Processing Code-Mixed Text

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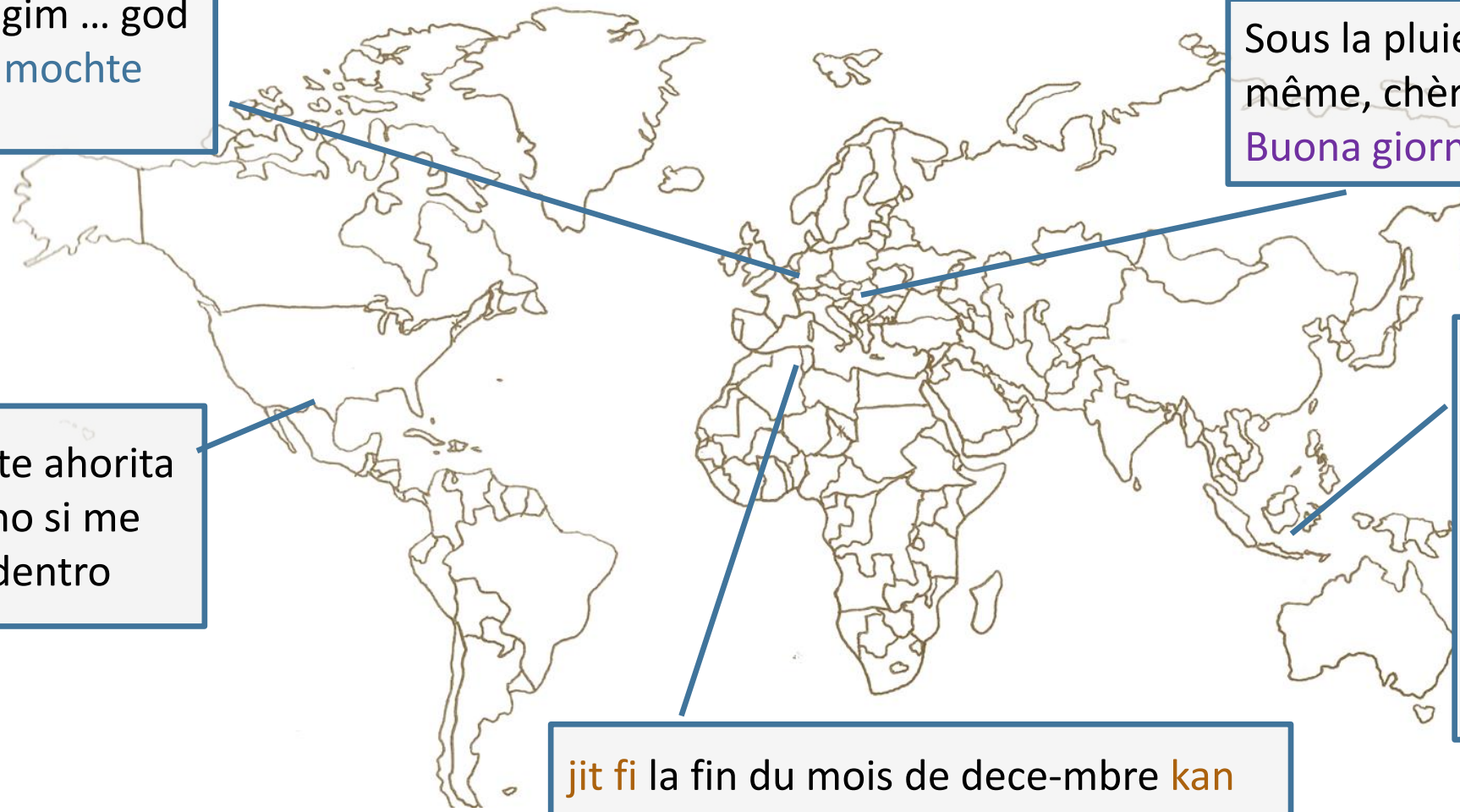
Code-mixing or *Code-Switching* is the mixing of two or more languages in a conversation or even an utterance.



Kibrisa geldigim … god warum? ich mochte nicht hier

Sous la pluie mais beau tout de même, chère Ileana! Buona giornata a te e a tutti!

no me lebante ahorita cuz I felt como si me kemara por dentro

Coridel Ent merilis full tracklist untuk debut mini album Jessica Jung yg akan segera rilis bulan Mei mendatang

jit fi la fin du mois de dece-mbre kan ljaw bared ktir wttalj

Outline of the tutorial

- Importance of code-mixing and multilingual processing for CSS
- Hands-on-session on Word-level Language Detection
- Advanced text processing

