Wonders and Mysteries of Multilingual Language Models

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ISIR — CNRS and Sorbonne Université

Workshop DataIA - ILLS @ CentraleSupélec

Multilingual Natural Language Processing

Computational Language Documentation

(Bayesian) Probabilistic Models

S. Okabe, P. Godard, L. Besacier

Retrieval Augmented MT

Non Autoregressive MT (LevT), imitation learning

J. Grego, J. Xu, M. Bouthors

Multidomain MT

Adapters, curriculum / sampling policy learning

P.M. Quang, J. Crego

Interacting with bitexts

Alignment & edit-based models

P. Cubaud, J. Crego, A.K Ngo-Ho, J. Xu

MT for Open Science

Integrating Terminology & Phraseology in NMT

S. Abdul-Rauf, R. Bawden, N. Kübler, etc

Multilingual LLMs

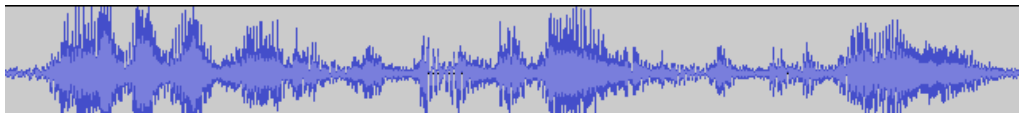
X-lingual Transfer, Probing & Metrics

G. Wisniewski, H. Schütze, A. Imani, M. Sabet, etc.

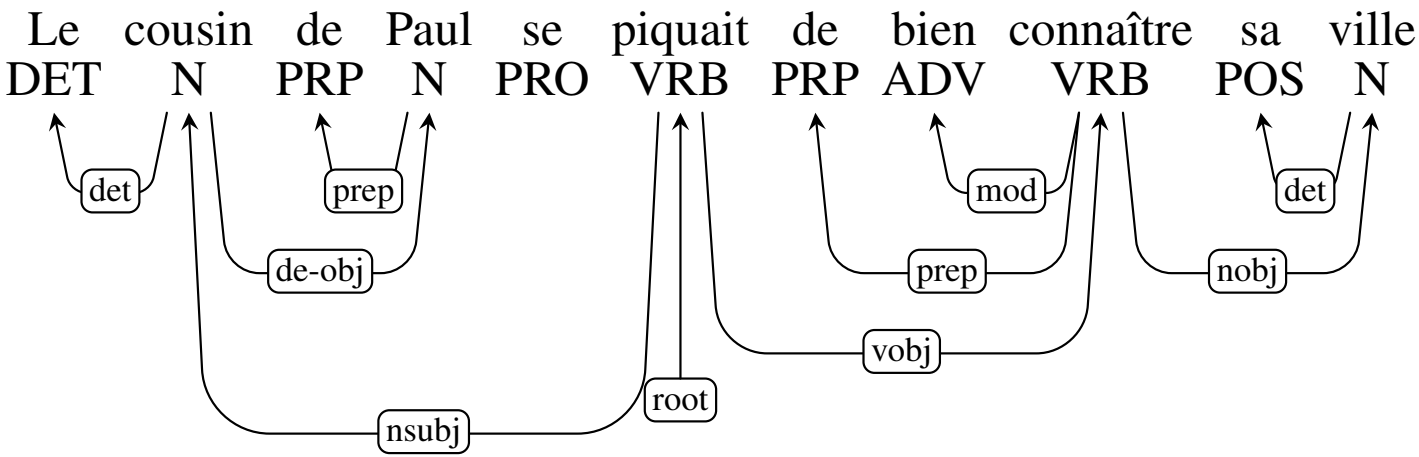
☞ details `fyvo.github.io`

Natural Language Processing : the Data-Based Revolution

Issues in Linguistic Analysis



lə ‖kuzɛ̃‖dø‖ pol ‖ sə ‖ pikɛ ‖ də ‖ bjɛ̃ ‖ ø ːdə ø ːdə ‖ bjɛ̃ ‖ konɛtrə ‖ sa ‖ vil



(sp / se-piquer-de-1
: ARG0 (c / cousin)
: ARG1 (k / connaitre-2
: ARG0 (c)
: ARG1 (v /ville))
)

Cousin ?

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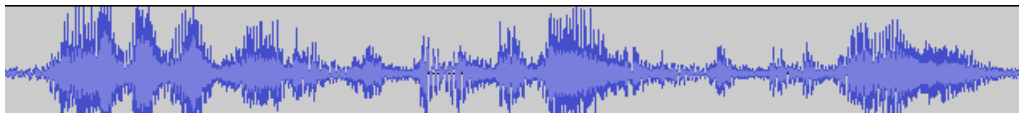

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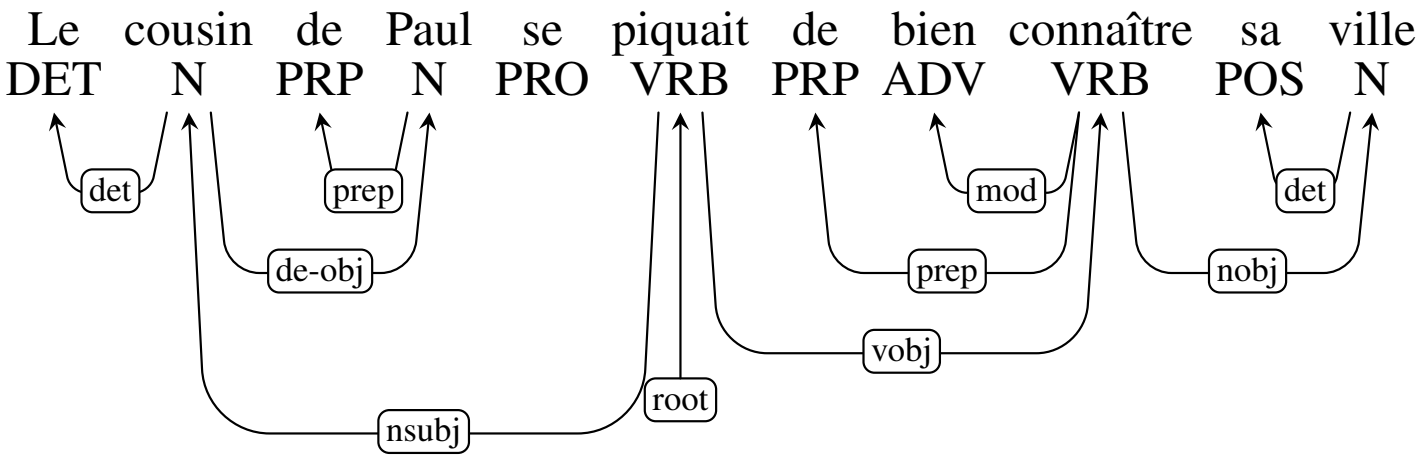

