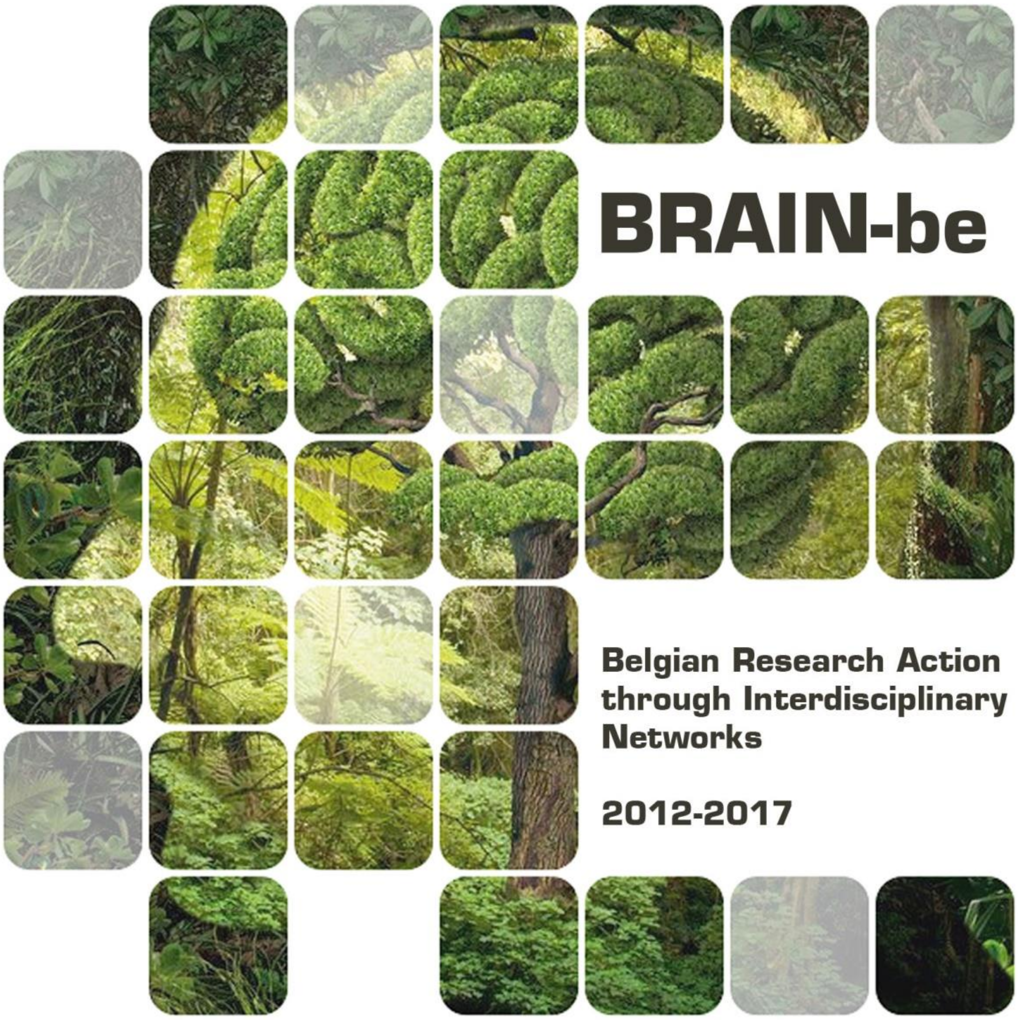

INSIGHT

Intelligent Neural Systems as InteGrated Heritage Tools

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INSIGHT

Intelligent Neural Systems as InteGrated Heritage Tools

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FINAL REPORT

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ABSTRACT

Context

Across the GLAM sector (Galleries, Libraries, Archives and Museums), cultural heritage institutions are currently digitising their collections at a rapid pace, because of the affordances of the computational medium. This rapid speed, however, also poses challenges to the curation of these materials: many institutions lack the staffing capacity to properly catalogue and semantically enrich this ever-growing body of raw materials beyond a basic level of descriptive metadata. This problem is experienced across the sector, but even more pressingly in smaller-scale institutions which, for instance, deal with lesser-resourced (national) languages. We have turned to artificial intelligence to help alleviate these issues and assist cultural heritage institutions in their semantic data enrichment efforts. Recent advances in the domains of computer vision and natural language processing, through deep representation learning in particular, are promising in this respect. Nevertheless, concrete applications towards the cultural heritage domain remain sparse and scattered in the literature, rendering their practical implementation challenging.

