. The ARC digital databases of Japanese printed culture hosts early Japanese books (299,983 titles)and woodblock prints (678,429 prints). The Ukiyo-e Portal Database itself comprises of collections of 28 institutions in Japan and abroad including 45,631 items from the Museum of fine Arts in Boston and 20,315 items from the British Museum, London. In total, 72 institutions share their collections via ARC. The ARC databases are open to the research community and the wider public. The Center provides access to the archive and database management technologies, shares expertise and methods as well as fosters global research community engaging with Japanese cultural heritage and computational methodologies relevant for the Digital Humanities.

2.5 Dataset development

Our study investigated 20,408 digitized prints featuring natural environments, issued ca.1800-1850s, such as the ones designed by Katsushika Hokusai and Utagawa Hiroshige. We focused on single woodblock prints (not printed book illustrations), produced mainly in the nineteenth century following the guiding research questions pertinent to art history and relevant for the historical contextualization of the prints. As the prints produced at the time were often serialized the dataset features several large sub-sets of prints belonging to the same series. Some sets include as many as circa 30 or 60 prints. These series share the same title but depict different places scattered across Japanese islands and celebrated for their cultural, political, economic importance, therefore functioning as meisho (famous places). The corpus has been identified through textual metadata (inscriptions on prints). The search was facilitated by the use of the keyword 'meisho' (famous place) and 'meisho-e' (image of a famous place). Both the print series titles and the names of the specific places are inscribed within the pictures often in rectangular cartouches in the upper corners of the prints. Besides this the inscriptions refer to names of designers, publishers, censor seals and other information relevant to the prints production process. Often the images also include short poems (either 31- or 17-syllable-long) related to the depicted places. In some cases, the images also featured smaller inscriptions scattered across the picture plane that identify diverse topographical features located in the proximity to the main meisho such as mountains, rivers, villages, temples and shrines. Similarly to the visual depictions, all inscriptions are printed and executed in a cursive script characteristic for the early-modern Japanese textual culture. Therefore, the data set includes a large number of place names, which makes them highly relevant for our analysis. These inscriptions have been deciphered by experts (specialists in Japanese art history and textual culture) and included as metadata in the database. At the time of our exploratory analysis we only had access to Japanese-language metadata although some (especially foreign) collections hosted in the database have bilingual metadata. As English-language metadata was not accessible for us during this

	Training Set	Testing Set
ANNOTATED SENTENCES (#)	100	100
LOC NAMED ENTITIES (#)	43	52
GPE NAMED ENTITIES (#)	85	157

Table 1. Overview of the training and testing datasets.

Japanese	English	Occurrences
名所絵京都関連	Meisho-e Kyoto related	36
江戸名所案内記図絵	Edo Famous Place Guide Illustration	15
京都関連	Kyoto related	15
京都関連名所絵	Kyoto-related Meisho-e	9
名所絵	Meisho-e	5

Table 2. Most frequent genre types in the training dataset.

Japanese	English	Occurrences
名所絵東京名所	Meisho-e Tokyo	23
名所絵東海道	Meisho-e Tokaido	18
名所絵江戸名所	Famous place picture Edo	9

Table 3. Most frequent genre types in the test data.

phase of the project it will be analyzed in the next phase and the findings will be crosschecked with the results of the Japanese-language analysis.

2.6 Benchmark data set

From the 20,408 digitized prints which arose from our search based on the keyword 'meisho' (famous place) and 'meisho-e' (image of a famous place), we randomly selected 200 samples to annotate and use them as our training and testing benchmark data. We re-trained Spacy's NER Japanese model [9] using the first 100 annotated Titles and evaluated, whether we improved, by assessing on the testing set. Tables 1, 2 and 3 present statistics of the dataset and the most frequent genre types.

2.7 The annotation process

An art historian, an expert in Japanese early modern history annotated two sets of images (100 images each) identified through random sampling. The annotation process targeted textual metadata provided by the database and included place names featured in the titles of the series and individual prints as well as place names that appeared in the inscriptions and used to identify diverse topographical features and structures (e.g. temples, bridges etc.) The annotation process was guided by two major principles. First, all places that were possible to be pinned on a map (e.g. names of cities, temples, shrines, bridges) were annotated as geopolitical entities (GPE). Second, places that were less-easily pinned on a map (e.g. roads, mountain ranges) were annotated as non-GPE locations (LOC).