Acknowledgments

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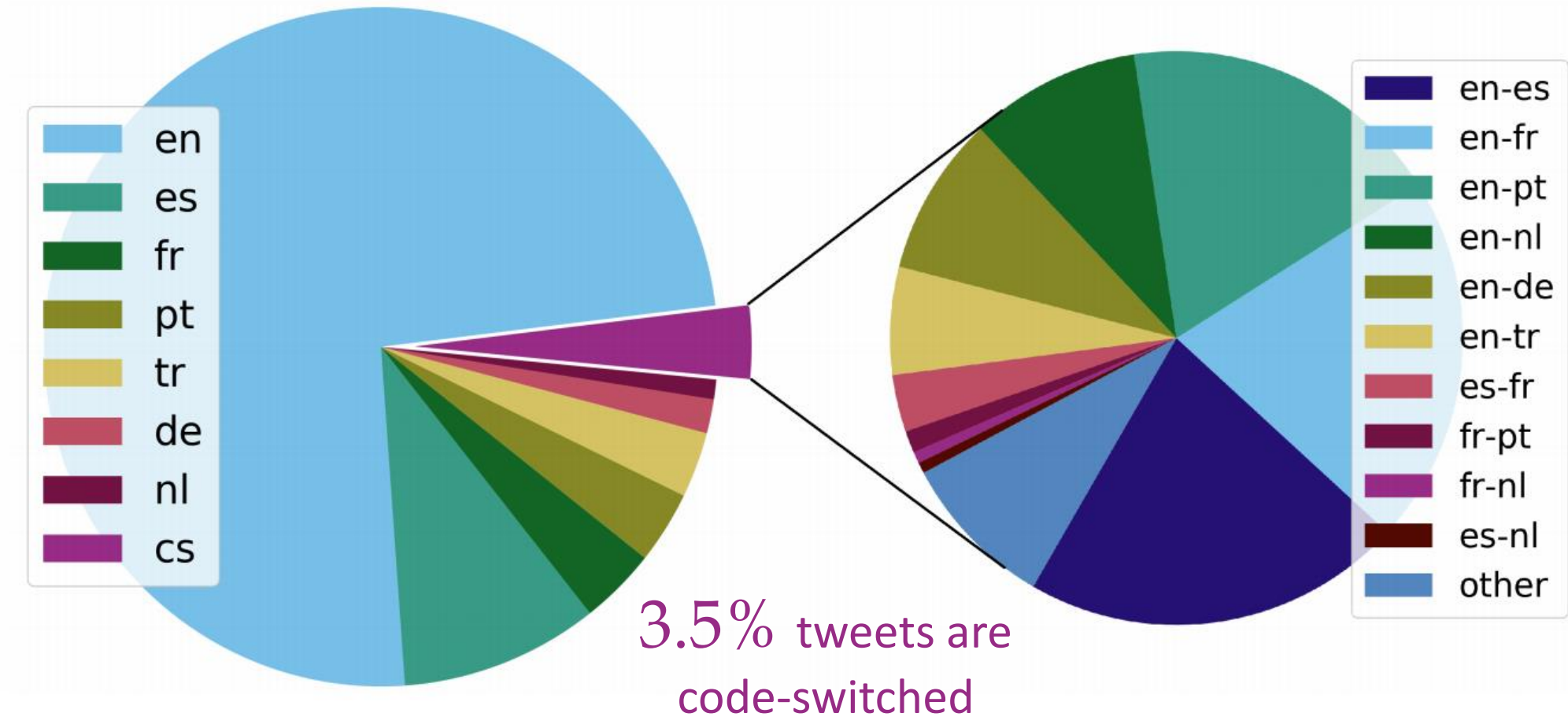
Code-mixing

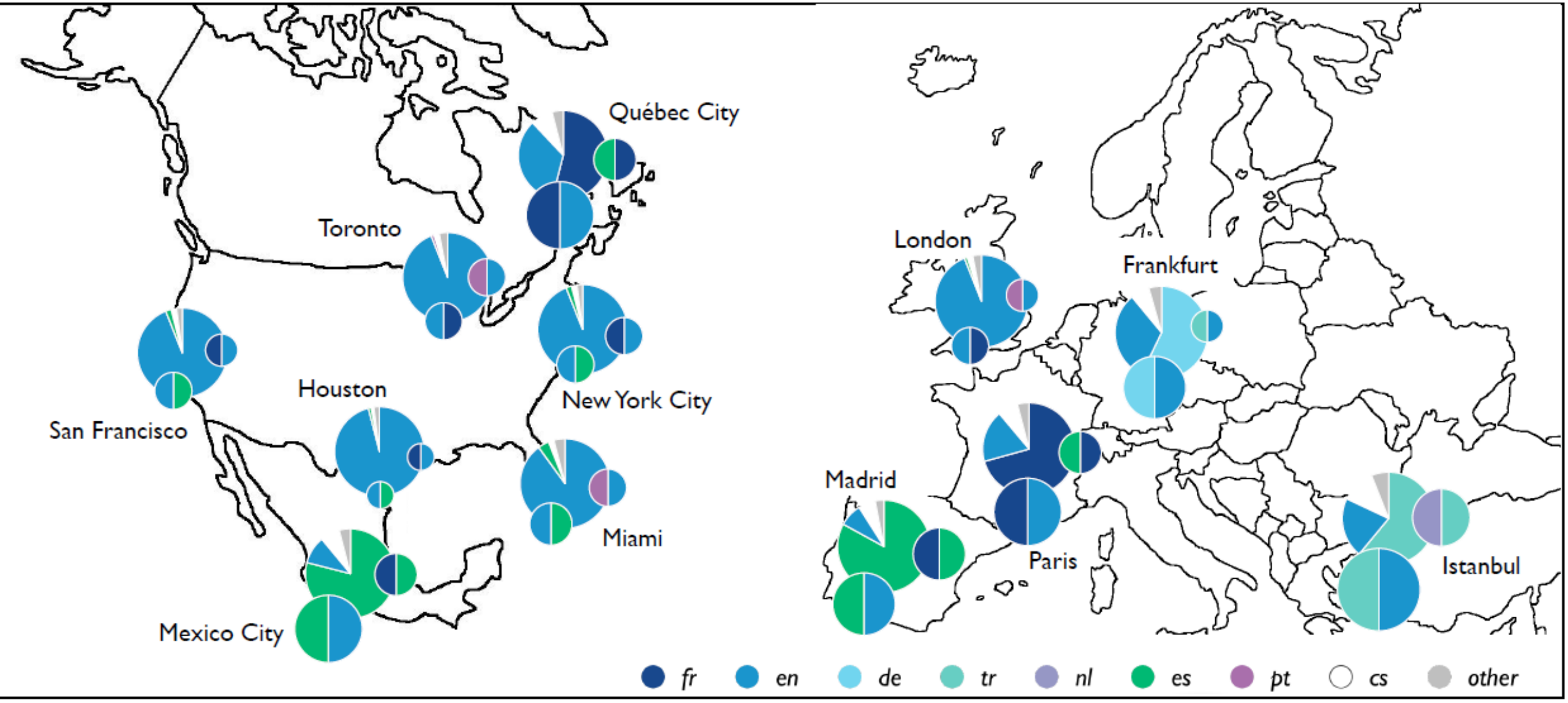
- Happens in all multilingual societies
- Is predominantly a spoken language phenomenon
- Is generally associated with informal conversations
- Has well-defined socio-pragmatic functions

Rijhwani et al. ACL 2017



Worldwide language distribution of monolingual and code-switched tweets computed over 50M Tweets (restricted to the 7 languages)

Geographical Distribution of Code-switching on 8M Tweets from 24 cities



NLP Technologies deployed in or for analysis of data from Multilingual societies must be able to process code-mixing

Cortana, aaj Hyderabad ka weather kaisa hai? Is it raining ya sunny day hai?