Objectives

INSIGHT's main objective was to transfer methods from the generic domain of machine learning to the specific context of semantic data enrichment in the domain of digitized cultural heritage collections. Major challenges that had be dealt with included: (i) the typically rather restricted size of previously annotated training sets in the cultural heritage domain, which poses a clear challenge for the data-hungry methods from deep representation learning; (ii) the complex context of Belgium's federal institutions, where institutions have to cater for a diverse and multilingual audience; (iii) the multimodal nature of the material, involving both visual as well as textual dimensions. We tackled these issues via two angles: (i) methods for transfer learning, where generic models could be pretrained on larger datasets and subsequently finetuned in a more specific application area; and (ii) methods for multimodal machine learning, so that we could jointly capitalize in technological advances in the fields of language and vision technology. As a case study, we focused on the digital collections of the RMFAB, where there existed a clear need for expanding the available metadata, especially regarding English translations of the textual materials and the generation of additional descriptive metadata.

Conclusions

Our research has broken new ground in all the targeted application areas. A series of papers have reported on the successful application of transfer learning, both in the textual and the visual modality. This work was situated in the pretraining-finetuning paradigm that is currently prevailing in machine learning and proved useful for e.g. the automated classification of visual artworks but also the machine translation of artwork titles. Significant advances were also reported in the domain of multimodal learning, where the joint encoding of visual and textual features yielded superior performance for the assignment of codes from a structured iconographic vocabulary (IconClass) to visual artworks. A highlight of the project was our joint work on the automated detection of musical instruments in the

visual arts, where we could harness the strength of all collaborating partners. Apart from demonstrating the theoretical feasibility of multimodal transfer learning for the cultural heritage domain, INSIGHT has yielded a meaningful number of practical deliverables, including (apart from scholarly publications) state of the art open source research software, novel open access datasets and an expanded, “Europeana-ready” version of the RMFAB dataset, as outlined in the original project proposal.

Keywords

Cultural Heritage – Artificial Intelligence – Multimodality – Computer Vision – Natural Language Processing – Computational Humanities

1. INTRODUCTION

Because of the affordances of the digital medium, cultural heritage institutions across the GLAM sector (Galleries, Libraries, Archives and Museums) are currently digitizing their physical collections at a rapid, steadily increasing pace. A typical example would be a museum that curates physical works from the visual arts (e.g. paintings), which can be photographed at a high resolution and then be made available through the institution's OPAC (Online Public Access Catalog). Such initiatives have a tremendous research potential in the context of open science but also serve an important (e.g. cultural, educational) outreach purpose, opening up collections to a much wider audience. The practical usefulness of these digital objects, however, is very much determined by the size and quality of the descriptive metadata that accompanies it, detailing, for instance, information about an artwork's provenance or art historic relevance and interpretation. Several international standards exist to practically encode such information (e.g. through implementations of the Europeana Data Model[1]) or controlled vocabularies (thesauri, such as IconClass) that enable the detailed description of a work's iconographic characteristics and content. The adoption of such standards ultimately aids the sustainability of the fruits of the digitization process; this in turn helps to meaningfully embed the metadata in a rigorous scholarly framework, and moreover helps ensure the interoperability of digital information. Descriptive metadata nevertheless remains a very broad category and the availability of descriptions will very much depend on the level of detail.

The underlying problem – exacerbated by the increased pace of digitization – is that providing a detailed, high-quality semantic enrichment of the raw materials resulting from the digitization process is a time-consuming and error-prone activity that can only be carried out by trained domain experts, which can be hard to find and attract, and which are expensive to hire. Many cultural institutions are digitizing materials at a higher pace than the post-digitization annotation efforts can be carried out. Moreover, because of recent developments in the digital GLAM sector, the criteria for what constitutes a high-quality dataset (regarding open standards, interoperability, rights issues, …) become ever more demanding – one can refer to the FAIR principles as an example in this respect. (These principles behind this acronym stipulate that (scientific) data should be: Findable, Accessible, Interoperable and Reusable.) These issues are experienced across the entire cultural sector (and elsewhere), but even more so in smaller-scale institutions, that lack the funding or staffing capacity to engage in a sustained deep enrichment of their digital collections. Crowdsourcing initiatives from the field of citizen science are less feasible in this domain because of the high level of domain expertise that is typically required for carrying out these tasks.

