

# Multi-task learning based Transformers model helps improve abstractive summarization of dialogues.

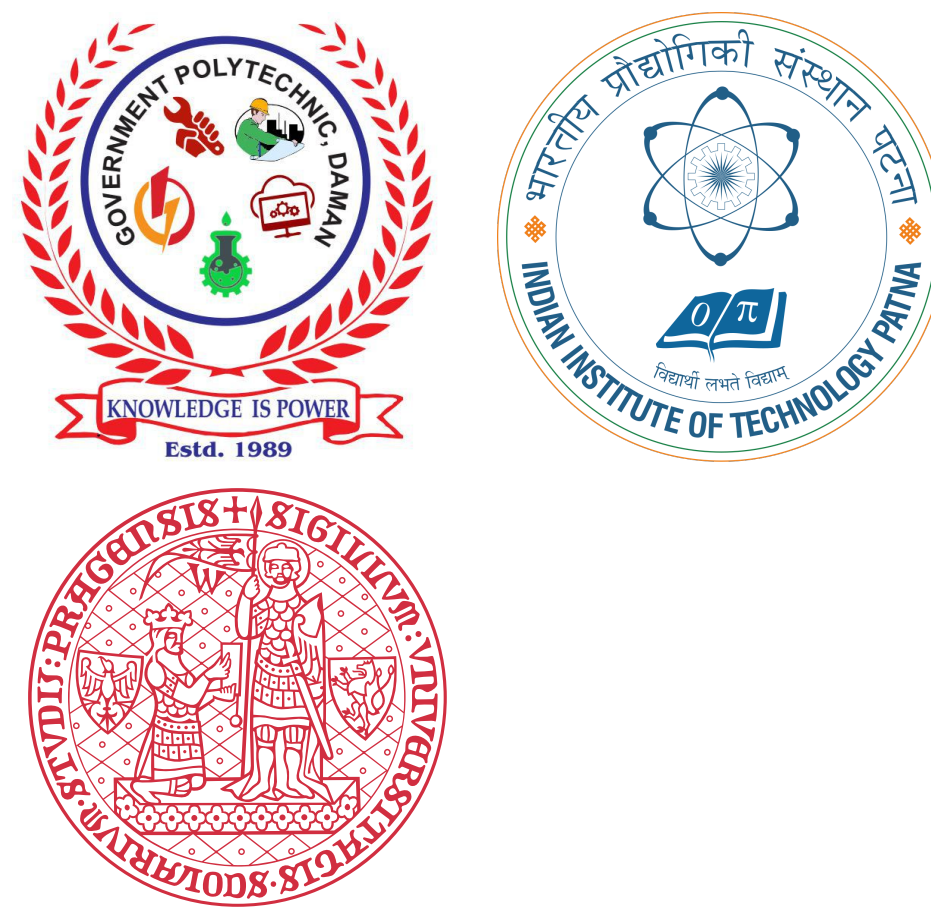
## A Multi-Task Learning Approach for Summarization of Dialogues

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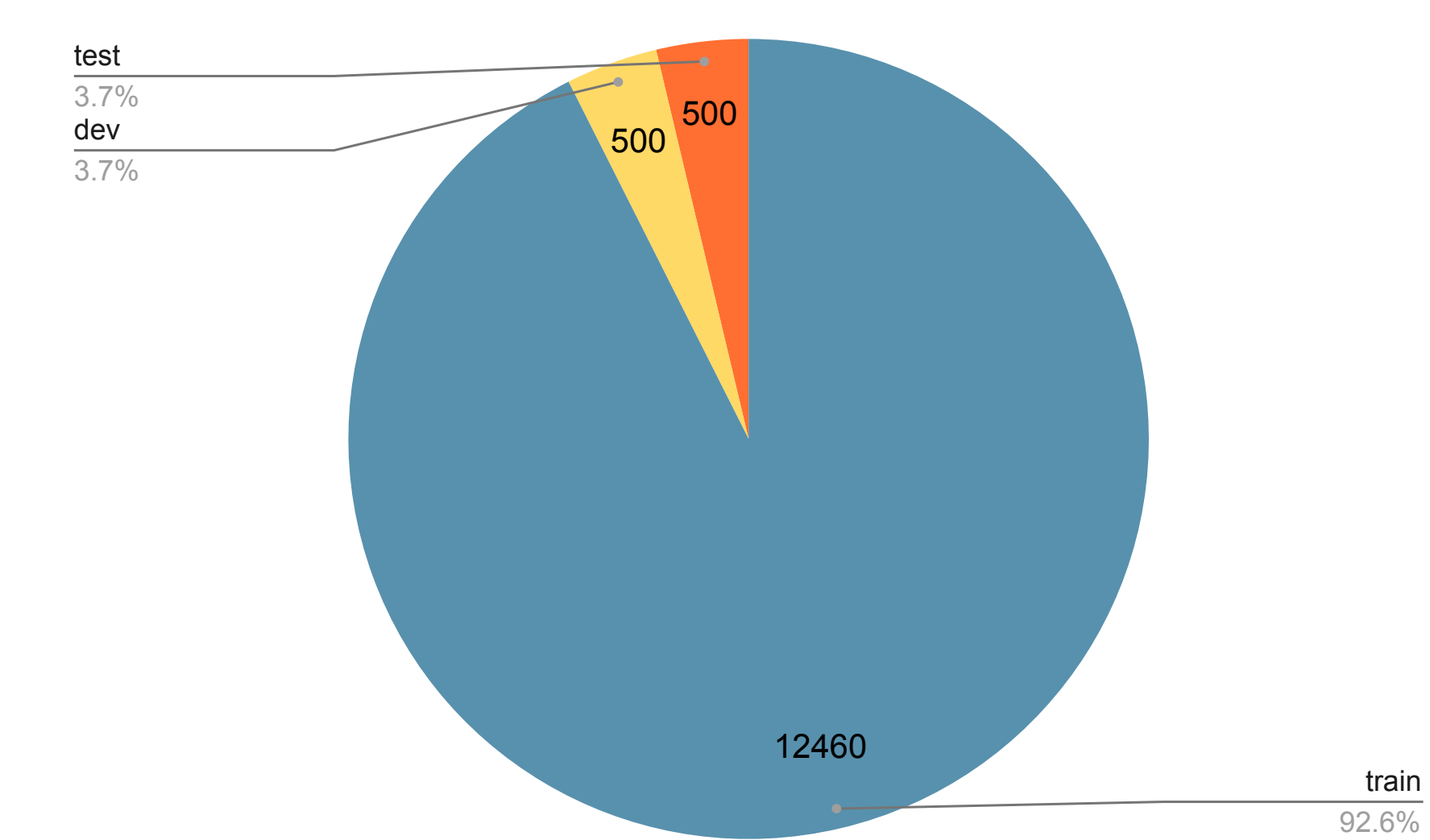
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## DialogSum Dataset

