Neural dialogue act recognition with transformer pre-training

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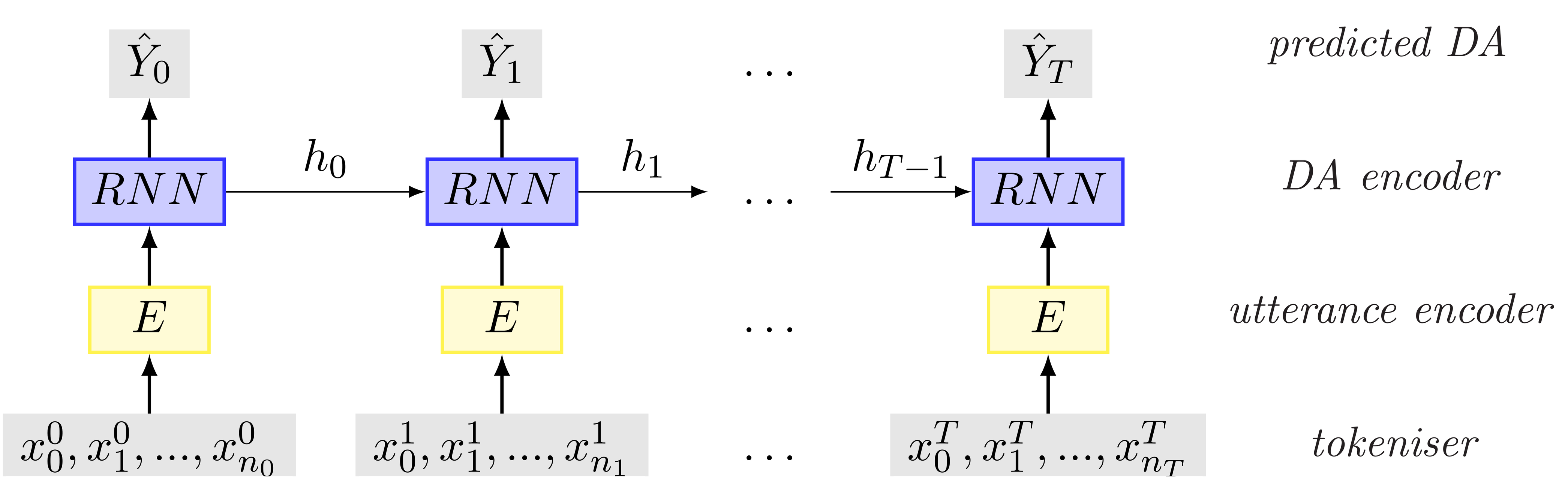
BERT SOLVES DIALOGUE #LAUGHTER

Recently, multi-layer neural language models pre-trained on massive amounts unlabeled data have been used to provide context-sensitive word vectors and sentence-level distributional representations. One such model, BERT, uses an attention-based transformer architecture to achieve state of the art results on a variety of NLP tasks (Devlin et al., 2018). However, given that BERT is pre-trained on book and encyclopedia data, there is no guarantee it will improve performance on *dialogue-specific tasks*. To assess BERT's potential for dialogue applications, we propose a series of *dialogue act recognition* (DAR) experiments with various utterance encoders, including BERT.

Neural dialogue act recognition model



Where is laughter (or its absense) most helpful?

It might be the case that dialogue-specific features, such as discourse markers, disfluencies, and laughter are useful for DAR. We train models on Switchboard *dialogues with laughter* (**L**) and *with laughters removed* (**NL**) to test if this is the case.

		accuracy	macro-average recall
GloVe	L	.702	.198
	NL	.698	.209
BERT	L	.779	.400
	NL	.772	.408

Top 5 dialogue acts by the impact of laughter

for GloVe:	increase in accuracy
continuer (+)	.158
non-verbal (x)	.108
appreciation (ba/fe)	.101
statement-opinion (sv/fx)	.092
conventional-closing (fc)	.067

for BERT [CLS]:	increase in accuracy
or-clause (qrr)	.488
open-question (qo)	.170
statement-opinion (sv/fx)	.163
response-acknowledgement (bk)	.124
rhetorical-questions (qh)	.122