[1] Note that EDM is not a registration standard but an exchange format; e.g. the RMFAB uses CDWA as a descriptive standard, whereas KMKG uses Spectrum.

2. STATE OF THE ART AND OBJECTIVES

Machine learning is a scholarly subfield of artificial intelligence, where researchers attempt to mimic the human ability to learn (i.e. optimize future performance on certain task, through learning from previous experience) and emulate these capacities in software (*in silico*). The real-life application potential of this technology is considerable, enabling the (partial) automation of tasks that could previously only be carried out by trained domain experts. After several proverbial “winters”, the field is currently seeing significant advances because of the introduction of “deep” representation learning, or machine learning based on an information architecture called a neural network. The practical application area of machine learning is therefore rapidly expanding, both in academia, the industry and, more generally, the cultural domain. Neural networks have rapidly become the learning method of choice across various modalities, such as text (in natural language procession) and vision (in image analysis).

Machine learning clearly finds a promising application area in this the domain of semantic data enrichment in cultural heritage institutions, as outlined above: machine learning systems could assist curators in the annotation of the raw materials, the translation of descriptive metadata to other languages, the application of controlled vocabularies in describing individual items etc. Nevertheless, while the momentum and potential of this technology are huge, a series of important obstacles present themselves. First of all, the most successful instances of machine learning come from the field of supervised machine learning, where algorithms are calibrated and optimized on an annotated dataset, i.e. datasets where humans have previously enriched the raw information, for instance through the application of class labels to objects. For generic language and vision models, such (often, extremely large) datasets are abundant, but they are much more sparse and limited in size for more specific domains, such as art history. Whereas larger players on the international scene, such as the Rijksmuseum, have released tremendously helpful annotated datasets for their collection, such a large annotation campaign is typically much less feasible for smaller, lesser-resourced collections. (There might be a serious mismatch, moreover, between the collection contents from different institutions, making it challenging to successfully transfer models from one institution to the next.)

In this context, we should refer to the pretraining-finetuning paradigm which has become a popular approach in machine learning: in this setup, large, so-called “foundation models” are pretrained on a generic dataset from which they learn to extract basic, yet crucial patterns from the data. Using transfer learning, these pretrained models can then be fine-tuned on a much smaller, but more specific dataset: research has demonstrated that even with small datasets, transfer learning can result in vastly superior performance on the target task, especially compared to training “from scratch” on the domain-specific data. This paradigm can be applied to datasets in the cultural heritage domain too, where we adopt large pretrained models from the generic domain, optimize them on data from the cultural heritage (e.g. the Rijksmuseum dataset) before attempting to optimize the model for the application-specific task (e.g. the MFAB dataset). Transfer learning through neural networks is especially worthwhile in this context, because this approach is equally applicable to the domains of text (through language models) and vision (through convolutional networks).

Because of the adoption of similar learning architectures in natural language processing and computer vision research, multimodal machine learning is increasingly attracting attention in the literature. In such approaches, the goal is to learn from (annotated) data across multiple (sensory) modalities simultaneously, thus seeking improved performance to systems that were only trained on a single modality at once. When attempting to assign an iconographic description to a painting, for instance, machines could benefit from having joint access to both the textual information (e.g. a title) and the visual data (e.g. the pixels in the photographic facsimile) associated with the object under scrutiny. Because cultural heritage datasets are often restricted in size (in comparisons to the gargantuan datasets that are available in generic machine learning), but do indeed often carry metadata across multiple modalities, the paradigm of multimodal machine learning seemed especially promising to explore in this project, also in combination with the aforementioned transfer learning strategies.

In conclusion, our objectives in this project were to advance the application of multimodal transfer learning in the context of digital datasets from the domain of cultural heritage. We aimed to assess the research-theoretical feasibility of, amongst others, the pretraining-finetuning paradigm, as well as stress-testing the real-life potential of its practical application on the in-house collections of the cultural heritage partners in the project.

