

For Research and Remembrance



Multilingual Automated Subject Indexing

A comparative study of **LLMs** vs **alternative approaches** in the context of the **EHRI Project**

Maria Dermentzi (King's College London)

Mike Bryant (King's College London, NIOD)

Fabio Rovigo (Vienna Wiesenthal Institute for Holocaust Studies)

Herminio García-González (Kazerne Dossin)



WIENER WIESENTHAL INSTITUT
FÜR HOLOCAUST-STUDIEN (WWI)



KAZERNE
DOSSIN

MEMORIAL, MUSEUM
AND RESEARCH CENTRE
ON HOLOCAUST
AND HUMAN RIGHTS



DH BENELUX 2024

6th June 2024

Leuven, Belgium



EHRI is funded by the EU

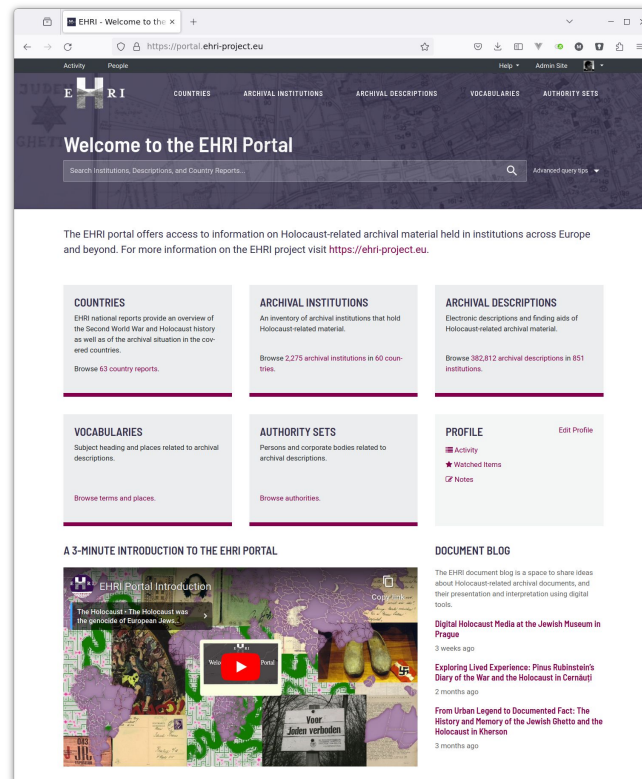


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EHRI's Mission

- The European Holocaust Research Infrastructure (EHRI) seeks to **improve access to information** about Holocaust-related archival material held by different institutions around the world
- One way it does this is the **EHRI Portal**, which makes collection **metadata** more **accessible** and **interconnected**



Multilingual archival descriptions

For Research and Remembrance



Related Items

Search Related Items...



Advanced query tips ▾

DISPLAYING ITEMS 1 TO 20 OF 309

Relevance ID/Code Name Recently Updated Detail

Give Them a Face portrait collection. Collection

Kazerne Dossin: Memoriaal, Museum en Onderzoekscentrum over Holocaust en Mensenrechten / Kazerne Dossin: Mémorial, Musée et Centre de Recherche sur la Shoah et les Droits Humains

KD_00017 English, Dutch 1880-1945 over 19,650 digitised images (individual photos) Updated 1 month ago

This collection contains over 19,650 portraits of Roma, Sinti and Jewish men, women and children from Belgium and the north of France, whom have been deported from the SS-Sammellager Mecheln (Dossin barracks) to Auschwitz-Birkenau, Buchenwald, Ravensbrück, Bergen-Belsen and Vittel between August 1942 and July 1944.

Julien Abrahamer, born in 1924; details regarding his activities in the French Jewish underground during World War II 0.89 - Collection of Personal Files of Jewish Underground Fighters in France

אברהמון יד ושמ / Yad Vashem Archives 5263466 English, Hebrew xerox 4 pages/frames Updated 5 years ago

Julien Abrahamer, born in 1924; details regarding his activities in the French Jewish underground during World War II Life in Chambéry. His work as assistant bookkeeper in the OSE (Children's Aid Society) office; detention with the office staff, 08 February 1944; due to his presence of mind, the book-keeper's secretary was able to escape; deportation on Transport 69 to Auschwitz, 07 March 1944. In the file: - Photograph of Julien Abrahamer; - Summaries of his activities.