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Natural Language Processing : the Data-Based Revolution

Downstream Applications

- **text analysis** : information retrieval and classification, question-answering, spell checking, information extraction, NLU, etc
- **text generation** : machine translation, summarization, dialog, TTS, etc

Natural Language Processing : the Data-Based Revolution

Processing Sequences of Symbols with Hidden Structure

Input	$\boldsymbol{w} = w_1 \ldots w_T \in \Sigma_1^T$
	w_t : *a phoneme, a letter, a morpheme, a word, a sentence*
Output	$\boldsymbol{y} \in \Sigma_2$: *sequence classification*
	y : *filter, topic, polarity, language, author*
Output	$\boldsymbol{y} \in \Sigma_2^T$: *sequence labelling*
	y_t : *PoS, feature, bracketing, etc*
Output	$\boldsymbol{y} \in \Sigma_2^*$: *sequence transduction*
	$\boldsymbol{y}$: *transcription, translation, answer, correction, summary, etc*
Output	$\boldsymbol{y} \in \mathcal{G}$: *sequence parsing*
	$\boldsymbol{y}$: *morphological or syntactic tree, semantic graph, discourse tree*

- Ambiguous or unobserved boundaries
- Ubiquitous ambiguity of basic units w_t
- Structural constraints over possible $\boldsymbol{x}, \boldsymbol{y}$ (unobserved)
- Internal structure within Σ_1 and Σ_2 (unobserved)
- Masive variabilty of data distribution (domain, genre, style, register)

Natural Language Processing : the Data-Based Revolution

The "Unreasonable Effectiveness" of Supervised Learning in NLP (1993-)

There is nothing but tabular data

sent_id = fr_partut-ud-184
text = *La sécurité des transports a trop fait l'actualité ces derniers temps* :

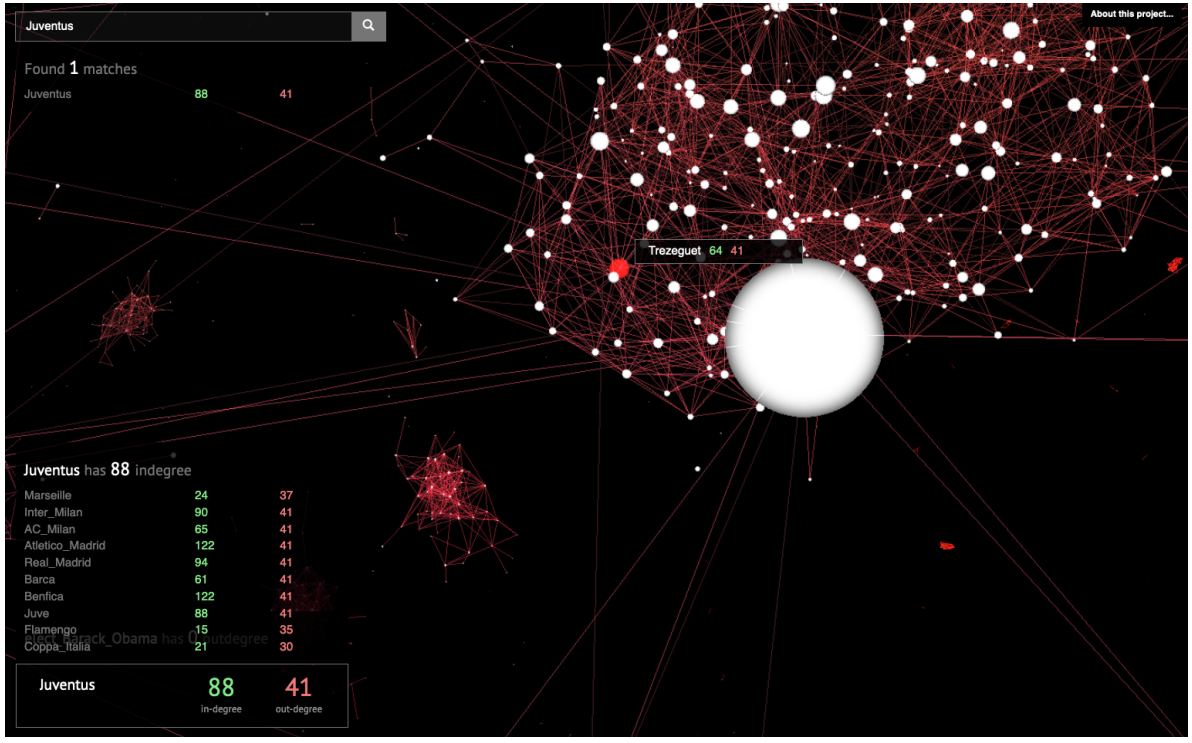
1	La	le	DET	RD	Def=Def|Gdr=Fem|Num=Sing|PronType=Art
2	sécurité	sécurité	NOUN	S	Gdr=Fem|Num=Sing
3-4	des	_	_	_	_
3	de	de	ADP	E	_
4	les	le	DET	RD	Def=Def|Num=Plur|PronType=Art
5	transports	transport	NOUN	S	Gdr=Masc|Num=Plur
6	a	avoir	AUX	VA	Mood=Ind|Num=Sing|Person=3|Tense=Pres
7	trop	trop	ADV	B	
8	fait	faire	VERB	V	Gdr=Masc|Num=Sing|Tense=Past|VbForm=Part
9	l'	le	DET	RD	Def=Def|Num=Sing|PronType=Art
10	actualité	actualité	NOUN	S	Gdr=Fem|Num=Sing
11	ces	ce	DET	DD	Num=Plur|PronType=Dem
12	derniers	dernier	ADJ	NO	Gdr=Masc|Num=Plur|NumType=Ord
13	temps	temps	NOUN	S	Gdr=Masc
14	:	:	PUNCT	FC	_

Picking "low-hanging fruits" with simple learners (classifiers, sequence learning)

Monolingual Pretrained Language Models are Powerful

Modern Lexical Representations : Word Embeddings

Map words w_t in context c onto vector-space representations x as $x = f_{\boldsymbol{\theta}}(w_t; c)$.
$f_{\boldsymbol{\theta}}()$ is a neural net eg. Transformer [Vaswani et al., 2017] with parameters $\boldsymbol{\theta}$.