Intersteller es una amazing movie!

Social Media Analytics

Adik… sem brape boleh bwak kenderaan? normal parent question – UiTMLendufornia

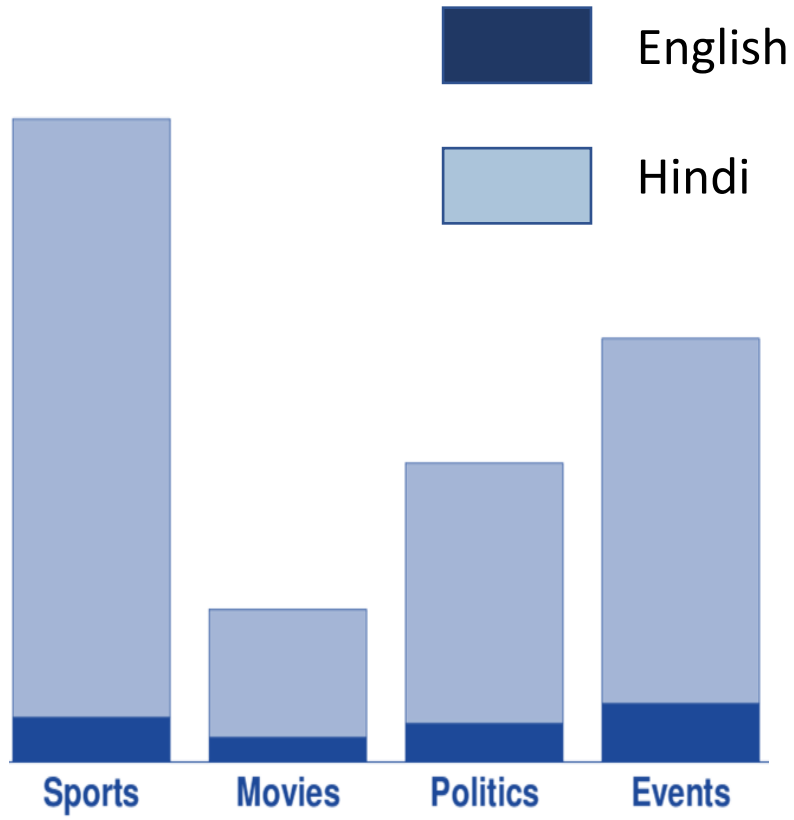
Socio-Pragmatic Functions of Code-mixing

When and why *do bilinguals prefer a certain language?*

- Topic change
- Puns
- Emphasis
- Emotion
- Reported Speech

But it's unpredictable!

We might praise you in English, but *gaali to Hindi me hi denge*! (Rudra et al., EMNLP 2016)



Fraction of tweets with swear words

Study of 830K Tweets from Hi-En bilinguals

1. The native language, Hindi, is *strongly preferred* (10 times more) for negativity and swearing
2. English is used far more for positive sentiment than negative
3. Language change often corresponds with changing sentiment

Inferences drawn from data in a single (usually the majority) language are likely to be misleading for multilingual societies.

Processing Code-mixing

Language Detection

I know when you switched from Inglés a Español

En En En En En En Sp Sp Sp

Pairwise Language Detection

Kalam	ke	speech	se	India	inspired	ho	gaya	#respect
NE	Hn	En	Hn	NE	En	Hn	Hn	Other

Can’t we just use dictionaries?

Challenges

Dilwale vs. Bajirao Mastani: Even Super-Films Get the Monday Blues

Named Entities

What was your favourite moment at the concert? Was war für euch der schönste Moment

Ambiguity

Wat n awesum movie it wazzzz! sabko dekhna chahiye

Spelling Variations

Transliteration

Out-of-Vocabulary Words

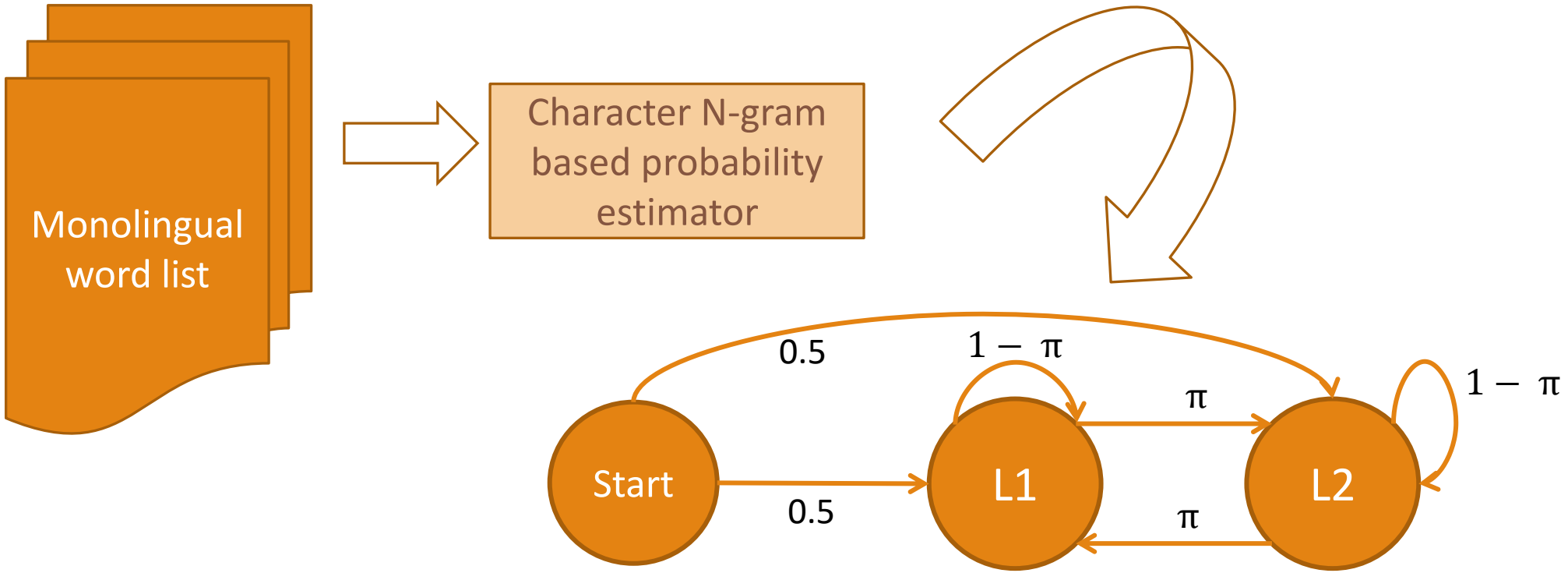
Character n-gram based classifiers for each language