3. METHODOLOGY

As originally planned, the first phase of the project was primarily dedicated to single-modality transfer learning (in natural language processing and computer vision, respectively), as well as the annotation of novel datasets, involving generic art history data retrieved from the web, as well as subcollections from the in-house partner data. In the second phase of the project, we proceeded to multimodal varieties of machine learning in which the forces of language technology and vision technology were joined.

The transfer learning avenue was initially researched in a series of application-specific tasks (e.g. artwork title translation or object detection) that related to the wider domain of AI for cultural heritage. The textual strand in this phase of the project focused on a title translation and more specifically the language pairs involving Dutch, English and French. Using established architectures or neural machine translation we explored the feasibility of automatically translating between these language pairs in the context of the titles of artworks – uniform English titles, for instance, were still an important desideratum for the artworks at the RMFAB. Titles, however, are a very idiosyncratic text variety that are short and come with specific constraints, for instance, as to which words have to remain un-translated – e.g. proper nouns or neologisms, which are sometimes to be translated and sometimes not. Here, we relied on systems that were consecutively pretrained on smaller, less generic datasets before validating the calibrated systems on the museum's target dataset. Secondly, the vision component of the project in this phase focused on the classification of artworks (regarding material, type, author, etc.) on the basis of their photographic facsimiles. Here, convolutional neural networks were applied in the pretraining-finetuning paradigm by capitalizing on the Rijksmuseum dataset and transferring these foundation models to datasets from other institutions [code on GITHUB].

Transfer learning continued to play a major role in the next cluster of studies. Object detection is a popular task in computer science, where the idea is to locate and identify objects in images. We operationalized this task in the project through a focus on musical instruments (music iconography), which constitutes a salient iconographic category in art history. Moreover, because of the presence of the musical instruments museum in Brussels this task had a considerable practical application potential. In a project-wide study published in *DHQ*, we report on the creation of a large, annotated dataset (MINERVA [DOI]) for the detection of musical instruments in (unrestricted) image collections from the visual arts (with a non-exclusive focus on the historic period, cf. "old masters"). We benchmarked various commonly used systems for image classification and object detection, followed by a qualitative discussion of the results. In another study, we extended this research by assessing the possibilities for transferring vision models from photographic images of instruments to their artistic counterparts in history. For this, we explored the so-called "style transfer" that offers interesting possibilities for automatic data augmentation, which is attractive for tasks where only limited training data is available.

In the final stage, the project engaged in research specifically targeting *multimodal* transfer learning. The case study of choice here was the assignment of terms to artworks from domain-specific controlled vocabularies (or thesauri). We focused on IconClass, an important iconographic classification system that has steadily been gaining international recognition (and application) in recent decades: the RMFAB collection lacks annotation using this specific thesaurus and, thus, this presented an ideal real-world application area. Using multimodal networks, we learned to numerically represent artworks in so-called "feature vectors" (cf. representation learning), jointly on the basis of their title and their photographic reproduction and used these representations to retrieve relevant IconClass terms [code on Github].

4. SCIENTIFIC RESULTS AND RECOMMENDATIONS

Throughout the project, the pretraining-finetuning paradigm proved to be an enormous asset: we can safely conclude that transfer learning is a realistic and feasible strategy in furthering the application of AI in the cultural heritage domain. In the modality-specific case studies, we can report the following general results. Machine translation at the character-level is more performant for automatic title translation than competing approaches at the (sub)word-level. Our research shows that these algorithms moreover benefit from the inclusion of additional metadata (e.g. the assignment of IconClass terms, which enable institutions to pull in additional, more extensive descriptions) than just the title in the input. Classification studies in the domain of image classification showed similar results: the classification quality can be boosted significantly through the use of pretrained models; training from scratch in any case is not the recommended strategy. While some of the more advanced models are not trivially to implement in practice, we found that generic models, for instance from computer vision are readily available to and can be deployed with relative ease.