The structure of word spaces : related words are close

Monolingual Pretrained Language Models are Powerful

Learning θ

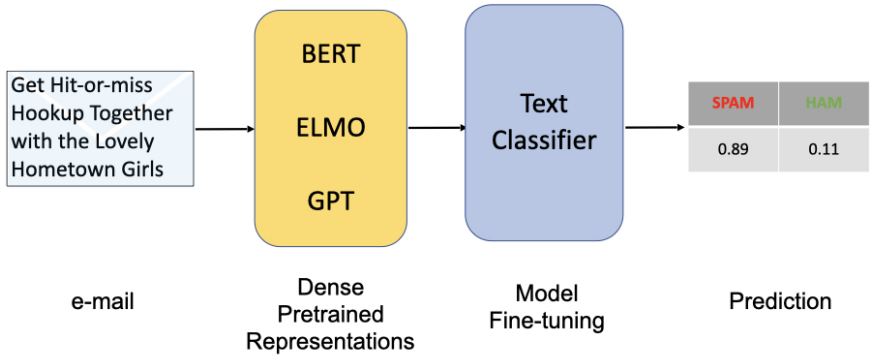
Gigantic collections of texts, simple auxiliary tasks with natural annotations

1. Predict next word given prefix : pure decoder
   Longtemps je me suis couché [mask] ... $\Rightarrow$ train $P_{\theta}(w_t|w_{<t})$
   GPT-2 [Radford et al., 2019], OPT [Zhang et al., 2022], GPT-J [Wang and Komatsuzaki, 2021], etc
2. Predict missing word given bidirectional context : pure encoder
   Longtemps je me suis couché de [mask] bonne heure. $\Rightarrow$ train $P_{\theta}(w_t|w_{-t})$
   BERT [Devlin et al., 2019], Roberta [Liu et al., 2019], CamemBERT [Martin et al., 2020] etc.
3. Denoising sequence to sequence : encoder-decoder
   Longtemts je couché suis de bnone || Longtemps je me suis couché de bonne heure.
   $\Rightarrow$ train $P_{\theta}(w|\tilde{w})$
   BART [Lewis et al., 2020], T5 [Raffel et al., 2020], etc.

Monolingual Pretrained Language Models are Powerful

Using θ

1. Learn + fine-tune task-adapted model $h_{\phi,\theta}(w;c) = h_{\phi}(f_{\theta}(w;c))$



2. With causal LMs, multi-purpose text generation via prompting

GEN Of course. In Chorukor, Monday is ilopagar, Tuesday ilopager, . . .
Wednesday ilopagur, Thursday ilopagir ...

Q&A Answer this : What are the birth date and place of Ludvík Vaculík ? . . .
23 July 1926, in Brumov, Moravia

SA "This Czech writer has written some the most wonderful French novels."
is a positive comment ? . . . [Yes | No]

Monolingual Pretrained Language Models are Powerful

Using θ

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☺ LM pre-training is mostly unsupervised