$INSPIRED$

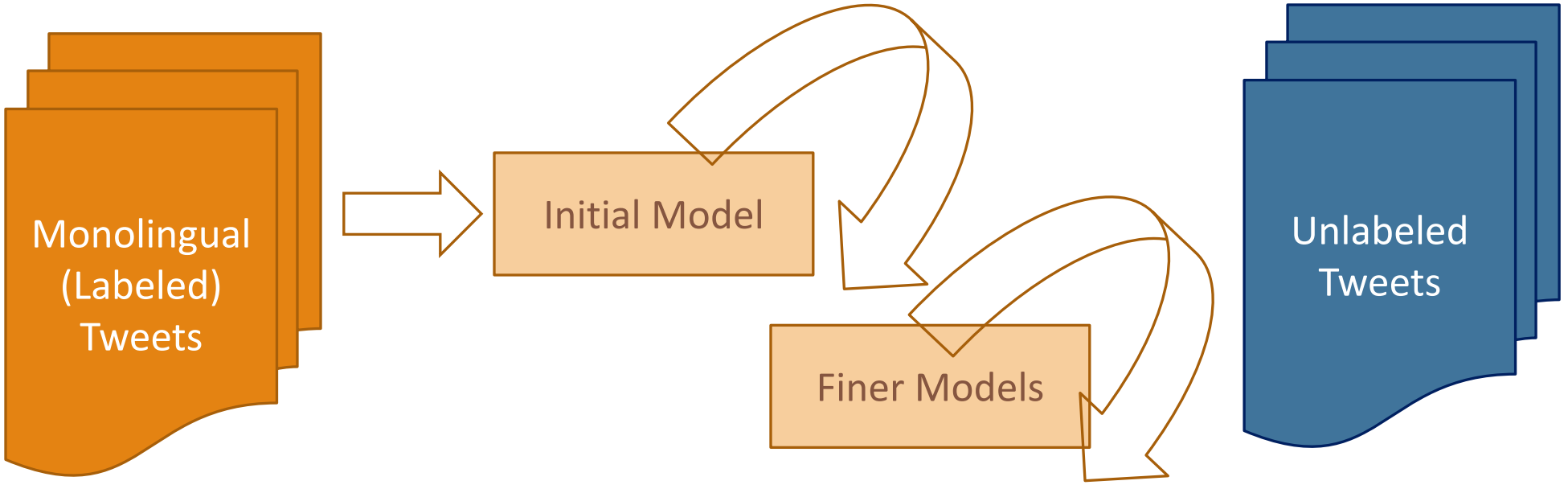
$IN	INS	NSP	SPI	PIR	IRE	RED	ED$

Character Trigrams

1. Simple Pairwise language labeling

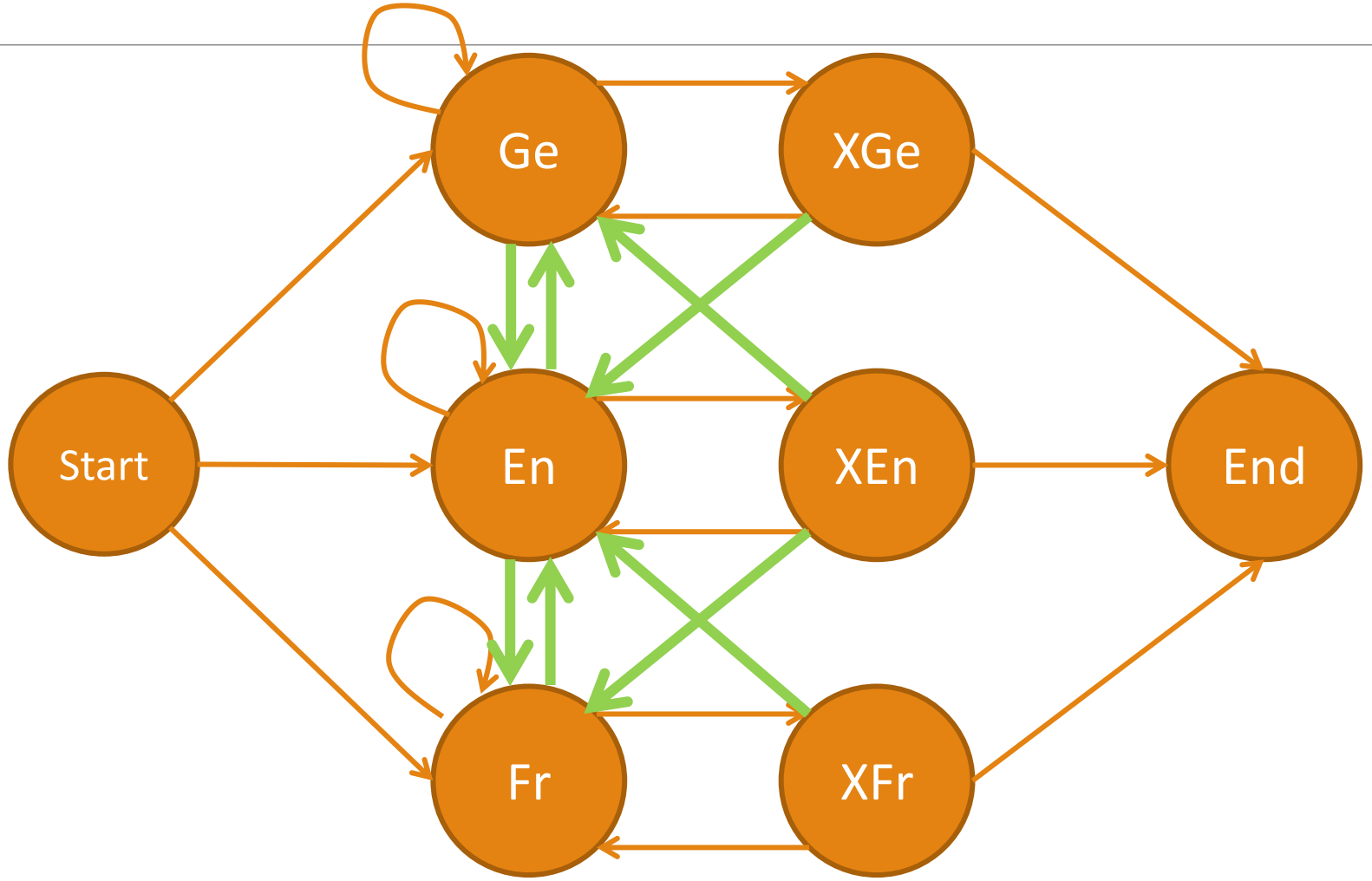


2. Semi-supervised Learning with Weak Labeling



Rijhwani et al. Estimating code-switching on twitter with a novel generalized word-level language detection technique. ACL 2017

Initial Model from Weakly Labeled Data



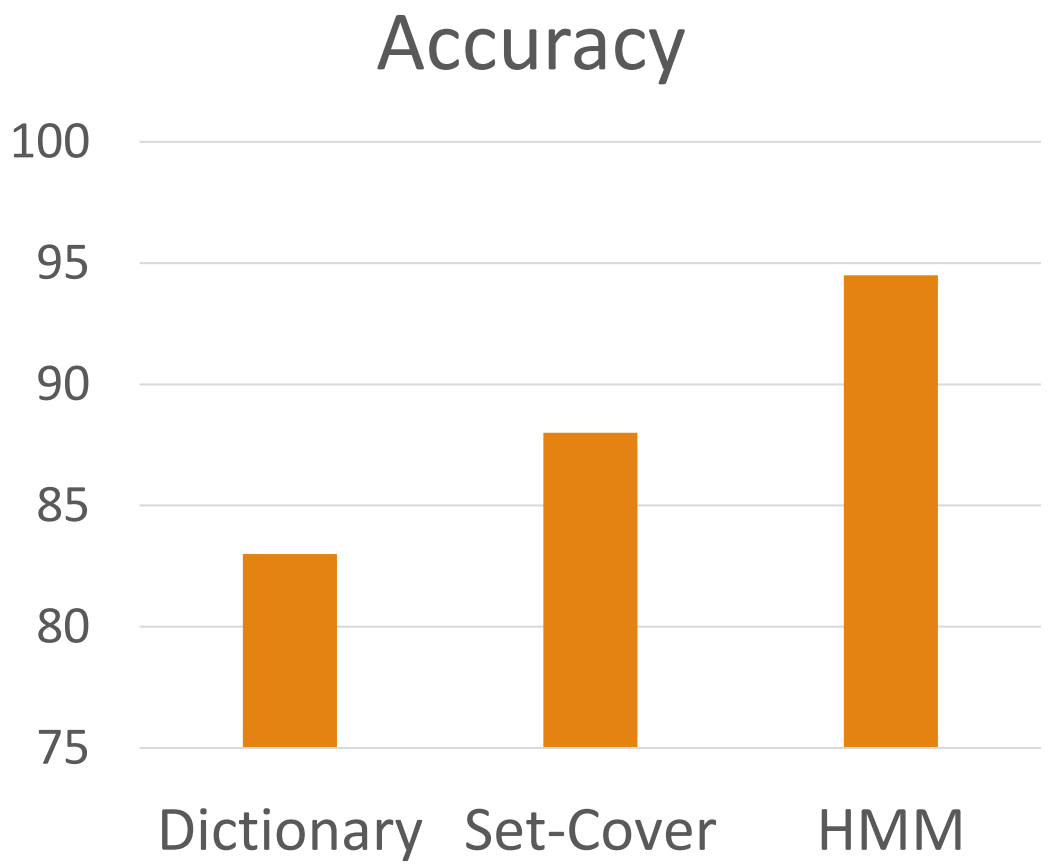
Experiments & Results

Languages (7): Dutch, English, French, German, Portuguese, Spanish, Turkish

Weakly Labeled Data: 85K Tweets for each language

Unlabeled Data: 2M Tweets

Test Set: 5000 Tweets, manually annotated.