Abram Hofnung. Collection

Kazerne Dossin: Memoriaal, Museum en Onderzoekscentrum over Holocaust en Mensenrechten / Kazerne Dossin: Mémorial, Musée et Centre de Recherche sur la Shoah et les Droits Humains

KD_00520 English 1942 10 digitised images (5 documents) Updated 1 month ago

This collection consists of five postcards sent by Abram Hofnung while detained at the Dossin barracks in August 1942 to his wife Bajla Tazman in Brussels.

Filter Results

LANGUAGE OF DESCRIPTION ⓘ

English (304)
French (3)
Hebrew (138)
Italian (2)
Latvian (1)
Dutch (3)

HOLDING INSTITUTION ⓘ

Kazerne Dossin: Memoriaal, Museum en Onderzoekscentrum over Holocaust en Mensenrechten / Kazerne Dossin: Mémorial, Musée et Centre de Recherche sur la Shoah et les Droits Humains (160)
אברהמון יד ושמ / Yad Vashem Archives (140)
Holokauszt Emlékközpont (3)
Archives Nationales de France (2)
Biblioteca Archivio "Renato Maestro" (2)
Latvijas Nacionālā arhīva, Latvijas Valsts arhīvs (1)
Mémorial de la Shoah Fondation (1)

Multilingual
catalogue

Diverse
institutions
using different
cataloguing
methodologies
(standards,
vocabularies, etc)



EHRI is funded by the EU



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The EHRI Terms Vocabulary

- Hierarchically organised, multilingual set of subject headings
- At the time of writing consists of **913 terms** translated in **12 languages**
- Used by EHRI for:
 - Manually cataloguing descriptions in the EHRI Portal
 - Aligning with subject headings given on descriptions shared by EHRI partner institutions
- Available in the Simple Knowledge Organisation System (SKOS) RDF format

https://portal.ehri-project.eu/vocabularies/ehri_terms

EHRI Terms: usage example

For Research and Remembrance



EHRI Terms / Deportations / People

Deportees

KEYWORDS

LANGUAGE

English - Deportees

ONLINE HISTORY

5 years ago

Link created

Show full history

Related Items

Search Related Items... Advanced query tips

DISPLAYING ITEMS 1 TO 20 OF 277

Relevance ID/Code Name Recently Updated Detail

Give Them a Face portrait collection. Collection
Kazerne Dossin: Memoriaal, Museum en Onderzoekscentrum over Holocaust en Mensenrechten / Kazerne Dossin: Mémorial, Musée et Centre de Recherche sur la Shoah et les Droits Humains
KD_00017 English, Dutch 1880-1945 over 19,650 digitised images (individual photos) Updated 1 week ago
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0.89 - Collection of Personal Files of Jewish Underground Fighters in France
ארכיון יד ושם / Yad Vashem Archives 5263466 English, Hebrew xerox 4 pages/frames Updated 5 years ago

Filter Results

LANGUAGE OF DESCRIPTION

English (272)

French (3)

Hebrew (138)

Italian (2)

Latvian (1)

Dutch (4)

HOLDING INSTITUTION

ארכיון יד ושם / Yad Vashem Archives (140)

Kazerne Dossin: Memoriaal, Museum en Onderzoekscentrum over Holocaust en Mensenrechten / Kazerne Dossin: Mémorial,



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Example of Subject Access Points

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EXISTENCE AND LOCATION OF
ORIGINALS

Directorate-General War Victims, Brussels. The list of transport IV was lost and has been recreated using the index cards of the Sicherheitspolizei-Sicherheitsdienst (Sipo-SD).

EXISTENCE AND LOCATION OF
COPIES

Directorate-general War Victims, Brussels ; USHMM, Washington DC

SUBJECTS

Transit camps
Sondertransporte
Deportees

PLACES

Mechelen

Challenges

Harmonising subject term usage in the EHRI Portal:

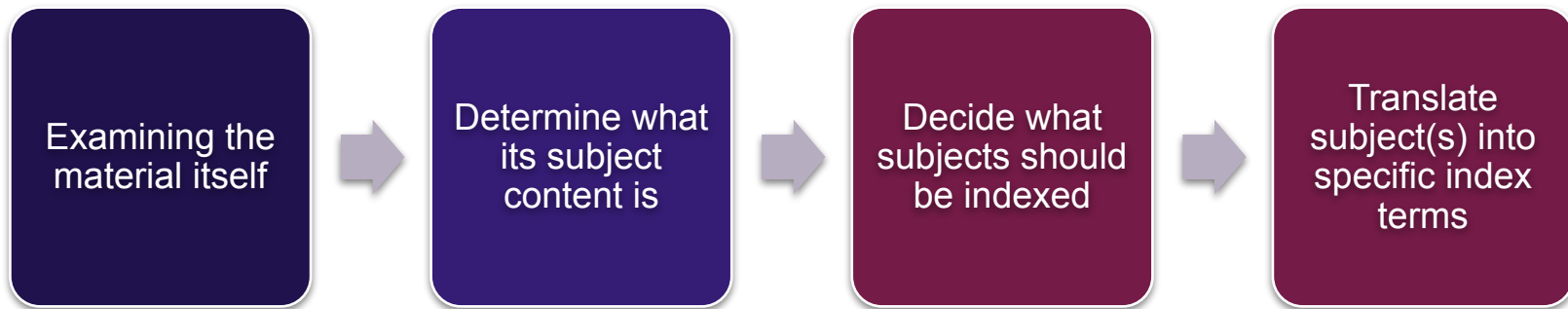
- ◆ 70% of descriptions with access points **do not align with EHRI Terms** common vocabulary
- ◆ 25% of collection-level descriptions have **no access points at all**

Research Question

Can **automated subject indexing** make archival descriptions in the EHRI Portal **more discoverable at scale** via:

1. Out-of-the-box, **general-purpose tools**, or...
2. Training **custom tools** on the Portal's existing metadata

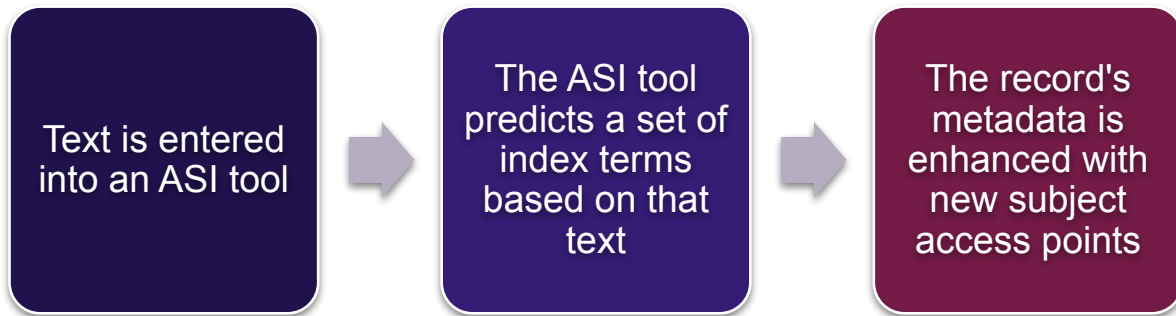
Typical Subject Indexing Process



Automated Subject Indexing (ASI)

Automated subject indexing is the use of machine-based methods to perform the subject indexing steps typically performed by human indexers (Golub, 2021).

ASI: Process



Depending on the **institution's strategy**, resulting terms may be added to the record:

- **Automatically** (ASI)
- **Semi-automatically** after expert verification (semi-ASI)

ASI: Approaches

Two prevailing approaches (Suominen et al., 2022, Toepfer and Seifert, 2020):

- ***Statistical associative approach*** (multilabel classification)
- ***Lexical approaches*** (**string-matching** to match terms in a **controlled vocabulary** with words in the text of the record's description) (Golub, 2021)

PLUS:

- ***Fusion approaches*** that combine the two (**ensemble models**)
- ***Transfer learning using “zero-shot” classification*** (Zhang et al., 2023). LLMs used out-of-the-box to predict suitable terms from a controlled vocabulary.

ASI & EHRI

EHRI has been experimenting with most of the aforementioned approaches.

- The text and the subject terms of already ingested EHRI Portal archival descriptions are used as a dataset for training ML models.
- These models predict suitable EHRI Terms for any text we pass through them based on what terms were assigned to similar descriptions in the past.