☺ Instructions can be learned or fine-tuned

☺ Extremely successful for "high resource" languages

☹ Annotation, corpus and model size matter

Monolingual Pretrained Language Models are Powerful

Using $\boldsymbol{\theta}$

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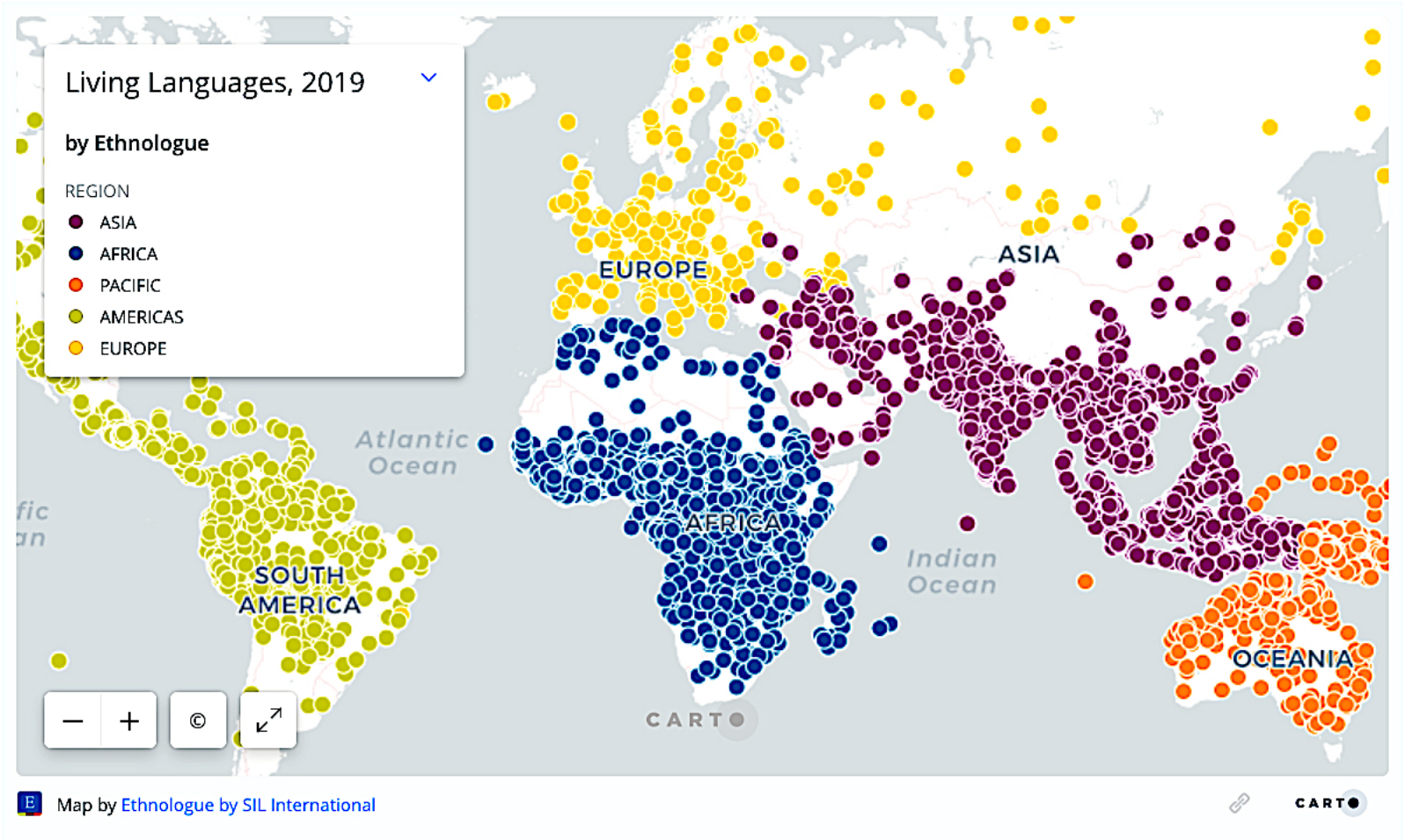
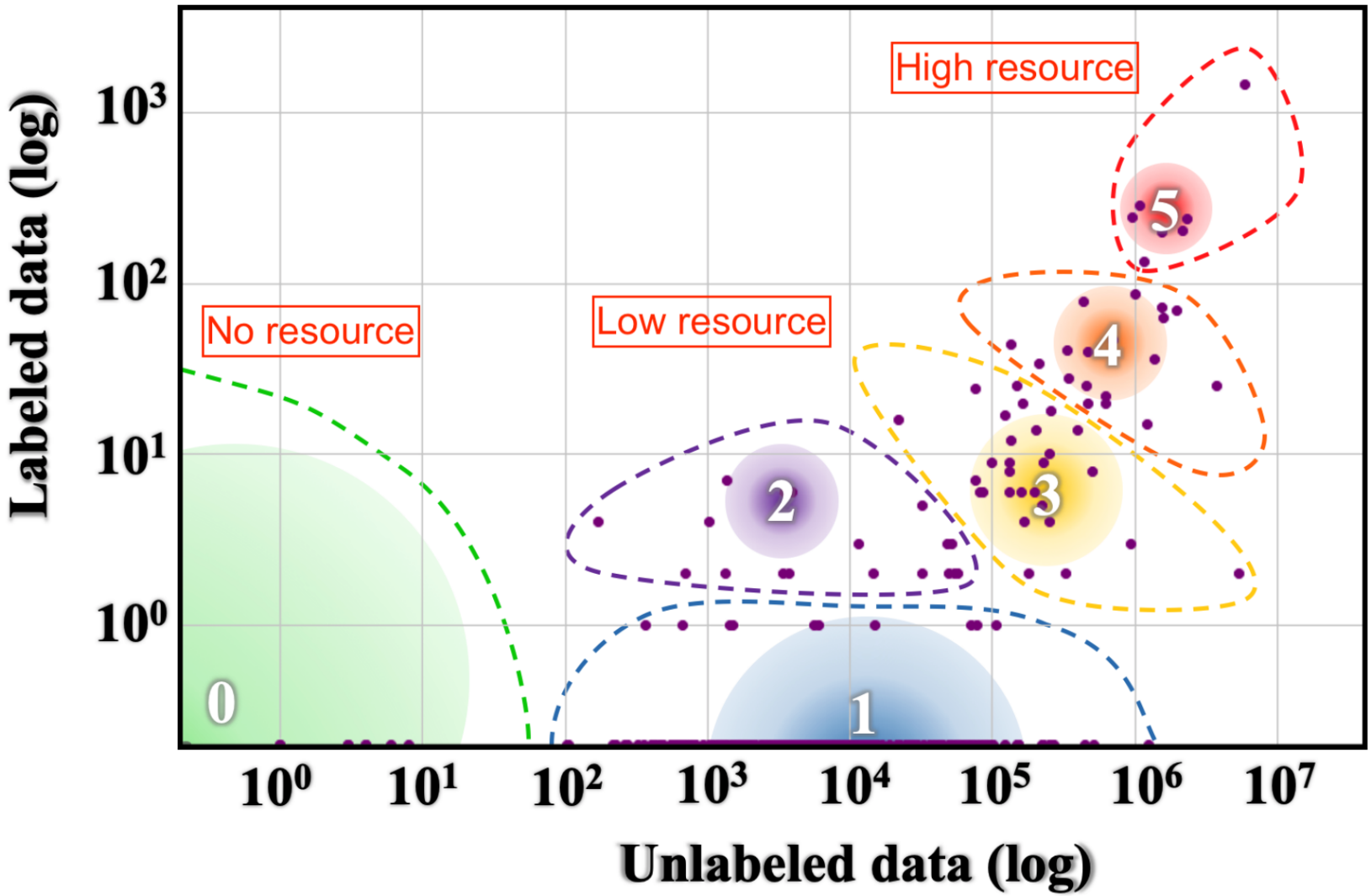
So Many Languages, most of them “Low-Resource”



So Many Languages, most of them “Low-Resource”



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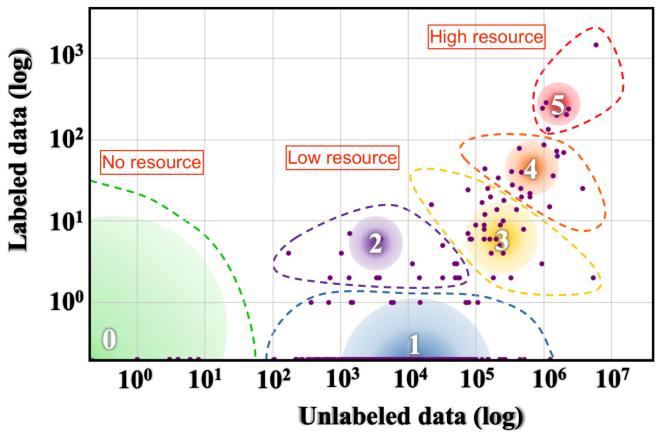