Our case study in the detection of musical instruments in artworks resulted in several observations that will be useful to other practitioners in neighboring field, which includes academic researchers, stakeholders in the public and cultural sectors, and especially digital curators of cultural heritage at large. While instrument detection as such is a feasible task, expectation management is in order here: common instruments, such as lutes or violins, can be detected with acceptable accuracy, but for less common and/or non-western instruments, a detailed identification is still out of reach. Most of this imbalance across instrument categories is due to (cultural) biases in the available training material, or quoting from our own work:

> One crucial final remark is that AI has an amply attested tendency not only to be sensitive to biases in the input data but also to amplify them […]. Whereas the computational methods presented here have the potential to scale up dramatically the scope of current research in music iconography, it also comes with ideological dangers. The technology could further strengthen the bias on specific canonical regions and periods in art history and lead the attention even further away from artistic and iconographic cultures that are already in specific need of reappraisal. The community will therefore have to think carefully about bias correction and mitigation. Collecting training data in a diverse and inclusive manner, with ample attention for resource-lower cultures should be a key strategy in future data collection campaigns (Sabatelli et al. 2021, ¶49).

Future annotation campaigns should take this caveat into account. Photographic datasets (which seem to be more diverse than art historical datasets containing instruments; cf. the MIMO dataset) might be suited to help remedy such biases. Our work showed that, through style transfer, there are possibilities that transfer models across the photorealistic and the artistic domain, but that these should not be over-estimated at this stage.