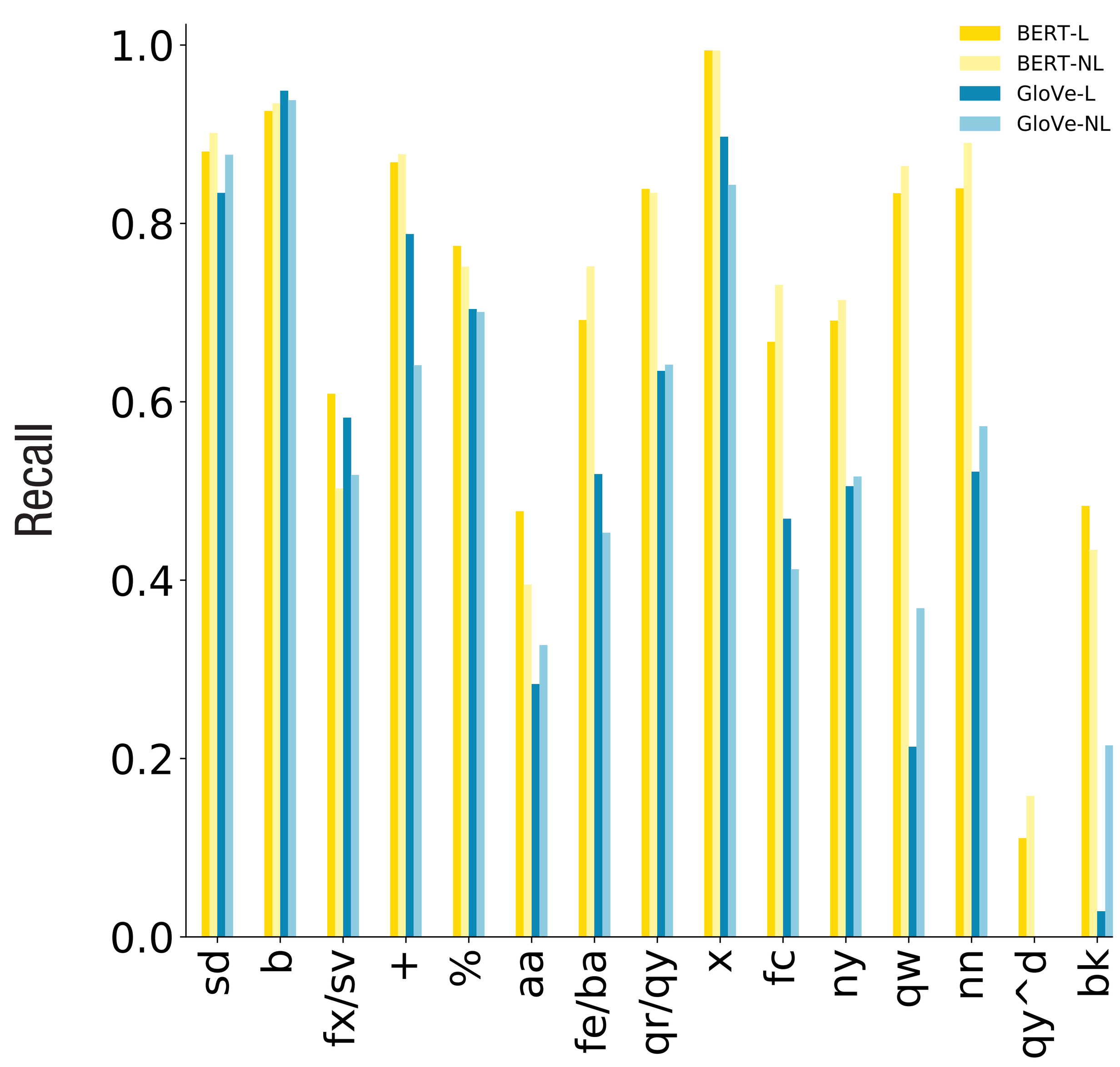
Switchboard dialogue act tags

Dialogue acts represent the meaning of an utterance by the speech act it carries out (Austin and Urmson, 2009). **Dialogue act recognition (DAR)** is the task of automatically labeling utterances with tags from a dialogue act schema such as DAMSL (Core and Allen, 1997).

Classes: 44 (including continuers and padding)
Dialogues: 808 / 115 / 232 (train/val/test)
Utterances: 156441 / 20825 / 44350 (train/val/test)

RNN for representing discourse

Many DAR strategies attempt to model discourse context in addition to the content of the utterance in question. Stolcke et al. (2000), for example, use a HMM to tag dialogue acts. The hidden state of neural sequence models can also represent discourse context (e.g. Kalchbrenner and Blunsom, 2013; Tran et al., 2017).



		prev.	accuracy on utterances containing laughter	next
GloVe	L	.703	**.703**	.650
	NL	.689	**.679**	.643
BERT	L	.768	**.768**	.761
	NL	.752	**.759**	.737

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