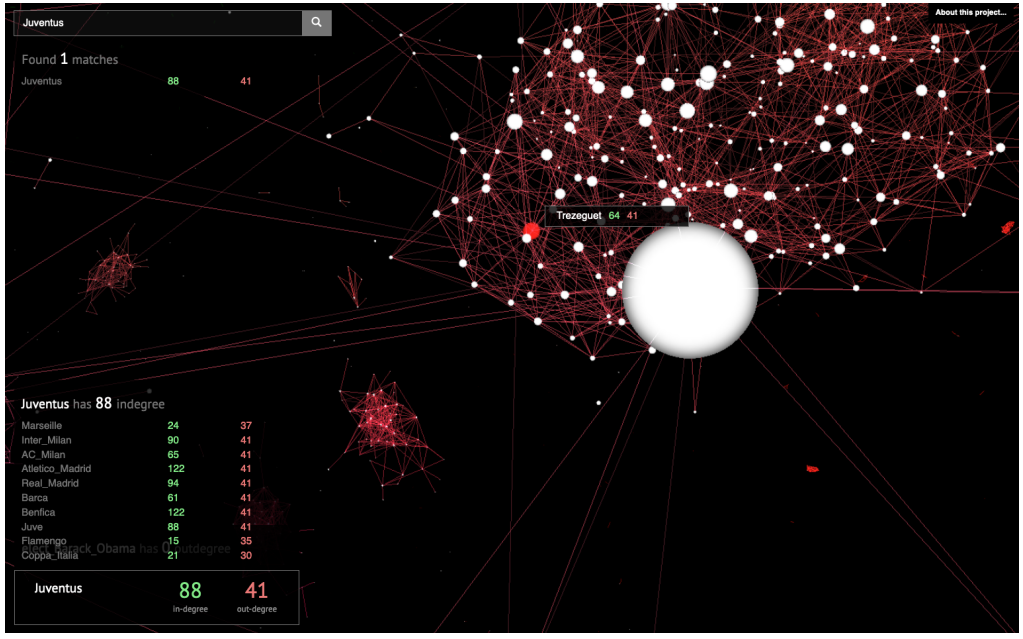
Cls	Example languages	#Lang	#Spkr	% Lang
0	Dahalo, Warlpiri, Popoloca, Wallisian, Bora	2191	1.2B	88.38%
1	Cherokee, Fijian, Greenlandic, Bhojpuri, Navajo	222	30M	5.49%
2	Zulu, Konkani, Lao, Maltese, Irish	19	5.7M	0.36%
3	Indonesian, Ukranian, Cebuano, Afrikaans, Hebrew	28	1.8B	4.42%
4	Russian, Hungarian, Vietnamese, Dutch, Korean	18	2.2B	1.07 %
5	English, Spanish, German, Japanese, French	7	2.5B	0.28%

Data and analysis from [Joshi et al., 2020]

Multilingual Pretrained Language Models - mPLMs

Multilingual Lexical Representations : Word Embeddings

Map words w onto vector-space representations x in context c as $x = f_{\boldsymbol{\theta}}(w; c)$
$f_{\boldsymbol{\theta}}()$ a complex neural net with parameters $\boldsymbol{\theta}$.



Neighbours should be semantically similar **cross-linguistically**

Multilingual Pretrained Language Models - mPLMs

Multilingual representations of texts

_Tous _les _être s _humain s _na issent _libre s _et _ég aux _en _digni té _et _en _droits . _Ils _sont _do u és _de _raison _et _de _conscience _et _doivent _agir _les _uns _en vers _les _autres _dans _un _ esprit _de _frater n ité .
_Všichni _lidé _rod í _se _svobod ní _a _sobě _rov ní _co _do _d ů stoj nosti _a _práv . _Jsou _na dán i _rozum em _a _s vědomí m _a _mají _spolu _jedna t _v _du chu _brat r ství .
_Tutti _gli _esse ri _umani _na scono _liberi _ed _e gu ali _in _digni tà _e _diritti . _Es si _sono _do tati _di _ragione _e _di _coscienza _e _devono _agir e _gli _uni _verso _gli _altri _in _spirito _di _fra tella nza .

Low-level, language independent segmentations

Multilingual Pretrained Language Models - mPLMs

Multilingual representations of texts

_Tous _les _être s _humain s _na issent _libre s _et _ég aux _en _digni té _et _en _droits . _Ils _sont _do u és _de _raison _et _de _conscience _et _doivent _agir _les _uns _en vers _les _autres _dans _un _ esprit _de _frater n ité .
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Low-level, language independent segmentations

Multilingual Pretrained Language Models - mPLMs

Learning multilingual θ

Multilingual Mixtures of corpora, simple auxiliary tasks with natural annotations :

1. Predict next word given prefix : pure decoder.
   mGPT [Shliazhko et al., 2022], XGLM [Lin et al., 2021], etc
2. Predict missing word given full context : pure encoder.
   mBERT [Devlin et al., 2019], XLM-R [Conneau et al., 2020]
3. Denoising sequence to sequence : encoder-decoder
   mBART50 [Liu et al., 2020b], mT5 [Xue et al., 2020], etc

+ Complementary objectives to bridge between languages :
parallel corpora, bilingual dictionaries, synthetic code-switched data [Conneau et al., 2020, Chi et al., 2021], etc.

Multilingual Pretrained Language Models - mPLMs

Using multilingual θ

1. Learn / fine-tune task-adapted model $h_{\phi,\theta}(w;c) = h_{\phi}(f_{\theta}(w;c))$ on L_1, perform zero-shot X-lingual transfer to L_2
2. Multilingual text generation with prompting

Translate into English

" By the end of the year, we will have seven new pharmacists. " :

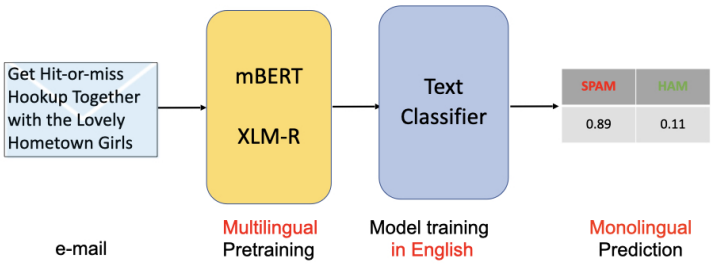
D'ici la fin de l'année, nous aurons sept nouveaux pharmaciens.

☺ Hardly more difficult than monolingual

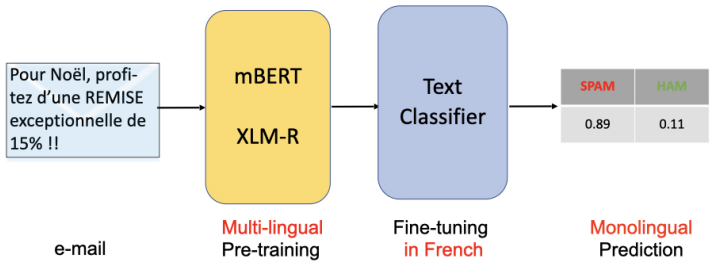
☺ Bring low resource languages up to steam