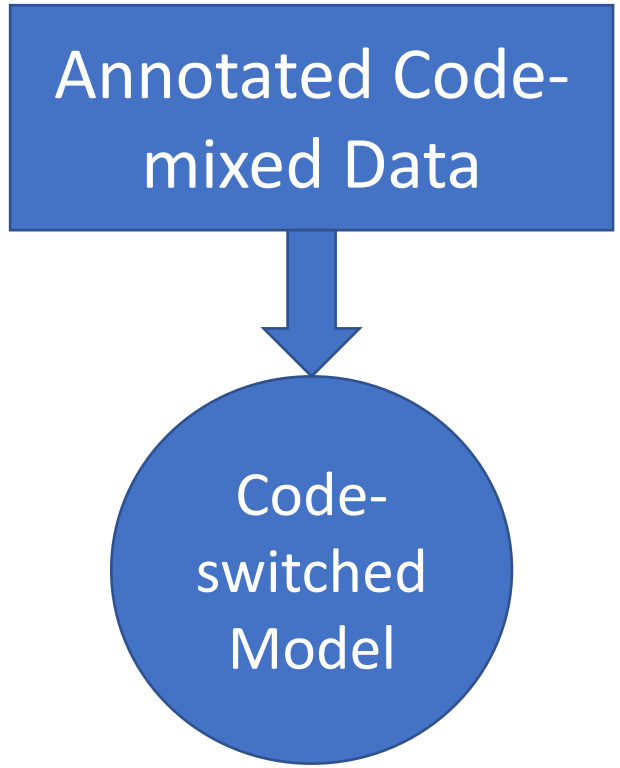


Language Detection

HANDS-ON SESSION

Computational Models of Code-Switching

- Supervised *i.e., from scratch*
- Divide & Conquer
- Combining Monolingual Models
- Zero-shot learning



