Do You Do Yoga? Understanding Twitter Users' Types and Motivations using Social and Textual Information

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PURDUE UNIVERSITY®

Motivation

follow

Emily
@UCLA alumni, traveler, yoga and nature lover. Tend to think in 3+ different languages.

Los Angeles, CA

T1: Scorpion pose or Vrischikasana with a wall. Good for spine. #yoga #scorpionpose.
T2: Busy day at work. Feeling energized after dancing @lafitness.

Smith
@Geologist, Believer in the Love religion, spontaneous fun maker.

Denver, CO

T1: Great job @Emily.
T2: RT: Vegan Drive Through experience. we tried getting one of everything.

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GYM

lafitness
A welcoming dance & fitness facility for movers ages 13+. Streaming classes daily on YouTube, support us by joining our Patreon Community!

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T1: Gentle #Yoga & Meditation w/ Michael. BreakOut Studios Online Classes. Join us for free class.
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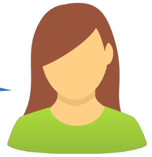

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Methodology

- We use following sources of information to build our model:

    1) Tweet text;
    2) User network;
    3) Metadata including user location and description.

- Our model employs those sources and then jointly builds a neural network model to generate a dense vector representation for each field and finally concatenates these representations.

Downstream Tasks

We demonstrate our model on two downstream tasks:

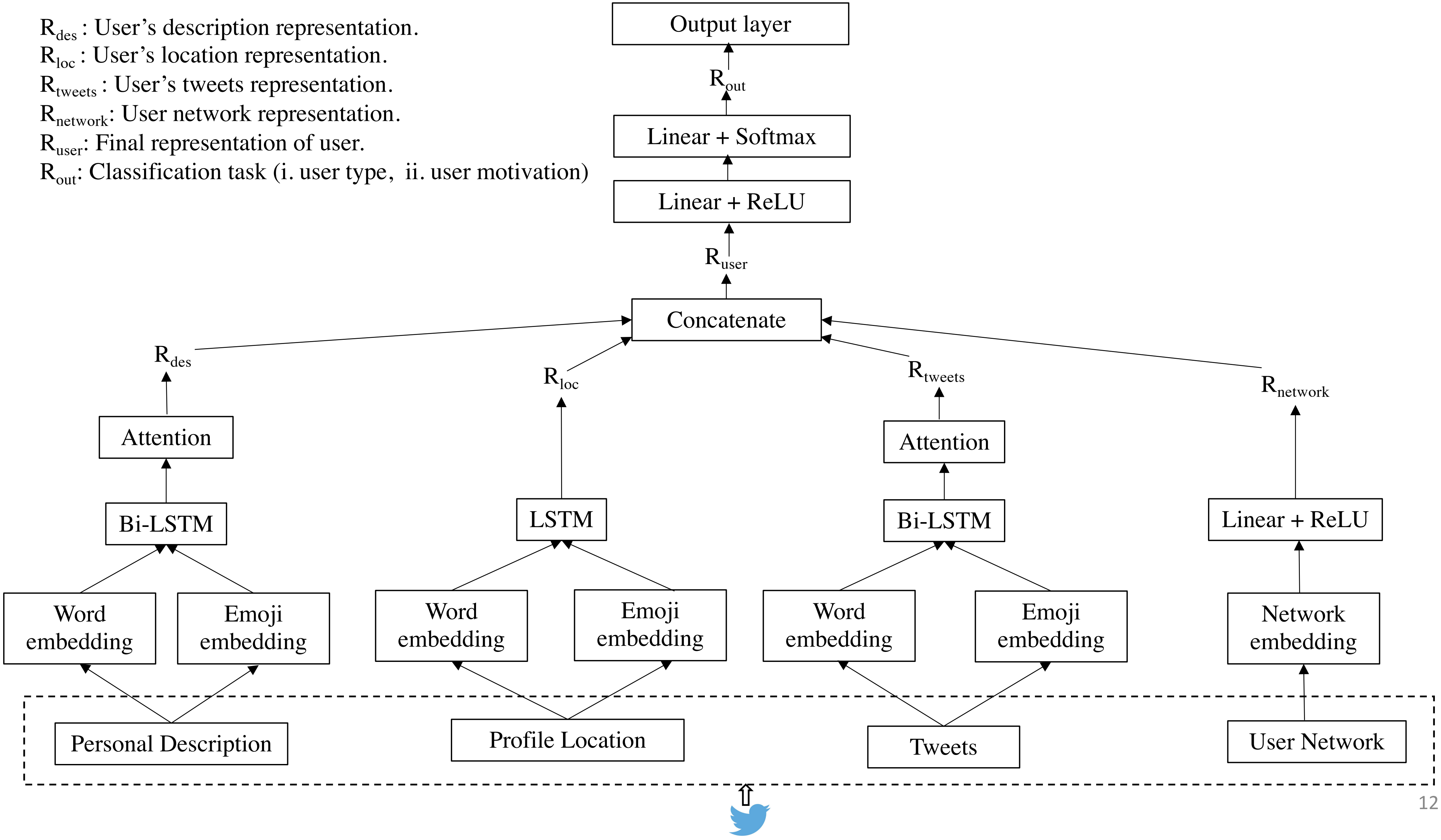
1) Finding user type
    1) Practitioner
    2) Promotional
    3) Other
2) Finding user motivation
    1) Health
    2) Spiritual
    3) Other