The effectiveness of multilingual PLMs

One model handling multiple languages



English spam filter

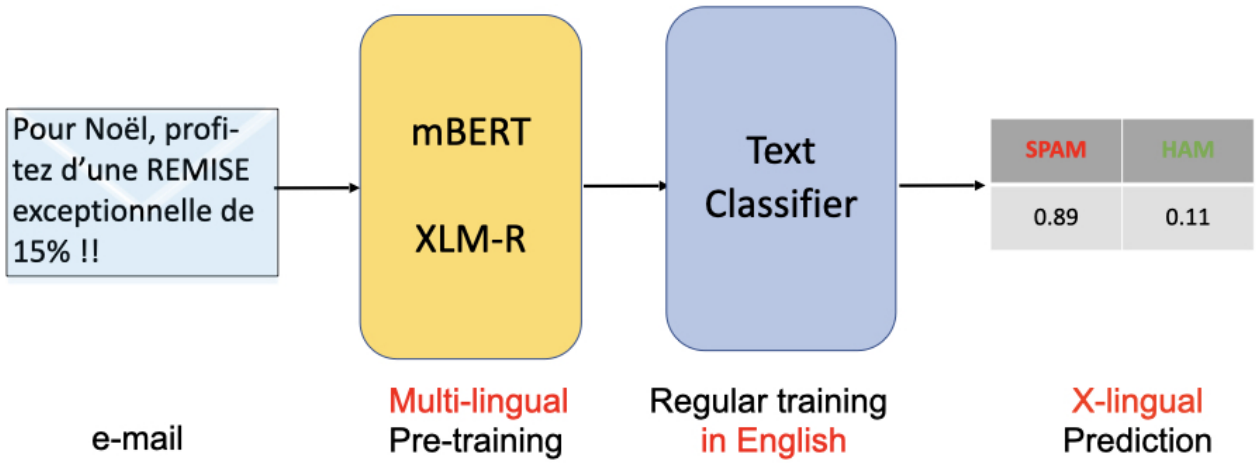


French spam filter

Effective for many languages / tasks [Pires et al., 2019, Wu and Dredze, 2020]

The effectiveness of multilingual PLMs

Knowledge transfer between languages

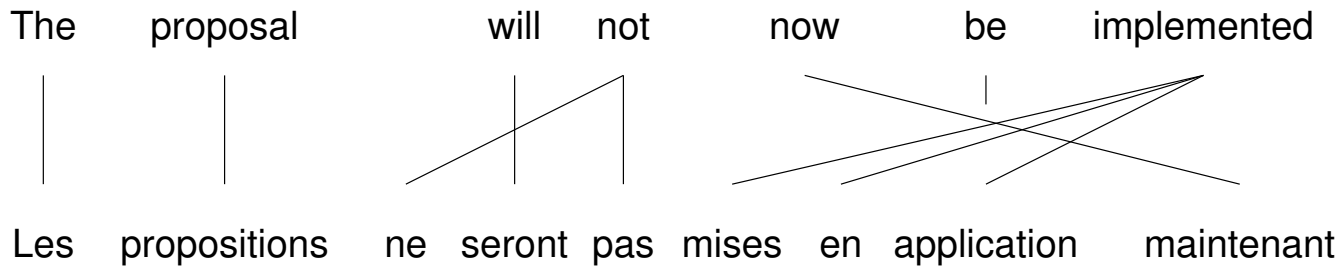


Multilingual zero-shot spam filter

- ☺ No foreign training data required
- ☺ Effective for many languages and tasks : X-GLUE [Liang et al., 2020]
  X-TREME+ [Hu et al., 2020, Ruder et al., 2023]

The effectiveness of multilingual PLMs

Multilingual Embeddings Align Lexical Representations



- Word Alignment = Bipartite Graph
- Multilingual embeddings + graph algorithms = unsupervised alignments
- Aligns code-switching and multilingual texts
- Also : unsupervised sentence alignments

	ENG-CES		ENG-DEU		ENG-FAS	
Method	F_1	AER	F_1	AER	F_1	AER
IBM2	.76	.25	.71	.29	.57	.43
IBM4	.75	.26	.77	.23	.51	.49
eflomal	.85	.15	.77	.23	.61	.39
fastText	.70	.30	.60	.40	.50	.50
mBERT[8]	**.87**	**.13**	**.79**	**.21**	.67	.33
XLM-R[8]	**.87**	**.13**	**.79**	**.21**	**.70**	**.30**

Word alignment, Argmax method

Jalili Sabet et al. [2020]

The effectiveness of multilingual PLMs

Unsupervised Alignments in Large Scale Evaluation

Glot-500 [ImaniGooghari et al., 2023] : a multilingual (XML-type) model for 500 languages

- New challenges
  - data selection and filtering
  - language identification at scale
- New evaluation methods
  - Round trip alignment
  - Sentence retrieval

