NATURAL LANGUAGE PROCESSING IN URGENCY DETECTION

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What is Urgency Detection?

- Humanitarian disasters: climate change, refugee crisis.
- Technology assisting: aid agencies and first responders
- Detecting *relevant* or *informative* tweets
- Sparseness of data, varying characteristics of disasters

- *Expresses an actionable need that needs to be resolved in a short time frame*.
- Information Retrieval (IR) problem
- Goal: flag messages that *express urgency* panic-ridden emotion
- Examples

Urgent and Non-Urgent example from a real-world dataset

Dataset	• **Urgent sentences** • **Non-Urgent sentences**
Macedonia	• Four locals are trapped in the marketplace need help. • Avalanche in Macedonia caused four deaths

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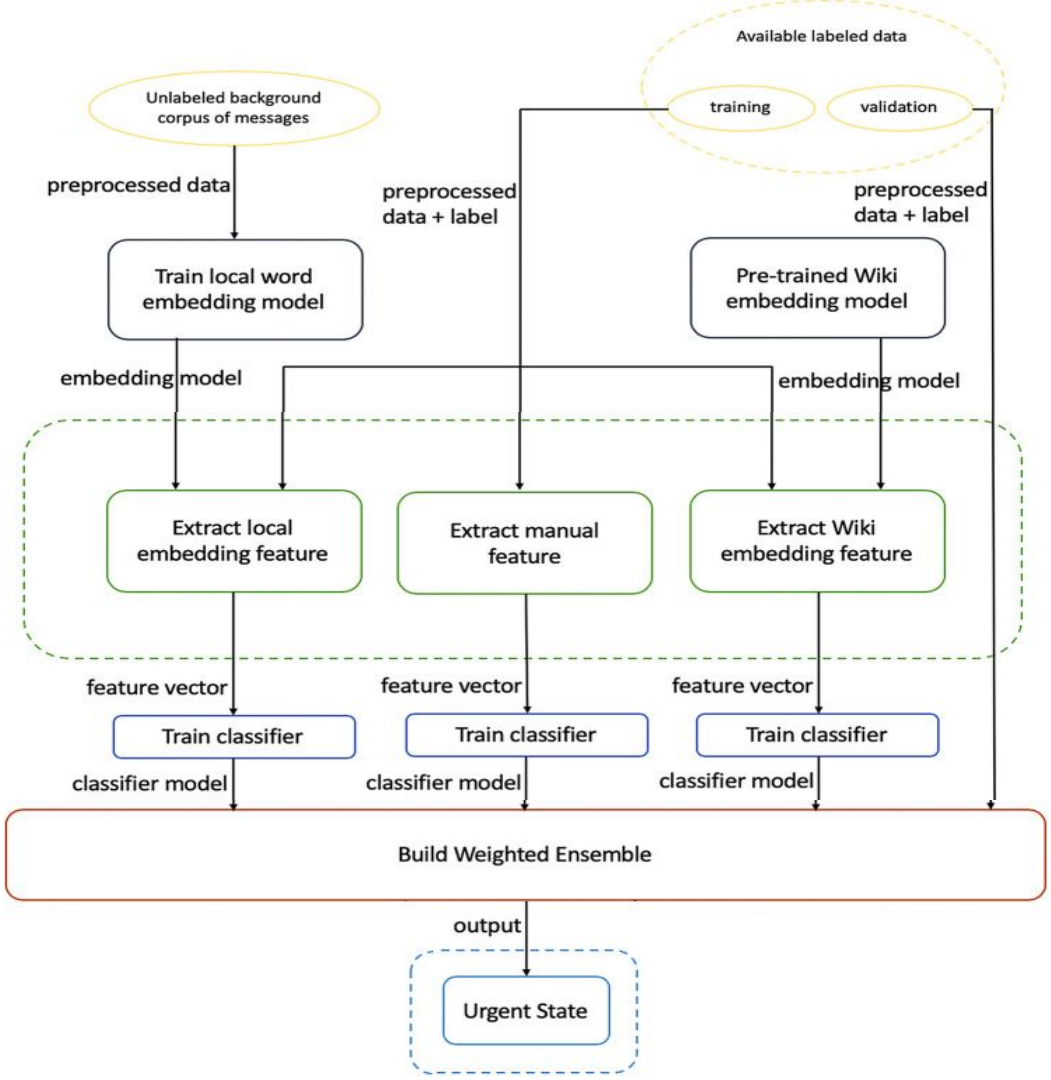
Role of Machine Learning


Available labeled data
training
validation
Unlabeled background corpus of messages
preprocessed data
preprocessed data + label
preprocessed data + label
Train local word embedding model
Pre-trained Wiki embedding model
embedding model
embedding model
Extract local embedding feature
Extract manual feature
Extract Wiki embedding feature
feature vector
feature vector
feature vector
Train classifier
Train classifier
Train classifier
classifier model
classifier model
classifier model
Build Weighted Ensemble
output
Urgent State