ASI: Example of Archival Description Text

United States / United States Holocaust Memorial Museum

Oral history interview with Jakob Lapides

IDENTIFIER in44151
LANGUAGE OF DESCRIPTION English
ACT IDENTIFIER 2005-023-4
RG-50.637.2004
LEVEL OF DESCRIPTION Item
LANGUAGES Hebrew
SOURCE EHRP Partner
WEB SOURCE <https://collections.ushmm.org/search/catalog/ln44151>
EXTENT AND MEDIA 1 videocassette (DVCR), sound, color, 1/4 in.

ASSOCIATE CURATOR Associate Curator Teresa Pollin conducted the interview with Jakob Lapides in Israel on March 27, 2005 for the United States Holocaust Memorial Museum's "Give Me Your Children: Voices from the Lodz Ghetto" exhibition.

ARCHIVAL HISTORY United States Holocaust Memorial Museum

CONSTRAINTS CONCERNING ACCESS No restrictions on access

PEOPLE Lapides, Jakob
Pollin, Ms. Teresa A.
Kutnicki, Mordecai Hayim
Pollin, Ms. Teresa A.
Lapides, Jakob

GEOPOLITICAL SCOPE Biala
Czestochowa (Concentration camp)

SUBJECTS Jewish youth Poland--Societies and clubs.
Mass-Persecution narratives.
Lodz (Poland)
Bar mitzvah.
Czestochowa (Poland)
Jewish orphanage--Poland--Lodz.
Jews--Poland--Lodz.
Zionism.
Poland--History--Occupation, 1939-1945.
Holocaust, Jewish (1939-1945)--Personal narratives.
World War, 1939-1945--Concentration camps.
Israel--Emigration and immigration.
Jewish orphanages--Poland.
Jewish police officers--Poland--Lodz.
Holocaust survivors--Israel--Interviews.
Bialystok--Poland.
World War, 1939-1945--Deportations from Poland.
Jewish ghettos--Poland--Lodz.
Forced labor.

NOTE Oral History

This description is derived directly from structured data provided to EHRP by a partner institution. This collection holding restriction considers that description as an accurate reflection of the archival holdings to which it refers at the moment of data transfer.

Notes on this description
2024-06-06

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EUROPEAN COMMISSION
PRIXARS

Associate Curator Teresa Pollin conducted the interview with Jakob Lapides in Israel on March 27, 2005 for the United States Holocaust Memorial Museum's "Give Me Your Children: Voices from the Lodz Ghetto" exhibition.

ASI: The goal

Associate Curator Teresa Pollin conducted the interview with Jakob Lapidés in Israel on March 27, 2005 for the United States Holocaust Memorial Museum's "Give Me Your Children: Voices from the Lodz Ghetto" exhibition.

- 
- Given some text in **any language**

ASI: The goal

Associate Curator Teresa Pollin conducted the interview with Jakob Lapides in Israel on March 27, 2005 for the United States Holocaust Memorial Museum's "Give Me Your Children: Voices from the Lodz Ghetto" exhibition.

- Given some text in **any language**
- Predict suitable **EHRI Terms**

SUBJECTS

Jewish youth--Poland--Societies and clubs.
Men--Personal narratives.
Łódź (Poland)
Bar mitzvah.
Czestochowa (Poland)
Jewish orphans--Poland--Łódź.
Jews--Poland--Łódź.
Zionists.
Poland--History--Occupation, 1939-1945.
Holocaust, Jewish (1939-1945)--Personal narratives.
World War, 1939-1945--Conscript labor.
Israel--Emigration and immigration.
Jewish orphanages--Poland.
Jewish police officers--Poland--Łódź.
Holocaust survivors--Israel--Interviews.
Rationing--Poland.
World War, 1939-1945--Deportations from Poland.
Jewish ghettos--Poland--Łódź.
Forced labor.

EHRI Experiments

- **Hugging Face:**
 - Fine-tuning for MLC: BERT-base Multilingual Cased (Devlin et al., 2019)
 - Zero-shot classification using the pre-trained mDeBERTa-v3-base-mnli-xnli (Laurer et al., 2023)
- **Annif** (Suominen et al. 2022):
 - Framework for *training, evaluating* and *combining* various non-LLM based ASI tools
 - TF-IDF, MLLM, fastText, Omikuji, NN Ensemble backends

EHRI Experiments

Key considerations in selecting the Transformer models:

- pre-trained on languages relevant to EHRI's material
- being open source and easily accessible
- transparent about training data used
- ability to quantitatively evaluate their performance using our in-house compute infrastructure

EHRI Experiments: Dataset

Associate Curator Teresa Pollin conducted the interview with Jakob Lapides in Israel on March 27, 2005 for the United States Holocaust Memorial Museum's "Give Me Your Children: Voices from the Lodz Ghetto" exhibition.