13,460 dialogues on daily-life conversations and their summaries. Out of these, 12,460 dialogues are in the training set, while 500 each in the development set and test set. The test set has three reference summaries for each dialogue.



Additionally, there is a hidden test set of 100 dialogues with no summaries. Each summary in all of these sets is also accompanied by topic information.

## Task

The task is to produce abstractive summaries of the dialogues. For automatic evaluation ROUGE-1, ROUGE-2 and ROUGE-L are used as the primary

## Sample Generated Summaries

Dialogue	Dialogue	Dialogue
Person1: Tom, I have got good news for you. Person2: What is it? Person1: Haven't you heard that your novel has won The Nobel Prize? Person2: Really? I can't believe it. It's like a dream come true. I never expected that I would win The Nobel Prize! Person1: You did a good job. I'm extremely proud of you. Person2: Thanks for the compliment. Person1: You certainly deserve it. Let's celebrate!	Person1: John dates her seven times a week. Person2: Really? That's a straw in the wind. Person1: I think so. Maybe he's fallen for her. Person2: Yeah. They suit each other. A perfect match between a man and a girl.	Person1: Honey, I have got good news for you. Person2: What is it? Person1: You are going to be a father. Person2: What? Do you mean that you are pregnant? Is it true? Person1: Yes. We will have our baby soon. Person2: Oh, dear, I'm so happy. Person1: Me, too.
Reference Summary	Reference Summary	Reference Summary
Person1 congratulates Tom for achieving the Nobel Prize.	Person1 and Person2 think John's fallen for a girl.	Person1 and Person2 feel happy because Person1 is pregnant.
Generated Summary	Generated Summary	Generated Summary
Generated Summary: Person1 congratulates Tom on winning the Nobel Prize.	Person1 and Person2 talk about John and the girl he loves.	Person1 and Person2 are happy that they will have their baby soon.

and BERTScore as the supplementary metric.