3 EMPIRICAL EVALUATION

3.1 Theoretical Framework

Information Extraction (IE) concerns the process of extracting useful structured information from entities, relationships, events and other types of unstructured data. The extracted information can then serve as data for analysis. In this study, we used a subfield of IE called Named Entity Recognition. ***Named Entity Recognition*** (NER) is an important and challenging task, used in many fields of Artificial Intelligent (AI) including Natural Language Processing (NLP) and Machine Learning (ML). NER concerns the extraction of information by processing structured and unstructured data and identifying Named Entities (NE), such as locations, people, events, organizations or companies [17]. ***The types of NER algorithms*** can be grouped into three categories: rule-based, ML-based and hybrid [27]. A rule-based NER algorithm detects the name entity by using a set of rules and a list of dictionaries that are manually predefined by human, e.g., patterns for location names, organization names, etc., which are mostly made up by a combination of grammatical, syntactic and spelling charasteristics [17]. ML-based NER algorithms most often solve the task by casting it as a classification or a sequence labeling task, and their training process requires (often, a large amount of) annotated data. Hybrid NER algorithms combine rules and ML methods. In this study, we employ ML-based NER, by using SpaCy [9]. ***SpaCy*** is an open-source Natural Language Processing library that is based on a Convolutional Neural Network (CNN) [7], which is pre-trained for POS tagging, dependency parsing, and Named Entity Recognition.[1] The focus of the library is production usage and the default model can recognize a wide range of named entities, including place, person, and organization in multiple languages, including Japanese. The Japanese model was trained on written texts from media and news, and the performance reported is 75% Precision, 69% Recall and 72% F1.[2]

3.2 Experimental Analysis

A human expert annotated 100 randomly sampled prints, which were used to evaluate SpaCy's NER model, by comparing the system-predicted named entities against the ones provided by the annotator (gold standard). We measured Precision, Recall and F1 at the named entity level (Table 4). We also calculated and compared the frequencies of the human-annotated named entities and those generated by SpaCy's NER model. It should be noted, that in the present study the named entities that we are interested in are places, which are mainly labeled by SpaCy either as GPE or as LOC.

	Precision		**Recall**		**F1-score**	
	default	*calibrated*	*default*	*calibrated*	*default*	*calibrated*
LOC	0.53	**0.59**	0.14	**0.5**	0.23	**0.54**
GPE	**0.84**	0.39	0.08	**0.44**	0.15	**0.41**

Table 4. Evaluation of SpaCy's Japanese NER with Precision, Recall and F1 at the named entity level, without (default) and with fine-tuning (calibrated) on 100 instances. In bold is the best score.

As can be seen in Table 4, SpaCy's NER (shown in the *default* column) is relatively precise for LOC (53%)) and very precise for GPE (84%). However, it achieves a very low Recall in both LOC (14%) and GPE (8%), which means that SpaCy can not detect most of the named locations that exist within the titles of Japanese Ukiyo-e prints. Hence, it can not be used, as is, to assist with automated annotation. However, when we calibrated SpaCy, using only 100 other annotated prints, Recall improved significantly (50% and 44% respectively for LOC and GPE),

[1] https://spacy.io/
[2] https://spacy.io/models/ja

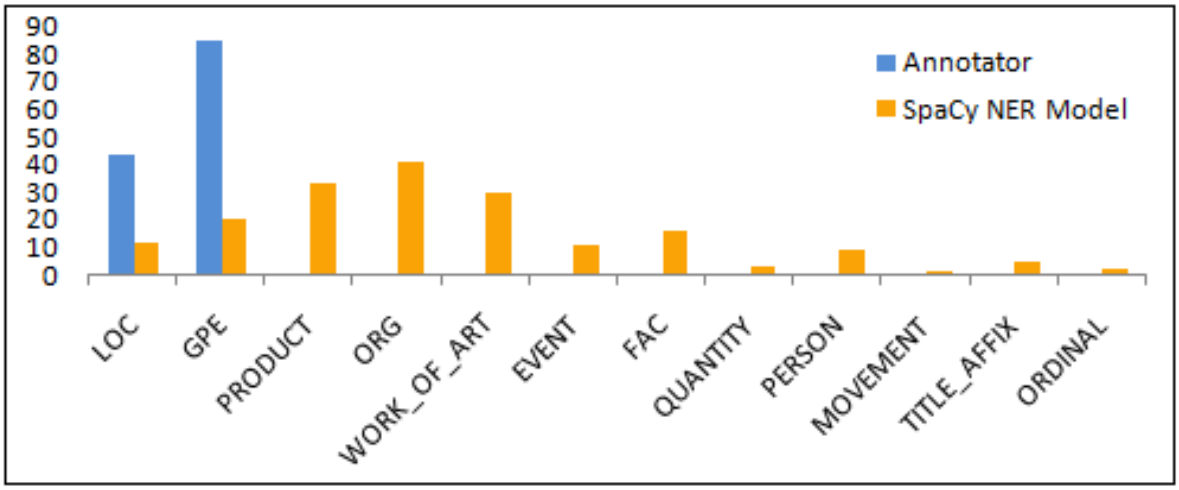

Fig. 2. Frequencies of named location entities, extracted by the human annotator (blue) and by SpaCy's default NER model (orange).

pulling up also F1. Although Precision appears to drop for GPE (39%), Recall improves more than five times (44%), leading to an F1 score that is significantly higher.