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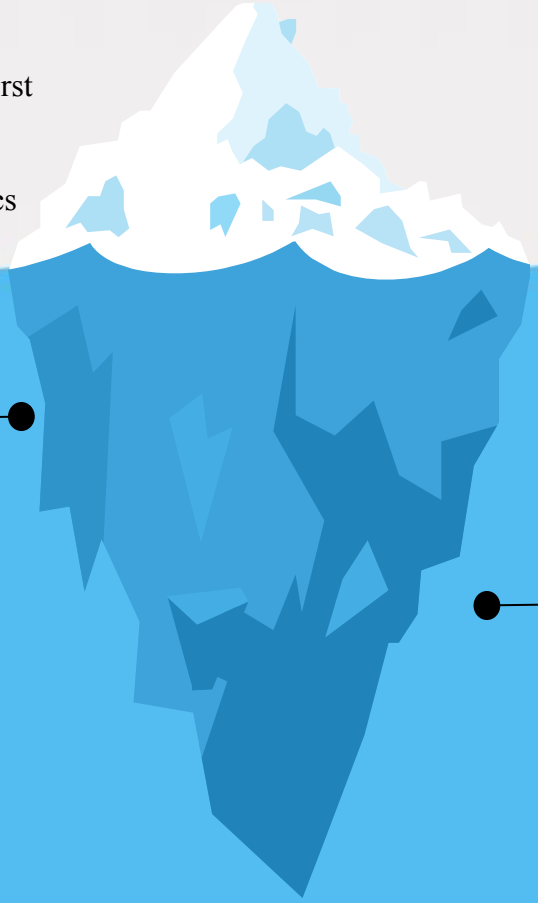

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Algorithmic Logic

Algorithmic Logic: Transfer Learning for Urgency Detection

INPUT :

- Labeled dataset in target domain: Dt
- Labeled dataset in source domain: Dsl
- Unlabeled corpus in source domain: Dsu
- Pre-trained Wikipedia Embedding Model: Ww
- Up-sampling parameter: u

OUTPUT :

- Classifier for Urgency Detection: C

METHOD :

1) Train word embedding Ws on text in Dsu ∪ Dsl ;

2) Up-sample Dt by factor u and ‘mix’ with Dsl to get expanded training set, Dtrain : Dtu ∪ Dsl

3) Extract manual feature set Fm, source embedding feature set Fs (using Ws), and Wiki feature set Fw (using Ww) from each message in Dtrain;

4) Train linear regression models Cs, Cm and Cw on Fs, Fm and Fw resp. to get classifier;

5) Return final classifier model C : avg score(Cs, Cm, Cw);

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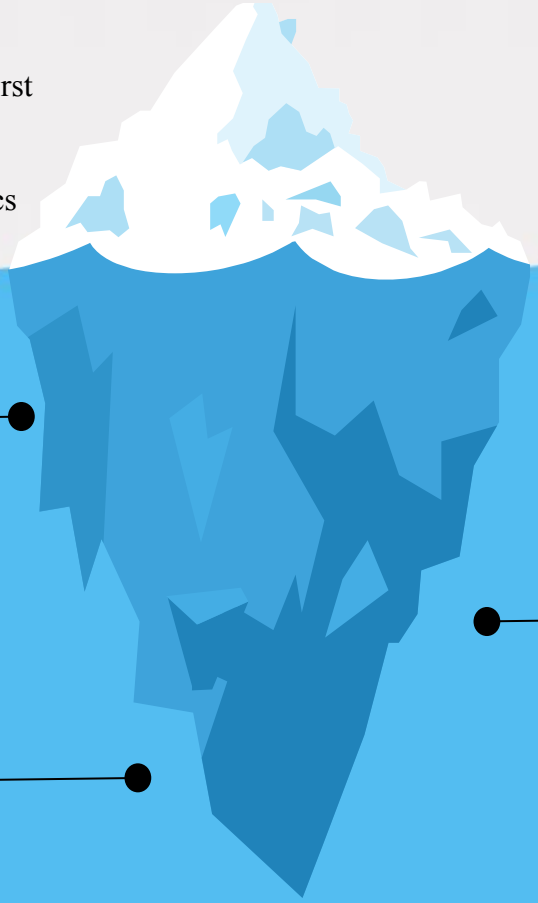

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Bottom-up Chart Parsing

Bottom-up Chart Parsing

Grammar

1. S → NP VP
2. NP → Det N
3. VP → VG NP
4. VG → V

Lexicons

1. Esha: NP
2. plays: V
3. the: Det
4. piano: N

Sentence: $_1$ Esha $_2$ plays $_3$ the $_4$ piano $_5$

Grammar

1. S → NP VP
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Lexicons

1. Esha: NP
2. plays: V
3. the: Det
4. piano: N

(11) (0, 4, S → NP VP *)			
--	(10) (1, 4, VP → VG NP *)		
--	(5) (1, 2, VP → VG * NP)	(9) (2, 4, NP → Det N *)	
(2) (0, 1, S → NP * VP)	(4) (1, 2, VG → V *)	(7) (2, 3, NP → Det * N)	--
(1) “Esha” (0, 1, NP → “Esha” *)	(3) “plays” (1,2, V → “plays” *)	(6) “the” (2, 3, Det → “the” *)	(8) “piano” (3, 4, N → “piano” *)

0 1 2 3 4

REFERENCES

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7341028/
2. https://arxiv.org/pdf/1907.06745.pdf
3. https://monkeylearn.com/blog/detecting-squeaky-wheel-urgency-in-customer-support-tickets/
4. https://www.unocha.org/sites/unocha/files/WHDT2018_web_final_spread.pdf
5. https://fasttext.cc/docs/en/pretrained-vectors.html
6. https://www.darpa.mil/program/low-resource-languages-for-emergent-incidents
7. https://hub.docker.com/r/ppplinday/emergence-detection