Language-Script	XLM-R-B	XLM-R-L	Glot500-m	Language-Script	XLM-R-B	XLM-R-L	Glot500-m	Language-Script	XLM-R-B	XLM-R-L	Glot500-m
efi_Latn	2.55	3.25	**6.23**	mfe_Latn	3.61	4.19	**6.26**	toi_Latn	3.19	4.10	**4.31**
ell_Grek	2.79	3.38	**4.77**	mgh_Latn	2.78	3.28	**3.48**	toj_Latn	1.43	1.84	**2.25**
eng_Latn	4.02	4.49	**6.39**	mgr_Latn	3.32	4.06	**6.39**	ton_Latn	2.01	2.64	**3.63**
enm_Latn	3.77	4.60	**7.19**	mhr_Cyrl	2.75	3.28	**5.32**	top_Latn	1.56	2.16	**2.19**
epo_Latn	4.01	4.83	**5.88**	min_Latn	2.62	3.05	**3.78**	tpi_Latn	2.44	2.71	**5.96**
est_Latn	4.34	5.24	**8.21**	miq_Latn	2.23	3.13	**4.12**	tpm_Latn	2.79	3.39	**4.67**
eus_Latn	3.12	3.80	**4.19**	mkd_Cyrl	3.99	4.54	**7.37**	tsn_Latn	2.82	3.12	**4.63**
ewe_Latn	2.22	2.67	**4.74**	mlg_Latn	3.34	3.81	**6.33**	tso_Latn	2.40	3.05	**5.00**
fao_Latn	3.85	4.62	**5.75**	mlt_Latn	2.94	3.57	**4.87**	tsz_Latn	2.68	3.14	**4.20**
fas_Arab	4.54	4.48	**7.00**	mos_Latn	2.71	3.24	**4.25**	tuc_Latn	1.43	1.83	**2.36**
fij_Latn	2.81	3.17	**4.94**	mps_Latn	1.50	1.65	**3.05**	tui_Latn	2.47	2.83	**4.53**
fil_Latn	3.26	3.92	**4.80**	mri_Latn	2.81	3.44	**5.49**	tuk_Cyrl	2.74	3.68	**4.33**
fin_Latn	4.06	5.19	**6.03**	mrw_Latn	2.69	3.24	**4.58**	tuk_Latn	2.43	3.23	**4.74**
fon_Latn	1.63	1.89	**3.70**	msa_Latn	3.17	3.50	**5.38**	tum_Latn	3.41	4.13	**6.15**
fra_Latn	3.19	3.97	**5.08**	mwm_Latn	1.74	1.99	**3.20**	tur_Latn	5.18	4.86	**7.45**
fry_Latn	3.36	3.99	**4.52**	mxv_Latn	1.75	2.11	**2.31**	twi_Latn	3.05	4.06	**6.70**
gaa_Latn	2.74	3.26	**6.01**	mya_Mymr	1.54	1.53	**2.46**	tyv_Cyrl	2.31	2.83	**3.33**
gil_Latn	2.76	3.20	**4.50**	myv_Cyrl	2.90	3.42	**4.46**	tzh_Latn	2.16	2.50	**3.08**
giz_Latn	3.00	3.43	**5.40**	mzh_Latn	2.62	3.02	**4.10**	tzo_Latn	2.01	2.29	**2.77**
gkn_Latn	1.93	2.07	**3.31**	nan_Latn	1.99	2.51	**2.56**	udm_Cyrl	2.90	3.48	**4.72**
gkp_Latn	1.88	2.25	**3.40**	naq_Latn	2.42	3.15	**4.41**	uig_Arab	2.58	3.11	**3.61**
gla_Latn	2.90	3.48	**3.61**	nav_Latn	1.75	2.10	**2.71**	uig_Latn	2.26	2.76	**3.79**
gle_Latn	3.52	4.24	**4.49**	nbl_Latn	3.09	3.87	**4.85**	ukr_Cyrl	5.71	5.96	**7.47**
glv_Latn	2.76	3.38	**4.45**	nch_Latn	2.18	2.74	**3.32**	urd_Arab	1.88	2.88	**3.96**
gom_Latn	3.05	3.59	**4.40**	ncj_Latn	2.64	3.40	**3.69**	urd_Latn	2.29	2.97	**3.03**
gor_Latn	2.26	2.73	**3.71**	ndc_Latn	3.32	3.85	**6.67**	uzb_Cyrl	2.73	3.26	**7.24**
grc_Grek	1.11	2.00	**2.93**	nde_Latn	4.00	4.60	**6.05**	uzb_Latn	3.32	3.98	**5.91**
guc_Latn	1.46	1.80	**2.23**	ndo_Latn	3.21	3.85	**5.61**	uzn_Cyrl	2.61	3.06	**5.86**
gug_Latn	2.60	3.23	**4.70**	nds_Latn	2.98	3.69	**4.70**	ven_Latn	2.96	3.64	**5.34**
guj_Gujr	3.18	4.15	**4.38**	nep_Deva	3.02	2.97	**6.31**	vie_Latn	3.99	4.48	**6.69**
gur_Latn	2.14	2.59	**3.22**	ngu_Latn	1.86	2.34	**3.39**	wal_Latn	2.87	3.65	**4.24**
guw_Latn	2.18	2.54	**4.56**	nia_Latn	2.75	**3.47**	3.24	war_Latn	3.04	3.74	**5.43**
gya_Latn	1.94	2.25	**4.63**	nld_Latn	2.81	3.63	**4.90**	wbm_Latn	2.44	2.86	**6.53**
gym_Latn	1.44	1.78	**2.63**	nmf_Latn	3.30	4.27	**5.05**	wol_Latn	3.47	4.48	**6.10**
hat_Latn	3.21	3.64	**6.39**	nnb_Latn	2.46	3.14	**4.08**	xav_Latn	0.87	1.03	**1.12**
hau_Latn	3.69	4.24	**6.31**	nno_Latn	3.90	4.61	**7.41**	xho_Latn	3.61	4.27	**5.90**
haw_Latn	2.25	2.63	**3.55**	nob_Latn	3.88	4.81	**5.83**	yan_Latn	2.95	3.35	**5.59**
heb_Hebr	1.85	2.41	**3.92**	nor_Latn	3.31	4.14	**5.82**	yao_Latn	2.01	2.66	**3.87**
hif_Latn	2.90	3.43	**3.60**	npi_Deva	3.29	3.30	**5.93**	yap_Latn	2.86	3.41	**3.45**
hil_Latn	2.92	3.48	**4.88**	nse_Latn	3.29	4.06	**5.74**	yom_Latn	3.25	4.00	**5.17**
hin_Deva	3.39	3.80	**5.13**	nso_Latn	3.06	3.92	**5.51**	yor_Latn	2.24	2.68	**3.88**
hin_Latn	2.94	3.20	**4.77**	nya_Latn	2.76	**3.19**	**5.96**	yua_Latn	2.04	2.26	**2.86**
hmo_Latn	2.43	2.70	**6.12**	nyn_Latn	2.77	3.50	**5.59**	yue_Hani	2.37	**3.19**	2.95
hne_Deva	2.48	2.53	**4.95**	nyy_Latn	2.21	2.74	**2.95**	zai_Latn	3.22	3.76	**5.21**
hnj_Latn	2.14	2.53	**4.28**	nzi_Latn	2.09	2.70	**4.20**	zho_Hani	2.77	4.38	**5.03**
hra_Latn	3.32	3.86	**5.19**	ori_Orya	2.73	2.77	**3.92**	zlm_Latn	4.39	5.15	**7.54**
hrv_Latn	4.14	5.24	**7.02**	ory_Orya	3.27	3.20	**4.39**	zom_Latn	3.65	4.45	**5.36**
hui_Latn	1.84	2.10	**3.47**	oss_Cyrl	2.20	2.52	**5.85**	zsm_Latn	4.49	5.07	**8.83**
hun_Latn	4.54	4.10	**5.62**	ote_Latn	1.89	2.23	**2.66**	zul_Latn	3.67	4.39	**5.44**
hus_Latn	1.70	2.00	**2.42**	pag_Latn	2.93	3.44	**4.56**				

Table 22: Accuracy of XLM-R-B, XLM-R-L, and Glot500-m on Round Trip Alignment (Part II).

Round Trip alignments, Part II

From 100^2 to 500^2 unsupervised word alignments

The effectiveness of multilingual PLMs

Multilingual Text Generation

If the French says : Ça n'arrête pas, nous sommes bien placés pour le savoir...

then the English should say : It doesn't stop, we know that well...

Model	En-Fr	Fr-En
GPT-2 [1,5b] [Radford et al., 2019]	5	11.5
GPT-3 [175b] [Brown et al., 2020]	21.2	25.2
PALM [540B] [Chowdhery et al., 2022]	38.5	41.1
BLOOM [176B] [BigScience et al., 2022]	??	??
SOTA [Liu et al., 2020a]	44.1	-

Closing the gap with well trained bilingual MT, really ?