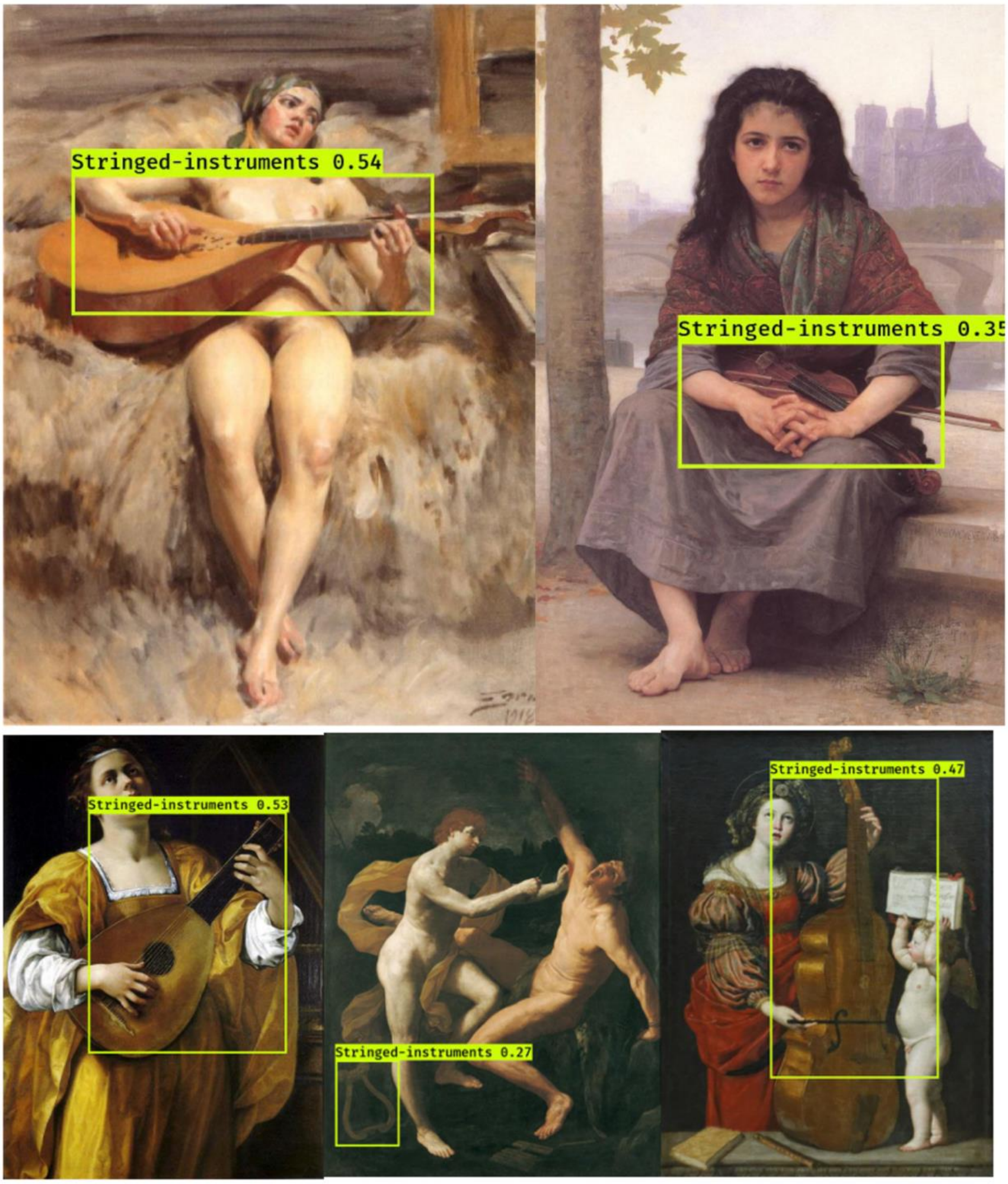

Figure from Sabatelli et al. (2021), showing successful examples of stringed instruments automatically detected using the system trained on MINERVA.

A crucial take away message from these studies was the insight that the use of large, pretrained language models (such as Google's multilingual BERT model) has the capacity to even out imbalances in the performance across resource-rich languages, such as English, and comparatively lesser resourced languages, like Dutch: the textual branch of our system did not experience a major drop when switching across such languages, which is especially promising for the cultural heritage domain that abounds in linguistic diversity. The fact that even emergent zero-shot capabilities were evident across languages, was equally relevant in this context.

Throughout its lifetime, the project had to cope with serious circumstantial difficulties that might become even more pressing for future research in this area. Recruiting suitable PhD candidates with a background in computer science ánd a demonstrable affinity with the Humanities proved very challenging: the PhD candidates in the project, for instance, could only be hired at much later moments in time which would inevitably result in a highly asynchronous and delayed execution of the project. We expect this difficult situation on the labour market to grow even worse in the coming years, because of the high demand for AI-skilled workers, and we advise future research projects in this area to plan projects accordingly. Another practical difficulty is that partners might easily switch jobs across different institutions: two of the original project proposers (Ellen van Keer and Eva Coudyzer) had left their respective positions by the time the project had to reach its full swing. This created significant coordination challenges, because new staff (with rather different backgrounds from the original proposal authors) had to get involved in the project on short notice. Another major challenge was the COVID19 crisis, and the ensuing lockdown, which imposed clear practical limitations on the collaboration possibilities among the partners, who were confronted with major shifts in their daily work routine. Mental health issues because of the increased work pressure are an important point of attention here. Finally, in the early phase of the project, the team experienced clear, unexpected and long-lasting difficulties in obtaining the digital collections data from some museum partners in a structured and open data format. Digital collection management can be problematic in institutions, when heavily bespoke, proprietary data management software is used, which endangers the sustainability, openness and interoperability of these data collections on the longer term. We believe that future strategic discussions about data management, also across (scientific and cultural) institutions in Belgium, should take these issues into account.

Project assets

Code repositories

- Minerva (object detection, image classification, saliency analysis): Github
- Title translations (machine translation): Github
- Style transfer (transfer learning for image classification): Github
- Rijksmuseum (image classification): Github
- IconClass matching multimodal (embeddings): Github

Novel datasets in object detection

- Musical instruments (object detection; image classification): Zenodo
- Animals (object detection; image classification): Zenodo
- Fruits (object detection; image classification): Zenodo

5. DISSEMINATION AND VALORISATION

The project's results were frequently communicated to a larger (academic) audience through international lectures and conference presentations, based on the peer-reviewed publications that were outputted at regular intervals during the project. These included talks for diverse scholarly audiences, ranging from pure AI conferences to venues in the computational humanities and the public arts. The kick-off of the project was visited by numerous colleagues and invited strongly positive feedback. An important academic deliverable were the two PhD theses that were written and successfully defended over the course of the project. The project also placed emphasis on educational valorization through internships (in the context of the master programme in Digital Text Analysis at the University of Antwerp) and master theses dedicated to the project (at the University of Liège).

Whenever possible, we have released our data and software [e.g. Github] under liberal, open licenses which should encourage their reuse in future scholarship. The annotated datasets in the domain of object detection for computer vision are particularly diverse and cover musical instruments, but also animals and fruits. We expect these resources to be useful as benchmark datasets to others working in this domain and to enable the monitoring of the scientific progress in computer vision for the cultural domain. Regarding practical application, the results of the multimodal assignment of IconClass codes will offer practical advantages to players in the field and we are currently continuing to explore these, amongst others in an MA internship in the Spring of 2023 at the RMFAB. Regarding societal added value for outreach, it is important to mention that the RMFAB will soon be able to capitalize on the translation efforts and serve English-language titles online for their entire digital collection, in a first step as an intranet publication with renewed uniformity rules.

