Challenges and Strategies in Cross-Cultural NLP

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UNIVERSITY OF COPENHAGEN
Resource disparity for languages

The State and Fate of Linguistic Diversity and Inclusion in the NLP World (Joshi et al., ACL 2020)
Social factors

NLP is for people (not just languages)

The Importance of Modeling Social Factors of Language: Theory and Practice
(Hovy & Yang, NAACL 2021)
## Social bias in language models

<table>
<thead>
<tr>
<th>Models</th>
<th>Demographics Alignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>bert-base-cased</td>
<td>![Alignment Image]</td>
</tr>
<tr>
<td>bert-base-uncased</td>
<td>![Alignment Image]</td>
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<tr>
<td>bert-base-multilingual-cased</td>
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<tr>
<td>bert-large-cased</td>
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<tr>
<td>bert-large-uncased</td>
<td>![Alignment Image]</td>
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<tr>
<td>distilbert-base-uncased</td>
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</tr>
<tr>
<td>albert-base-v2</td>
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<tr>
<td>albert-large-v2</td>
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<td>albert-xxlarge-v2</td>
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<tr>
<td>roberta-large</td>
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<td>google/electra-large-generator</td>
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<td>gpt2-large</td>
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<tr>
<td>gpt2-xl</td>
<td>![Alignment Image]</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Group Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 3.4 4.0 6.1 6.1 8.1 8.1 9.2 9.8 9.9 10.3 10.3 10.8 11.1 12.0 13.8</td>
</tr>
</tbody>
</table>

### Sociolectal Analysis of Pretrained Language Models
(Zhang et al., EMNLP 2021)
Dimensions of culture

- Objectives and Values
- Linguistic Form and Style
- Common Ground
- Aboutness
Form 📬

How we express ourselves in language

Morphosyntax

Word choice

Style
Style

Stylistic aspects of linguistic form:

- Directness
- Formality
- Politeness
- Emotional expression
Levels of granularity

Linguistic and cultural variation within groups

<table>
<thead>
<tr>
<th>Idiolect</th>
<th>Sociolect, dialect</th>
<th>Standardised language</th>
<th>Language, language family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual, personality</td>
<td>Social group or region, sub-culture</td>
<td>Country, national culture</td>
<td>International cultures</td>
</tr>
</tbody>
</table>
Common ground

Shared knowledge based on which people reason and communicate
Common ground

Conceptualisation
Commonsense
Stories
Metaphors
Clichés
...
Conceptualisation

- Objects
- Colours
- Kinship
- Space
- Time
- Events
Objects

Swahili

leso

Visually Grounded Reasoning across Languages and Cultures
(Liu et al., EMNLP 2021)
Events and rituals

Visually Grounded Reasoning across Languages and Cultures
(Liu et al., EMNLP 2021)

Visual concepts include culture-specific activities that cannot be mapped across cultures.
Colour

World Colour Survey
Probing colour

English BERT aligns with English-speaking Americans. (What about others?)

Can Language Models Encode Perceptual Structure Without Grounding? A Case Study in Color
(Abdou et al., CoNLL 2021)
Differences in colour grounding

Nafaanra, a language of Ghana and Côte d’Ivoire

A. 1978 system  
B. 2018 system

The evolution of color naming reflects pressure for efficiency: Evidence from the recent past  
(Zaslavsky et al., Journal of Language Evolution 2022)
"Commonsense is the basic level of practical knowledge and reasoning concerning everyday situations and events that are commonly shared among most people."

*Commonsense Reasoning for Natural Language Processing*  
(Sap et al., ACL 2020 Tutorial)
Visual commonsense

Visually Grounded Reasoning across Languages and Cultures
(Liu et al., EMNLP 2021)
Some knowledge is "universal", other culture-specific

COMET: Commonsense Transformers for Automatic Knowledge Graph Construction
(Bosselut et al., ACL 2019)
Commonsense

Before a wedding, the bride...
- plans the wedding
- gets to know groom's family
- buys a dress

A funeral usually takes place...
- in church or a funeral home
- at cremation / funeral grounds
- at home

Towards an Atlas of Cultural Commonsense for Machine Reasoning
(Acharya et al., CSKGs 2021)
Knowledge bias in language models

“[X] was created in [Y]”

<table>
<thead>
<tr>
<th>Language</th>
<th>Country 1</th>
<th>Country 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>en</td>
<td>Japan (170), Italy (56)</td>
<td></td>
</tr>
<tr>
<td>de</td>
<td>Deutschland (217), Japan (70)</td>
<td></td>
</tr>
<tr>
<td>nl</td>
<td>Nederland (172), Italië (50)</td>
<td></td>
</tr>
<tr>
<td>it</td>
<td>Italia (167), Giappone (92)</td>
<td></td>
</tr>
</tbody>
</table>

The language of prompting affects the model's answer to prompts

Multilingual LAMA: Investigating Knowledge in Multilingual Pretrained Language Models (Kassner et al., EACL 2021)
Aboutness ❤️

What content do people care about?