The effectiveness of multilingual PLMs

Understanding MT performance of BLOOM

- Methods :
  - Multiple prompts, in multiple languages
  - 3 datasets and tasks
  - Dozens of language pairs (H-H, L-H, L-L)
  - Multiple metrics
- Main takeaways
  - a call for clarity when reporting results
  - the failures of 0-shot learning, “language hallucinations”
  - "Free-rider effects” and language similarities
  - poor MT quality for LR languages

Src ↓	Trg →	ar	en	es	fr	zh
ar	BLOOM	–	40.3	23.3	33.1	17.7
	M2M	–	25.5	16.7	25.7	13.1
en	BLOOM	28.2	–	29.4	45.0	26.7
	M2M	17.9	–	25.6	42.0	19.3
es	BLOOM	18.8	32.7	–	24.8	20.9
	M2M	12.1	25.1	–	29.3	14.9
fr	BLOOM	23.4	45.6	27.5	–	23.2
	M2M	15.4	37.2	25.6	–	17.6
zh	BLOOM	15.0	30.5	20.5	26.0	–
	M2M	11.6	20.9	16.9	24.3	–

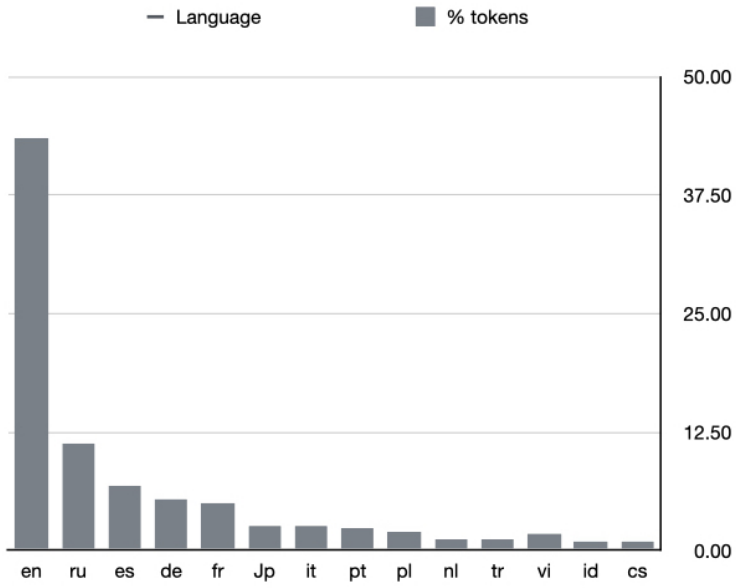
(a) High-resource language pairs.

Src ↓	Trg →	en	fr	hi	id	vi
en	BLOOM	–	45.0	27.2	39.0	28.5
	M2M	–	42.0	28.1	37.3	35.1
fr	BLOOM	45.6	–	18.5	31.4	32.8
	M2M	37.2	–	22.9	29.1	30.3
hi	BLOOM	35.1	27.6	–	–	–
	M2M	27.9	25.9	–	–	–
id	BLOOM	43.2	30.4	–	–	–
	M2M	33.7	30.8	–	–	–
vi	BLOOM	38.7	26.8	–	–	–
	M2M	29.5	25.8	–	–	–

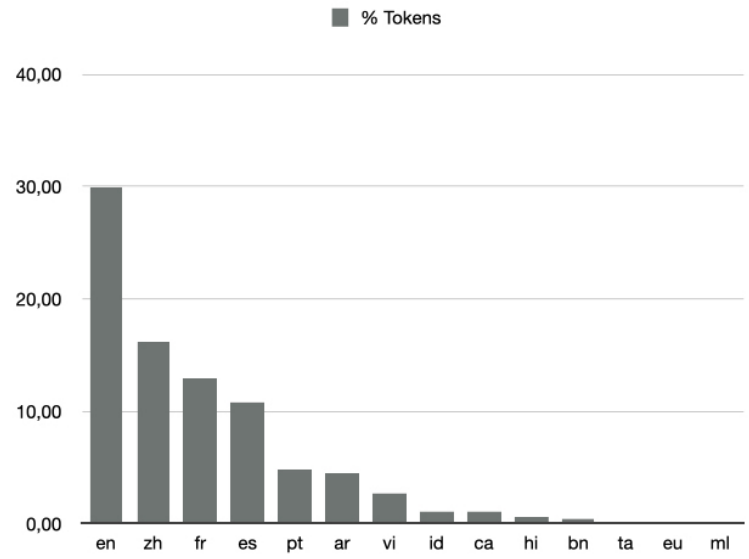
(b) High→mid-resource language pairs.

The effectiveness of multilingual PLMs

Caveats



Languages in mT5
(104 languages)



Languages in Bloom
(59 languages)

- ☹ English centric
- ☹ Poorly documented, hard to reproduce – what is a language anyway ?

What we would like to know

Why can this work ?

- Lexical overlap not necessary

  L1 : Longtemps je me suis couché de bonne heure .
  L2 : Mpohufnqt kf nf tvjt dpvdiê ef cpoof ifvsf !

- Transfer breaks with reversal or words shuffle

  L1 :Longtemps je me suis couché de bonne heure .
  L2 :. heure bonne de douché suis me je longtemps

- Vocabulary alignment helps
- Language typological similarity helps

Analyses in [K et al., 2020, Dufter and Schütze, 2020, Deshpande et al., 2022, ImaniGooghari et al., 2023], etc

What we would like to know

Why can this work ?

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- Vocabulary alignment helps
- Language typological similarity helps

Analyses in [K et al., 2020, Dufter and Schütze, 2020, Deshpande et al., 2022, ImaniGooghari et al., 2023], etc

? Impact of language distributions
? Impact of model size
? Impact of number of languages - curse of multilinguality
? Which linguistic properties help / break X-lingual transfer
? Metrics for “coverage”

What we would like to know

Can mPLMs handle truely multilingual texts ?

? Generate code-switched output

> Et le premier ministre nous répond que *a farmer is a farmer a Canadian is a Canadian* d'un bout à l'autre du Canada.
> Autrement dit *they are getting out of the closet* parce que cela leur donne le droit d avoir deux enfants.

(Exemples from [Carpuat, 2014])

? Generate text with multilingual prompts

Přeložit do angličtiny : Ça n'arrête pas, nous sommes bien placés pour le savoir... ; :

It doesn't stop, we know that well...

? Answer questions X-linguistically

? Generate summaries from multilingual sources

Take Aways

Large mPLMs serve practical purposes

They learn linguistic features

They display amazing emerging properties

Multilingual models also useful in MT, parsing, etc

They improve technological support for many languages [Ruder et al., 2023]

They remain poorly understood

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