6. PUBLICATIONS (*CHRONOLOGICALLY SORTED*)

Sabatelli, M., Kestemont, M., Daelemans, W., & Geurts. “Deep Transfer Learning for Art Classification Problems.” *European Conference on Computer Vision (ECCV), 4th Workshop on Computer VISion for ART Analysis (VISART IV)*, München (GE), 2018.

Matthia Sabatelli, Nicolae Banari, Marie Cocriamont, Eva Coudyzer, Karine Lasaracina, Walter Daelemans, Pierre Geurts & Mike Kestemont, "Advances in Digital Music Iconography. Benchmarking the detection of musical instruments in unrestricted, non- photorealistic images from the artistic domain". *Digital Humanities Quarterly* (2020). Special issue on AudioVisual Digital Humanities.

Sabatelli Matthia, Kestemont Mike & Geurts Pierre, “On the transferability of winning tickets in non-natural image datasets”. *16th International Joint Conference on Computer Vision, Imaging and, Computer Graphics Theory and Applications (VISIGRAPP) / 16th, International Conference on Computer Vision Theory and Applications, (VISAPP)*, FEB 08-10, 2021 - ISBN 978-989-758-488-6 - Setubal, Scitepress, (2021), p. 59-69.

Banari Nicolae, Daelemans Walter & Kestemont Mike, “Character-level transformer-based Neural Machine Translation”. *NLPIR 2020: Proceedings of the 4th International Conference on Natural Language Processing and Information Retrieval*, Seoul Republic of Korea, December 2020 - ISBN 978-1-4503-7760-7 - New York, N.Y., Association for Computing Machinery, 2020, p. 149-156.

Banari Nicolae, Sabatelli Matthia, Geurts Pierre, Daelemans Walter & Kestemont Mike, “Transfer learning with style transfer between the photorealistic and artistic domain”. *IS&T International Symposium on Electronic Imaging. Computer Vision and Image Analysis of Art 2021* - 2021, p. 041(1)-041(8).

Banari Nicolae, Lasaracina Karine, Daelemans Walter & Kestemont Mike, “Transfer learning for digital heritage collections: comparing neural machine translation at the subword-level and character-level”. *Proceedings of the 12th International Conference on Agents and Artificial Intelligence - Volume 1: ARTIDIGH* - ISBN 978-989-758-395-7 - Setubal, Scitepress, (2020), p. 522-529.

Banari Nicolae, Daelemans Walter & Kestemont Mike, “Neural machine translation of artwork titles using Iconclass codes”. *Proceedings of LaTeCH-CLfL 2020*, pp. 42–51, Barcelona, Spain (Online) - 2020, p. 42-51.

Banari Nicolae, Daelemans Walter & Kestemont Mike, “Multi-modal label retrieval for the visual arts: the case of Iconclass”. *Proceedings of the 13th International Conference on Agents and Artificial Intelligence (ICAART 2021)* - Volume 1 - ISSN 2184-433X - SCITEPRESS, 2021, p. 622-629.

Sabatelli, M. (2022). *Contributions to Deep Transfer Learning: from Supervised to Reinforcement Learning*. Doctoral thesis, ULiège - Université de Liège, Liège, Belgium. Jury: Geurts, P. (Promotor).

Banari Nicolae, Kestemont Mike [Promotor], Daelemans Walter [Promotor]. *Applications of artificial intelligence for the resource-scarce cultural heritage domain: from language and image processing to multi-modality*. Doctoral thesis, Antwerp, University of Antwerp, Faculty of Arts, Department of Literature, 2022, x, 156 p.

Nicolae Banari, Walter Daelemans & Mike Kestemont, “Transfer Learning for the Visual Arts: The Multi-Modal Retrieval of Iconclass Codes”. *ACM Journal on Computing and Cultural Heritage* (2023 advance access [doi]).

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ANNEXES

Because of staffing shortages, INSIGHT was asynchronously continued a while longer at the RMAFB (for six months, until 31/01/2023). Below, we include the partner-specific report for this period (authored by K. Lasaracina).