Text* and associated **subject terms** (linked with the EHRI Terms vocabulary) of around **37,000** archival descriptions in **15 languages**.

*The fields selected were ISAD(G) elements 3.1.2. Title; 3.2.2. Administrative / Biographical History; 3.2.3. Archival History; and 3.3.1. Scope and Content.

SUBJECTS

Jewish youth--Poland--Societies and clubs.
Men--Personal narratives.
Łódź (Poland)
Bar mitzvah.
Częstochowa (Poland)
Jewish orphans--Poland--Łódź.
Jews--Poland--Łódź.
Zionists.
Poland--History--Occupation, 1939-1945.
Holocaust, Jewish (1939-1945)--Personal narratives.
World War, 1939-1945--Conscript labor.
Israel--Emigration and immigration.
Jewish orphanages--Poland.
Jewish police officers--Poland--Łódź.
Holocaust survivors--Israel--Interviews.
Rationing--Poland.
World War, 1939-1945--Deportations from Poland.
Jewish ghettos--Poland--Łódź.
Forced labor.

Experiments: Dataset

- To obtain our training and test sets we used **iterative multilabel stratification** (Sechidis et al., 2011) as implemented in the Python package `iterative-stratification` (Bradberry, 2018/2021).
- We did this to increase the chances that all **labels** (and **language codes**) would have positive examples in the train set as well as in the test set.

Experiments: Evaluation

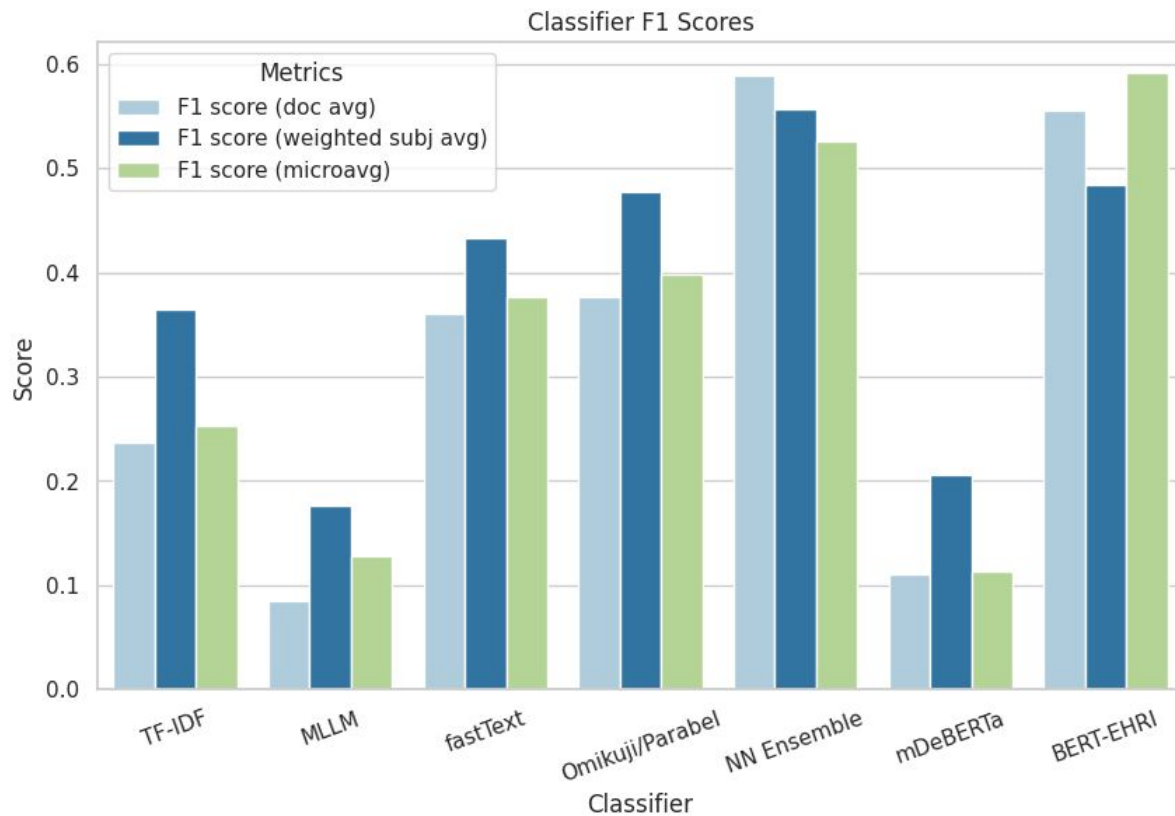
- Create Annif backends for LLM-based MLCs
 - Off-the-shelf zero-shot models
 - Fine-tuned EHRI model
- Compare zero-shot, fine-tuned and Annif models
- Perform **quantitative** and **qualitative** evaluation of ~160 examples