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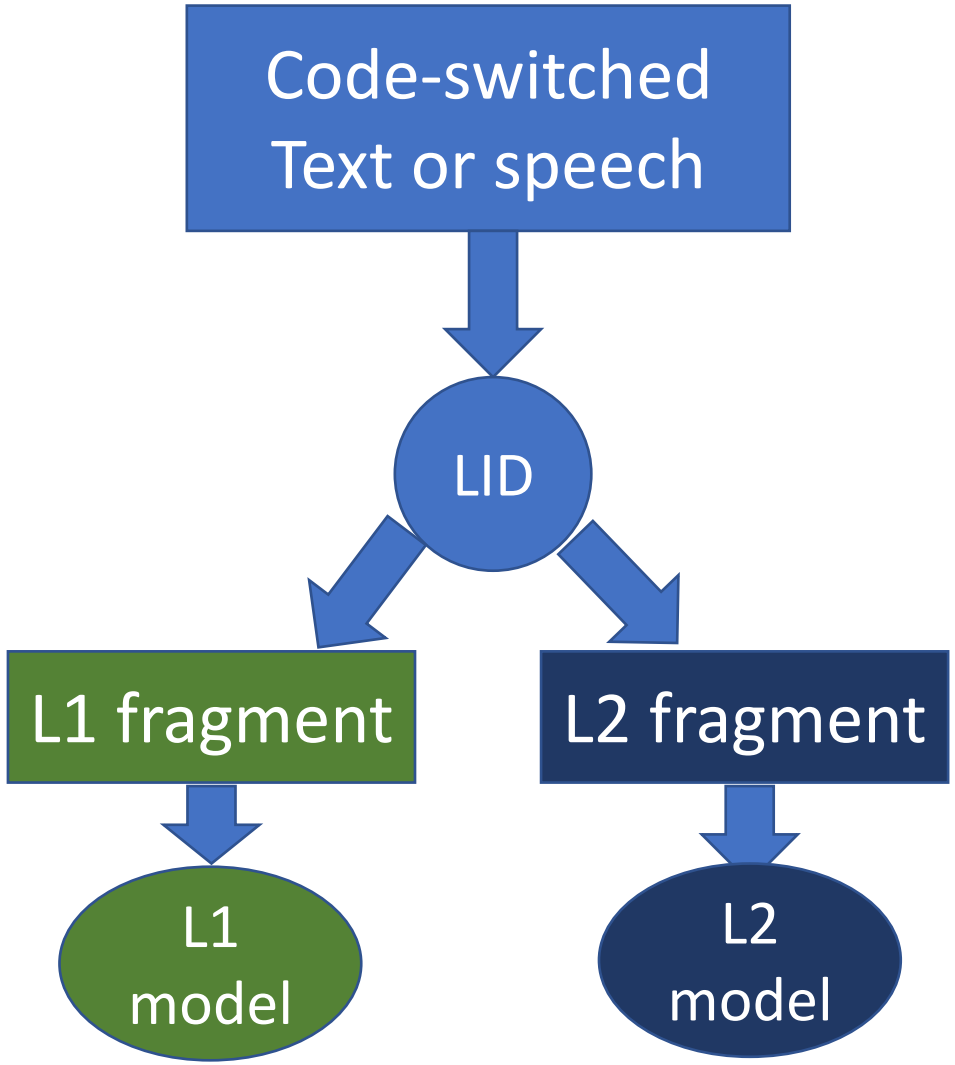