Le projet de recherche BRAIN - INSIGHT (2017-2023) a travaillé à la mise en application des avancées récentes en Intelligence Artificielle (plus particulièrement la technologie du langage et la vision par ordinateur) pour enrichir (de façon automatisée) les métadonnées descriptives des œuvres d’art. Démarré en 2017, ce projet a été pionnier pour le secteur des musées, il a ouvert la voie de l’IA au service des collections des MRBAB. Il a matérialisé l’importance pour la Recherche des sets de données ouverts et constitué les premiers pas de l’Institution vers l’Open Science. Dans ce sens, fort des échanges avec les ingénieurs liés à l’IA, ce projet a engagé la stratégie d’ouverture des données du Musée. Des données et images accessibles (FAIR Principles), directement (ré)utilisables, sont le fondement du "Musée de demain”, elles constituent la base du déploiement de dispositifs numériques qui sont des **points d’accroche aux collections pour le public** et ont un rôle sous-jacent dans le rayonnement international (en ligne) du Musée.

<u>Dernière année du projet de recherche</u>

Les MRBAB sont dans une dynamique qui vise à offrir au public, pour toutes les collections exposées, un cartel en français, en néerlandais mais aussi *en anglais*. Cette même aspiration anime de longue date le service numérique du Musée qui aimerait pouvoir proposer via son catalogue en ligne : toutes les œuvres de la collection (pas uniquement les œuvres exposées) en FR-NL mais aussi *en anglais*. Un travail qui, effectué manuellement, prendrait de nombreuses années. INSIGHT a à la fois joué un rôle de levier et d'accélérateur de ce processus.

<u>Développement de l’accessibilité des collections en anglais</u>

La base de données des collections des MRBAB est complétée quotidiennement en français et en néerlandais. Grâce à INSIGHT, le titre et la description physique de 12 000 œuvres ont été traduits (depuis le français/néerlandais) en anglais en vue de développer l’accessibilité des collections, pour ce faire :

- une première phase de travail a consisté à préparer et à contrôler le set de données en anglais (data quality / data cleaning) en collaboration avec les conservateurs de l'Institution.

La tâche s'est avérée chronophage et a mis en évidence la difficulté de traduction du titre d'une œuvre d'art, une traduction littérale n'étant pas la norme. La traduction d'un titre vers l'anglais remet parfois également en question les traductions antérieures dans les 2 autres langues (NL - FR). Un processus qui implique souvent de revenir à l'œuvre et à ce qu'elle représente, ce qui constitue un véritable travail de recherche, à compléter par une connaissance fine de l'anglais. Quelques exemples :

Inv.	Nom d'artiste	Descr. EN	Titre en FR	Titre en NL	Titre en EN
2923	P. Franchoys	Oil on canvas	Rubis sur l'ongle	De nagelproef	~~Pay in Full~~
6862	E.L.T. Mesens	Collage and gouache on paper	Au bord des mots	Aan de rand van het woord	On the Verge of Words OF At the Edge of Words
7121	S. Vandercam	Gouache and collage on torn paper	Papier meurtri n° 7	Mishandeld papier nr. 7	Mistreated Paper no. 7 OF Bruised Paper no. 7

Le travail de vérification des titres en anglais s'avère être un travail de grande ampleur (à poursuivre). Outre la vérification de la traduction, un travail d'uniformisation des titres a également été mené et par-là des **règles d'uniformité** ont été définies : sur l'emploi des majuscules, des abréviations, des articles, de la ponctuation, …

- Une deuxième phase a été de vérifier l'import (par la société Axiell) du set de données en anglais dans la base de données FABRITIUS (VUBIS).
- La troisième phase a été de mettre en place une interface de consultation en anglais (construction de l'interface, manipulation du Content Management System pour l'affichage des champs souhaités, la finalisation de leur mise en page, tests, …).

En conclusion, en 2022-2023, INSIGHT a accéléré le processus de développement de l'accessibilité en anglais des collections des MRBAB. Une dernière phase (2023) envisagera la possibilité d'automatisation (collaboration avec l'Université d'Anvers) de l'application des règles d'uniformité établies (2022) aux titres nouvellement formulés en anglais.