Experiment: quantitative evaluation

For quantitative evaluation, we **assume** that the terms assigned to EHRI-ingested records are complete and correct (gold standard)

- Computed **F1 scores**:
 - Micro-averaged (taking into account total true positives, false negatives and false positives)
 - Weighted macro-averaged (computing the metrics per label weighted by each label's number of true instances)
 - Averaged per document
- All of these scores range from zero to one, with one being the best possible score.

Experiment: quantitative evaluation



Experiment: human evaluation

Why?

Quantitative evaluation doesn't necessarily tell the full story

- Subject indexing with large controlled vocabularies is a very **subjective task**—small overlap between human cataloguers
- Hard to develop a truly comprehensive gold standard dataset
- Our training dataset is derived from heterogeneous data, leading to inconsistencies

Experiment: human evaluation

Qualitative evaluation of four distinct label sets:

- Original labels assigned by EHRI staff or co-referenced with data from EHRI partner institutions
- NN Ensemble classifier (best performing Annif backend according to our quantitative evaluation)
- Fine-tuned BERT-based model
- mDeBERTa-based zero-shot model

Experiment: human evaluation

C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
	Tool 1				Tool 2				Tool 3				Tool 4	
Text	Labels	Good	Poor		Labels	Good	Poor		Labels	Good	Poor		Labels	Good
A 4759	Healthcare	<input type="checkbox"/>	<input type="checkbox"/>		People	<input type="checkbox"/>	<input type="checkbox"/>		Diseases	<input type="checkbox"/>	<input type="checkbox"/>		Healthcare	<input type="checkbox"/>
Nemocný v nemocnici v Terezíně	Diseases	<input type="checkbox"/>	<input type="checkbox"/>		Healthcare	<input type="checkbox"/>	<input type="checkbox"/>		Healthcare	<input type="checkbox"/>	<input type="checkbox"/>		Food and eating	<input type="checkbox"/>
Patient in a hospital in Terezin					Prohibitions and bans	<input type="checkbox"/>	<input type="checkbox"/>						Diseases	<input type="checkbox"/>
					Medical personnel	<input type="checkbox"/>	<input type="checkbox"/>						Daily life	<input type="checkbox"/>
					Pamphlets	<input type="checkbox"/>	<input type="checkbox"/>						Judenrat	<input type="checkbox"/>
Linkuva photographs	Photographs	<input type="checkbox"/>	<input type="checkbox"/>		Prewar period	<input type="checkbox"/>	<input type="checkbox"/>		Photographs	<input type="checkbox"/>	<input type="checkbox"/>		Photographs	<input type="checkbox"/>
folder					Jewish population	<input type="checkbox"/>	<input type="checkbox"/>							
1					Photographs	<input type="checkbox"/>	<input type="checkbox"/>							
United States Holocaust Memorial Museum					Jewish culture	<input type="checkbox"/>	<input type="checkbox"/>							
Consists of eight photographs of pre-war Jewish life in Linkuva, Lithuania. Includes photographs of homes, the					Holocaust memory	<input type="checkbox"/>	<input type="checkbox"/>							
Feissel Florette ילידת Mulhouse 1922 צרפת, פרטים על פעילותה במחתרת היהודית בצרפת בזמן מלחמת העולם השנייה	Personal documentation	<input type="checkbox"/>	<input type="checkbox"/>		Imprisonment	<input type="checkbox"/>	<input type="checkbox"/>		Deportees	<input type="checkbox"/>	<input type="checkbox"/>		Photographs	<input type="checkbox"/>
קסרקס	Help to Jews	<input type="checkbox"/>	<input type="checkbox"/>		Ghetto life	<input type="checkbox"/>	<input type="checkbox"/>		Detentions	<input type="checkbox"/>	<input type="checkbox"/>		Personal documentation	<input type="checkbox"/>
pages/frames 6	Relief and welfare organisations	<input type="checkbox"/>	<input type="checkbox"/>		Wartime period	<input type="checkbox"/>	<input type="checkbox"/>		Personal documentation	<input type="checkbox"/>	<input type="checkbox"/>		Deportees	<input type="checkbox"/>
Feissel Florette ילידת Mulhouse 1922 צרפת, פרטים על פעילותה במחתרת היהודית בצרפת בזמן מלחמת העולם השנייה בריחה עם היהודים ל-Lyon ביולי 1940; החיים עם המשפחה במחנה Chaudanne בסוף 1940; קבלת סיוע מארגון Aide Sociale aux Refugies ב-Perigueux; קבלת עבודה בתור מזכירה בארגון חודות להמלצת הרב Hirschler Rene (רבה)	Deportees	<input type="checkbox"/>	<input type="checkbox"/>		Deportation to camps	<input type="checkbox"/>	<input type="checkbox"/>		Camps	<input type="checkbox"/>	<input type="checkbox"/>		Detentions	<input type="checkbox"/>
	Detentions	<input type="checkbox"/>	<input type="checkbox"/>		Arbeitseinsatz	<input type="checkbox"/>	<input type="checkbox"/>		Photographs	<input type="checkbox"/>	<input type="checkbox"/>		Commemoratio n	<input type="checkbox"/>