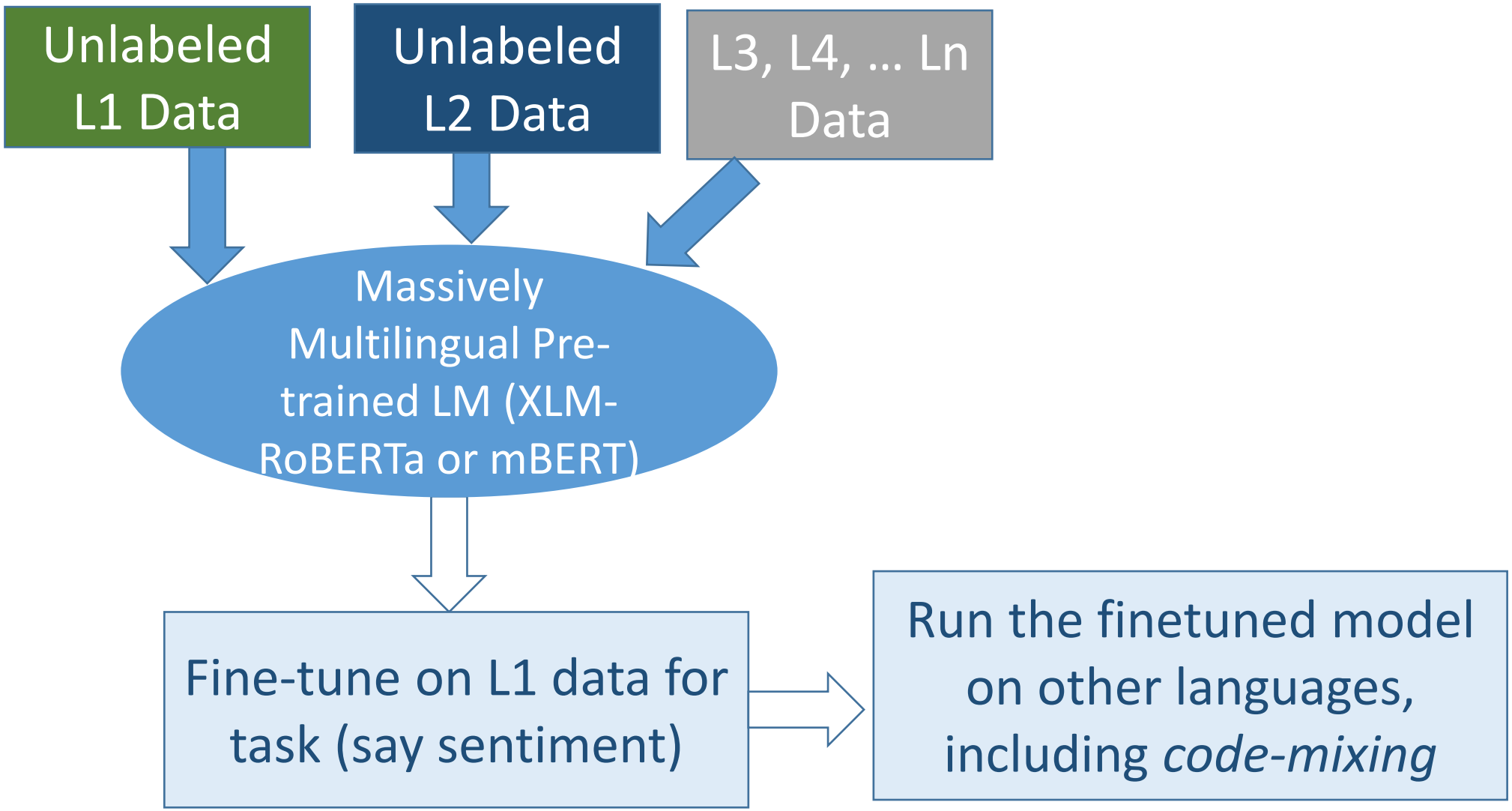
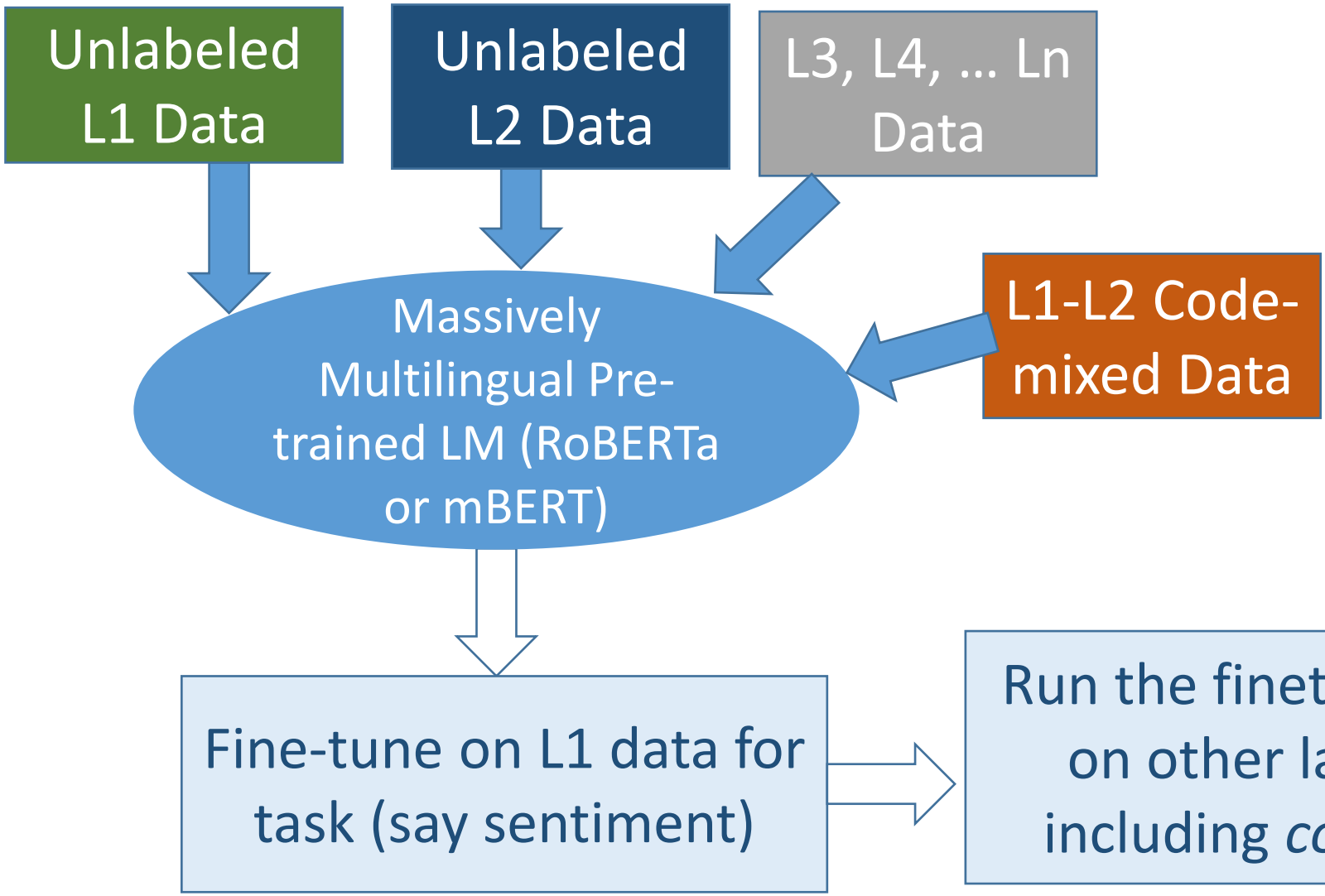