## Muti-Task Model

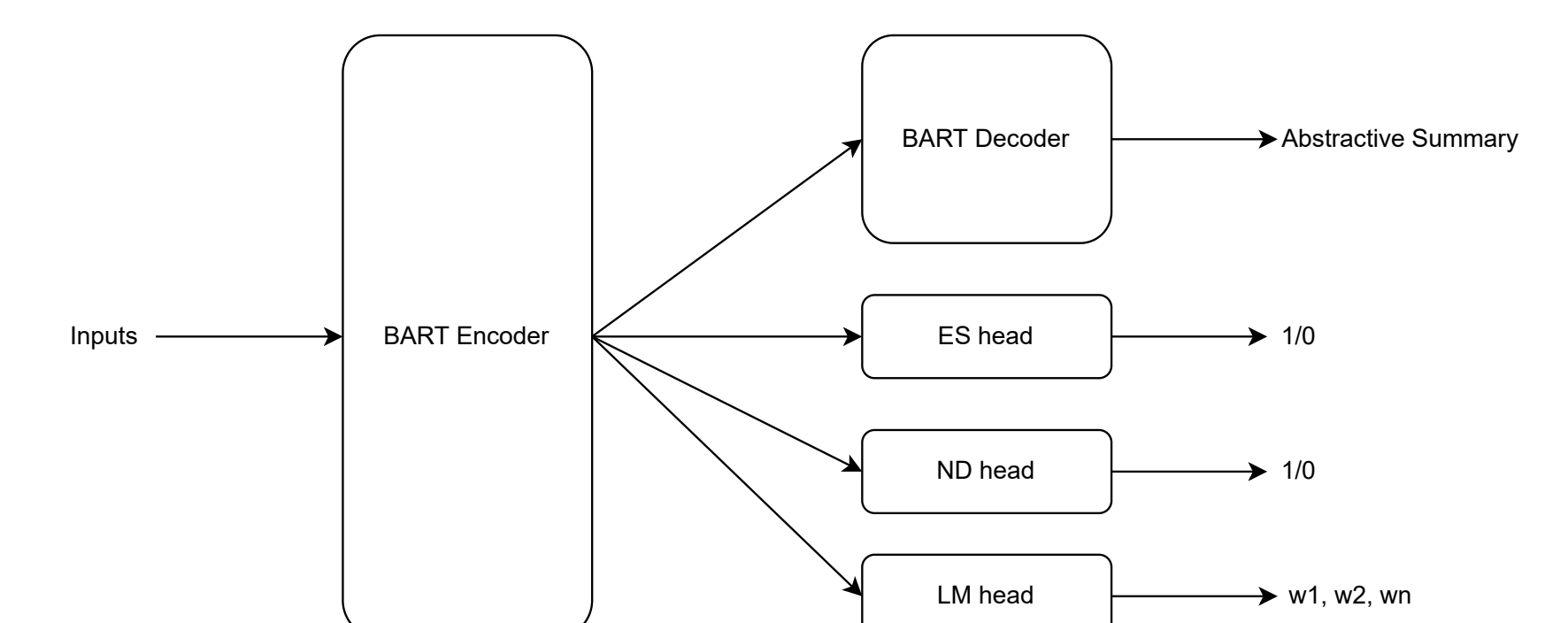
We attempt the DialogSum Challenge with a Multi-Task Transformers-based model with abstractive summarization (AS) as the main task and the following auxiliary tasks:

- **Extractive Summarization (ES)** - classification of a given sentence as either belonging/not belonging to the extractive summary of a given document. Here, we utilize the AMI extractive summaries.
- **Novelty Detection (ND)** - identification of novel text, i.e., text containing new information. For this, we experiment with the Quora Question Pair (QQP) dataset, and the Microsoft Research Paraphrase Corpus (MRPC).
- **Language Modeling (LM)** - we perform masked language modeling on the gold summaries from the training set as per the training strategy adopted by BERT.

## Evaluation

Best ROUGE scores obtained with AS+ES(AMI) and best BERTScore with AS+ND(QQP).

## Architectural Representation



## Training Set Instance

<b>Dialogue:</b> #Person1#: Hi, Mr. Smith. I'm Doctor Hawkins. Why are you here today? #Person2#: I found it would be a good idea to get a check-up. #Person1#: Yes, well, you haven't had one for 5 years. You should have one every year. #Person2#: I know. I figure as long as there is nothing wrong, why go see the doctor? #Person1#: Well, the best way to avoid serious illnesses is to find out about them early. So try to come at least once a year for your own good. #Person2#: Ok. #Person1#: Let me see here. Your eyes and ears look fine. Take a deep breath, please. Do you smoke, Mr. Smith? #Person2#: Yes. #Person1#: Smoking is the leading cause of lung cancer and heart disease, you know. You really should quit. #Person2#: I've tried hundreds of times, but I just can't seem to kick the habit. #Person1#: Well, we have classes and some medications that might help. I'll give you more information before you leave. #Person2#: Ok, thanks doctor.
<b>Summary:</b> Mr. Smith's getting a check-up, and Doctor Hawkins advises him to have one every year. Hawkins'll give some information about their classes and medications to help Mr. Smith quit smoking.
<b>Topic:</b> get a check-up

## Results

Model	R1	R2	RL	BERTScore
Single-Task				
AS	46.15	20.41	43.93	92.40
AS[T]	46.91	20.28	44.26	92.38
Multi-Task				
AS+ES	46.24	19.42	43.54	92.40
AS+ES(AMI)	47.26	21.18	45.17	92.60
AS+ND(QQP)	46.62	20.12	44.09	92.72
AS+LM	45.11	18.92	43.08	92.30
AS+ES+ND(MRPC)	46.85	19.96	44.43	92.57
AS+ES(AMI)+ND	46.60	19.90	44.03	92.40
AS+ES(AMI)+ND(QQP)	46.73	20.30	44.44	92.43
AS+ES+LM	45.51	19.73	43.90	92.52
AS+ND(MRPC)+LM	45.14	19.60	43.20	92.26
AS+ES+ND(MRPC)+LM	45.62	19.80	44.10	92.60

