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GitHub Repo Link: -

https://github.com/KuNNaL2412/Text_Summarization

Assignment: Evaluate OpenLLMs for Text Summarization

Objective: Compare at least three OpenLLMs on a text summarization task and recommend the best model based on performance metrics.

Steps: -

Task Definition: Define the text summarization context (e.g., news articles).

Dataset: Use a dataset with articles and their summaries.

Model Selection: Pick at least three OpenLLMs.

Implementation: Implement text summarization for each model.

Metrics: Use ROUGE scores for performance evaluation.

Evaluation: Apply metrics to each model.

Analysis: Summarize performance in a table.

Recommendation: Pick the best model and justify your choice.

Dataset Used: - "cnn_dailymail" with columns - id, articles & highlights.

Models Used: - Huggingface Transformer Models

1. facebook/bart-large-cnn
2. Einmalumdiewelt/T5-Base_GNAD
3. google/pegasus-cnn_dailymail

Metrics Used: - ROUGE Scores

1. rouge1 (Precision, Recall, F1 Score)
2. rouge2 (Precision, Recall, F1 Score)
3. rougeL (Precision, Recall, F1 Score)

Sample Dataset Article: -

(CNN)Never mind cats having nine lives. A stray pooch in Washington State has used up at least three of her own after being hit by a car, apparently whacked on the head with a hammer in a misguided mercy killing and then buried in a field -- only to survive. That's according to Washington State University, where the dog -- a friendly white-and-black bully breed mix now named Theia -- has been receiving care at the Veterinary Teaching Hospital. Four days after her apparent death, the dog managed to stagger to a nearby farm, dirt-covered and emaciated, where she was found by a worker who took her to a vet for help. She was taken in by Moses Lake, Washington, resident Sara Mellado. "Considering everything that she's been through, she's incredibly gentle and loving," Mellado said, according to WSU News. "She's a true miracle dog and she deserves a good life." Theia is only one year old but the dog's brush with death did not leave her unscathed. She suffered a dislocated jaw, leg injuries and a caved-in sinus cavity -- and still requires surgery to help her breathe. The veterinary hospital's Good Samaritan Fund committee awarded some money to help pay for the dog's treatment, but Mellado has set up a fundraising page to help meet the remaining cost of the dog's care. She's also created a Facebook page to keep supporters updated. Donors have already surpassed the \$10,000 target, inspired by Theia's tale of survival against the odds. On the fundraising page, Mellado writes, "She is in desperate need of extensive medical procedures to fix her nasal damage and reset her jaw. I agreed to foster her until she finally found a loving home." She is dedicated to making sure Theia gets the medical attention she needs, Mellado adds, and wants to "make sure she gets placed in a family where this will never happen to her again!" Any additional funds raised will be "paid forward" to help other animals. Theia is not the only animal to apparently rise from the grave in recent weeks. A cat in Tampa, Florida, found seemingly dead after he was hit by a car in January, showed up alive in a neighbor's yard five days after he was buried by his owner. The cat was in bad shape, with maggots covering open wounds on his body and a ruined left eye, but remarkably survived with the help of treatment from the Humane Society.

Sample Dataset Summary: -

Theia, a bully breed mix, was apparently hit by a car, whacked with a hammer and buried in a field. "She's a true miracle dog and she deserves a good life," says Sara Mellado, who is looking for a home for Theia.

Analysis: - Summarization Performance

Models Used		
Bart	T5	Pegasus
Generated Summary: - Theia, a one-year-old bully breed mix, was hit by a car and buried in a field. She managed to stagger to a nearby farm, dirt-covered and emaciated. She suffered a dislocated jaw, leg injuries and a caved-in sinus cavity. ROUGE Score: - ROUGE-1: Score (precision=0.4883720930232558, recall=0.4883720930232558, fmeasure=0.4883720930232558) ROUGE-2: Score (precision=0.2857142857142857, recall=0.2857142857142857, fmeasure=0.2857142857142857) ROUGE-L: Score (precision=0.4883720930232558, recall=0.4883720930232558, fmeasure=0.4883720930232558)	Generated Summary: - In Washington State, a stray dog apparently died after being hit by a car and buried in a field. Now, she's been receiving treatment at a local veterinary hospital. Donors have already exceeded the \$10,000 goal. ROUGE Score: - ROUGE-1: Score (precision=0.39473684210526316, recall=0.3488372093023256, fmeasure=0.3703703703703704) ROUGE-2: Score (precision=0.21621621621621623, recall=0.19047619047619047, fmeasure=0.20253164556962025) ROUGE-L: Score (precision=0.3684210526315789, recall=0.32558139534883723, fmeasure=0.34567901234567905)	Generated Summary: - Theia, a white-and-black bully breed mix, was apparently hit by a car and buried in a field .<n>Four days later, the dog staggers to a farm and is taken in by a worker .<n>She needs surgery to fix a dislocated jaw and a caved-in sinus cavity. ROUGE Score: - ROUGE-1: Score (precision=0.47058823529411764, recall=0.5581395348837209, fmeasure=0.5106382978723404) ROUGE-2: Score (precision=0.26, recall=0.30952380952380953, fmeasure=0.2826086956521739) ROUGE-L: Score (precision=0.4117647058823529, recall=0.4883720930232558, fmeasure=0.44680851063829785)

Recommendation: -

1. According to the ROUGE Scores the best model would be the Pegasus model because when compared to other model's scores the Pegasus model performed better in most aspects.
2. And although there are many pros and cons of each model according to the Summary generated from the article when we the read the generated the summary from T5 model, the summary seems catchier and more informative than that of others.

Implementation and Code at: -

https://github.com/KuNNaL2412/Text_Summarization/blob/main/Text_Summarization.ipynb

References: -

1. <https://huggingface.co/facebook/bart-large-cnn>
2. https://huggingface.co/Einmalumdiewelt/T5-Base_GNAD
3. https://huggingface.co/google/pegasus-cnn_dailymail