Vyas et al. 2014. En-Hi POS Tagging

Massively Multilingual Zeroshot Transfer

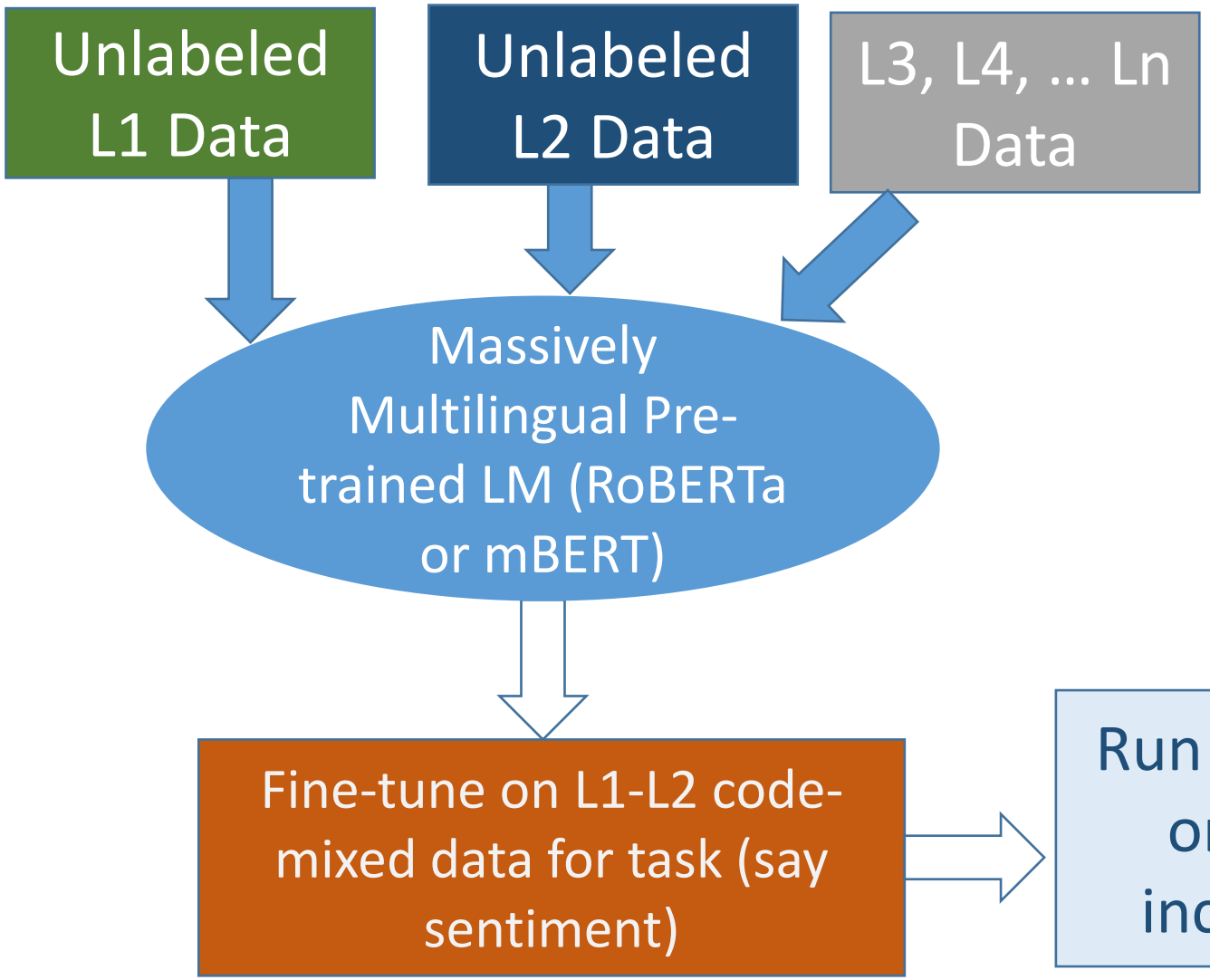


Massively Multilingual Zeroshot Transfer



Code-mixed pre-training requires unlabeled code-mixed text

Massively Multilingual Zeroshot Transfer



Code-mixed fine-tuning requires labeled code-mixed data

Evaluation Test-benches

GLUECoS

GitHub - microsoft/GLUECoS: A benchmark for code-switched NLP, ACL 2020

LinCE

LinCE Benchmark (uh.edu)

Resources

- Sitaram et al. (2019) A Survey of Code-switched Speech and Language Processing. Arxiv. https://arxiv.org/abs/1904.00784
- https://github.com/gentaiscool/code-switching-papers
- Project Melange: https://www.microsoft.com/en-us/research/project/melange
- EMNLP 2019 Tutorial by Monojit Choudhury et al. [slides]
- EMNLP-IJCNLP2019: Tutorial [T2] Processing and Understanding Mixed Language Data (Part 1/2) on Vimeo [video]

Understanding code-mixing is not a luxury but a necessity for building NLP systems for multilingual societies.

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