Experiment: human evaluation

	GS Labels			NN Ensemble			BERT-FT			mDeBERTa		
	<i>F</i>	<i>N</i>	<i>U</i>	<i>F</i>	<i>N</i>	<i>U</i>	<i>F</i>	<i>N</i>	<i>U</i>	<i>F</i>	<i>N</i>	<i>U</i>
J1	221 75%	69 23%	4 1%	267 48%	252 45%	37 7%	233 53%	179 41%	28 6%	340 41%	312 37%	183 22%
J2	210 71%	83 28%	1 0%	239 43%	288 52%	29 5%	197 45%	213 48%	30 7%	342 41%	444 53%	49 6%
J3	191 65%	99 34%	4 1%	238 43%	303 55%	15 3%	217 49%	209 48%	14 3%	344 41%	460 55%	31 4%

Human judges rated many of the zero-shot predictions as favourable, although the model also achieved some of the highest neutral and unfavourable scores.

Limitations, Concerns, Discussion

- Qualitative evaluation was very limited (only meant as a preliminary check)
- Google Translate was used for descriptions in languages that authors did not understand
- No access to the actual archival material but only to metadata
- Limited metadata with insufficiently descriptive text
 - Many labels therefore judged “neutral”, inconclusive
 - This could contribute to relatively low performance of all classifiers

Limitations, Concerns, Discussion

- Signs of **spurious correlations**
- Index terms correlating with oral testimony interviewees' names
- Index terms correlating with institution or project name
 - "The USHMM, Oral History Branch, in cooperation with Watchtower Bible and Tract Society, Inc" => "Jehovah's Witnesses"
- Several cases produced labels which, in context, would be deemed inappropriate
 - e.g. phrase "produced in cooperation with" => "collaborators"

Limitations, Concerns, Discussion

- Hierarchical vocabulary resulted in some redundant, overlapping terms
e.g. “Political activities”, “Politics”, “Political organisations” and “Political movements”
- The model used for zero-shot classification was trained on a **CommonCrawl** dataset which might have already “seen” some of the descriptions in our dataset

Conclusion

Based on our experiments:

- ASI tools tested here only usable in a semi-ASI scenario
- Ability of LLM-based zero-shot classification to correctly predict more specific (“narrower”) labels potentially useful as part of a data augmentation effort
- NN Ensemble model on a par with fine-tuned BERT (if not better)
- Future work: fine-tuning multilingual LLMs with a more balanced dataset, experimenting with more SOTA models

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Thank you!

Abstract:



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References

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Devlin, J., Chang, M.-W., Lee, K., & Toutanova, K. (2019). BERT: Pre-training of Deep Bidirectional Transformers for Language Understanding. Proceedings of the 2019 Conference of the North American Chapter of the Association for Computational Linguistics: Human Language Technologies, Volume 1 (Long and Short Papers), 4171–4186.
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