• Related to topic/domain
Entities

USA & Europe are over-represented in datasets across languages.

Dataset Geography: Mapping Language Data to Language Users (Faisal et al., ACL 2022)
Values

Objectives and goals people strive for

• What is considered desired or desirable

Cultures and Organizations: Software of the Mind (Hofstede, 1991)
Why are we doing NLP?

• Users may have different goals, often implicit

No single correct answer.

Changing the World by Changing the Data (Rogers, ACL 2021)
Common meta-objectives in NLP

Accuracy, fairness, etc. reflect the values of NLP researchers

Square One Bias in NLP: Towards a Multi-Dimensional Exploration of the Research Manifold (Ruder et al., ACL 2022)
Conflicting objectives between stakeholders

- Researchers
- Practitioners
- End-users
- Affected communities
- Regulators

Transparent values facilitate adaptation and decision making
Language technology for all (potential) users

Local Languages, Third Spaces, and other High-Resource Scenarios (Bird, ACL 2022)

Benefit to all requires finding the intersection, particularly for local languages
Value bias in language models

For each of the following, indicate how important it is in your life. Would you say it is (read out and code one answer for each):

<table>
<thead>
<tr>
<th></th>
<th>Very important</th>
<th>Rather important</th>
<th>Not very important</th>
<th>Not at all important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>Family</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Q2</td>
<td>Friends</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Q3</td>
<td>Leisure time</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Q4</td>
<td>Politics</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Q5</td>
<td>Work</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Q6</td>
<td>Religion</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Probing Pre-Trained Language Models for Cross-Cultural Differences in Values (Arora et al., 2022)
Value bias in language models

The Ghost in the Machine has an American accent: value conflict in GPT-3

(Jo~nson et al., 2022)

Die allermeisten von uns kennen den Zustand völliger Erschöpfung auf der Flucht, verbunden mit Angst um das eigene Leben oder das Leben der Kinder oder der Partner, zum Glück nicht. Menschen, die sich zum Beispiel aus Eritrea, aus Syrien oder dem Nordirak auf den Weg machen, müssen oft Situationen überwinden oder Ängste aushalten, die uns wahrscheinlich schlichtweg zusammenbrechen ließen. Deshalb müssen wir beim Umgang mit Menschen, die jetzt zu uns kommen, einige klare Grundsätze gelten lassen. Diese Grundsätze entstammen nicht mehr und nicht weniger als unserem Grundgesetz, unserer Verfassung.

Values are altered
to reflect US culture

(translation)

“1. I am in favor of limiting immigration.
2. I am in favor of limiting immigration for humanitarian reasons.
3. I am in favor of limiting immigration for economic reasons.”

GPT-3 summarise
Strategies

Existing and potential ways to address the challenges

DATA   MODELS   TASKS
Data

Selection    Annotation    Projection

Culture-sensitive curation
Culturally diverse collection
Native data or culturally sensitive translation
Models

Training  Transfer  Pre-training

Robust optimisation

Balanced sampling

Measuring cultural bias
Robust optimisation

Minimax and Neyman–Pearson Meta-Learning for Outlier Languages (Ponti et al., Findings 2021)
Robust optimisation does not always work

On Language Models for Creoles
(Lent et al., CoNLL 2021)
Tasks

Cross-cultural translation

"I saw Merkel eating a Berliner from Dietsch on the ICE"

I saw Biden eating a Boston Cream from Dunkin’ Donuts on the Acela

Adapting Entities across Languages and Cultures
(Peskov et al., Findings 2021)

Style transfer

Entity adaptation

Explanation by analogy
Multi-granularity adaptation

Jury Learning: Integrating Dissenting Voices into Machine Learning Models
(Gordon et al., CHI 2022)
Summary

- NLP is for people (not just languages)
- Culture is multidimensional
- Objectives may be in conflict
- Generalisation-representation trade-off

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