Model

- **Yoga User Network (YUN)** - a joint embedding model based on the fusion of neural networks with attention mechanism leveraging users' social and textual information to understand user type and motivation.

YUN Model

R_{des} : User's description representation.
R_{loc} : User's location representation.
R_{tweets} : User's tweets representation.
$R_{network}$: User network representation.
R_{user}: Final representation of user.
R_{out}: Classification task (i. user type, ii. user motivation)



Dataset

- YUN model
  - ~ **0.4 million** yoga-related tweets from Twitter using Twitter streaming API (May to November of 2019) containing specific keywords.

  - ~**1300** users have at least a yoga-related tweet in their timelines.

  - ~ **3 million** of timeline tweets.

Baseline Models

- User type and motivation detection baseline – 10 baselines
    1. Description only;
    2. Location only;
    3. Tweets only;
    4. Network only;
    5. BERT finetuned with Description (Description_BERT);
    6. BERT fine-tuned with Location (Location_BERT);
    7. BERT fine-tuned with Tweets (Tweets_BERT);
    8. joint embedding on description and location (Des + Loc);
    9. joint embedding on description, location, and tweets (Des + Loc + Twt);
    10. joint embedding on description, location, and network (Des + Loc + Net).

Results and Analysis

Evaluation Metrics:

- Accuracy
- Macro-avg F1 score

TABLE II: Performance comparisons on test data

	user type		**user motivation**	
Model	**Accuracy**	**Macro F1 score**	**Accuracy**	**Macro F1 score**
Description	0.725	0.693	0.782	0.575
Location	0.676	0.563	0.695	0.470
Tweets	0.721	0.687	0.744	0.504
Network	0.752	0.557	0.790	0.541
Description_BERT	0.718	0.681	0.771	0.528
Location_BERT	0.679	0.606	0.695	0.476
Tweets_BERT	0.760	0.669	0.805	0.551
Des + Loc	0.733	0.693	0.775	0.599
Des + Loc + Twt	0.760	0.725	0.794	0.580
Des + Loc + Net	0.775	0.723	0.828	**0.647**
YUN	**0.790**	**0.742**	**0.844**	0.619

Results and Analysis

YUN (Des + Loc + Twt + Net) outperforms the baselines.

- Accuracy (user type): 79.0%
- Macro-avg F1 score (user type): 74.2%
- Accuracy (user motivation): 84.4%

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Ablation study by training individual neural network model for each field i.e., description, location, tweets and network.

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- User location has the lower performance.

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- profile description is the most informative.
- User location has the lower performance.
- Excluding user network information (Des + Loc + Twt model) declines the performance of the final model.

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Error Analysis

- Misclassifications
  - Did not use contextualized word embedding for text.
  - Misleading or absence of profile description.
    - Users do not have their profile description in Twitter.
    - Users who provide profile description related to “yoga” but usually retweet yoga-related quotes.
  - Absence of user location information.

Discussion and Future Work

- Misclassifications in user type and motivation detection.
- Expensive data annotation.
- Develop a contextualized model to predict user type and motivation using minimal supervision.
- Use the model to understand users’ type and motivation for different lifestyle choices i.e. “keto diet”, “veganism”.

THANK YOU ☺

Slide: https://tunazislam.github.io/files/IEEE_ICSC_YUN.pdf

Questions?

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