By performing error analysis, we found out that the low performance of *default* SpaCy's model is explained in part by its inability to assign the correct labels to the named entities that it correctly identifies. In other words, the *default* model is able to identify correctly many named entities, but the labels it assigns to them do not seem to match those of the annotator. This is also reflected in Fig. 2, where the frequencies of several other classes are above zero. For example, the assignments of LOC and GPE tags are relatively low compared to those of the annotator, while for instance ORG tag has been assigned (incorrectly) to a large number of entities. The calibrated SpaCy model, on the other hand, is much more aligned with the gold standard, in terms of the predicted-class frequency (see Fig. 3).

4 DISCUSSION

Our experimental results showed that the performance of the default (pre-trained) NER model that SpaCy library offers for Japanese is low. In terms of scores, for the LOC and GPE labels that we are interested in, given that these are the corresponding named entity tags for places, SpacY's default model achieves relatively high precision scores (53% and 84% respectively), but significantly low recall (14% and 8%) and F1 (23% and 15%) scores. Also, although it is able to detect correctly various named entities, it seems to assign incorrectly the named entity tags to most of them (e.g. assigning to place entities labels such us ORG [-Companies, agencies, institutions-] or PRODUCT). Such an example is shown in Figure 4, where SpaCy's default NER model classifies a correctly recognised GPE as a 'work of art'.

Concerning our attempt to retrain and update SpaCy's default NER model, with our own custom entities presented in our data set, the experimental results prove that is was a successful one. Specifically, despited the fact that for the LOC and GPE labels precision scores may decrease, recall scores improved by 40% and F1 scores by 30%. These fluctuations prove that our re-trained model has an adequately better overall performance. Performance can be improved further by adding more annotated data, a task that we plan to undertake in future work.

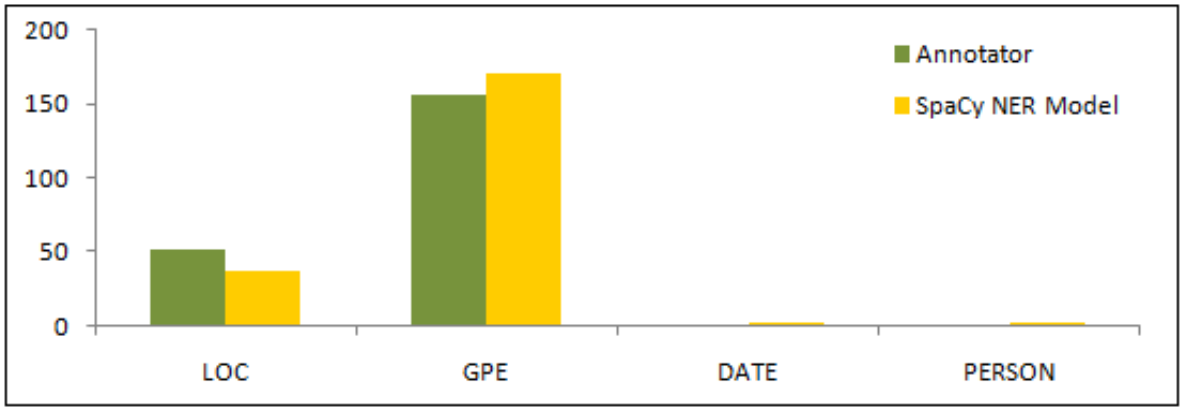

Fig. 3. Frequencies of named location entities, extracted by the human annotator (in blue) and by the calibrated SpaCy NER Model (orange).

Fig. 4. Comparison between the annotations of the human expert and the default SpaCy Japanese NER model for a title.

5 CONCLUSION

In this paper we presented results of the first-step of an analytical process aimed at the investigation of the relationship between topography and its visual renderings in early modern Japanese ukiyo-e landscape prints. Due to the complexity of the question and research material at hand we applied Named Entity Recognition (NER), an NLP technique, to detect place-names featured in the titles of landscape prints hosted by the digital database of the Art Research Center at the Ritsumeikan University, Kyoto, one of the hubs of Digital Humanities in Japan. We proposed an approach to generate labeled data to facilitate 'distant viewing' or macroanalysis of visual datasets needed to assist art historical studies of this rich, complex and diverse research material. Experimental evaluations indicated that NER performance can be improved by 30% and reach 50% precision by using part of a new dataset, introduced with this study, to retrain the model. By adding more data, as we plan to do in future work, we can develop an automated annotator of satisfying performance, which will be applied to assist realization of the overarching goals of our study presented above.

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