CSC2/447: Homework 3

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All solutions are my own; I consulted with no one on this homework.

[Q1] Present data examples of SQuAD dataset.

Example from the training subset:

Context:

Architecturally, the school has a Catholic character. Atop the Main Building's gold dome is a golden statue of the Virgin Mary. Immediately in front of the Main Building and facing it, is a copper statue of Christ with arms upraised with the legend "Venite Ad Me Omnes". Next to the Main Building is the Basilica of the Sacred Heart. Immediately behind the basilica is the Grotto, a Marian place of prayer and reflection. It is a replica of the grotto at Lourdes, France where the Virgin Mary reputedly appeared to Saint Bernadette Soubirous in 1858. At the end of the main drive (and in a direct line that connects through 3 statues and the Gold Dome), is a simple, modern stone statue of Mary.

Question:

What is in front of the Notre Dame Main Building?

Answer:

'text': ['a copper statue of Christ'], 'answer-start': [188]

Example from the training subset:

Context:

Super Bowl 50 was an American football game to determine the champion of the National Football League (NFL) for the 2015 season. The American Football Conference (AFC) champion Denver Broncos defeated the National Football Conference (NFC) champion Carolina Panthers 24–10 to earn their third Super Bowl title. The game was played on February 7, 2016, at Levi's Stadium in the San Francisco Bay Area at Santa Clara, California. As this was the 50th Super Bowl, the league emphasized the "golden anniversary" with various gold-themed initiatives, as well as temporarily suspending the tradition of naming each Super Bowl game with Roman numerals (under which the game would have been known as "Super Bowl L"), so that the logo could prominently feature the Arabic numerals 50.

Question:

Which NFL team represented the AFC at Super Bowl 50?

Answer:

'text': ['Denver Broncos', 'Denver Broncos', 'Denver Broncos'], 'answer-start': [177, 177, 177]

[Q2] Fine-tune both BERT and the linear projection layer with different learning rates. Report its QA performance on the SQuAD dataset. Please set 'num_train_epochs'=5.

Learning Rate	F1	EM
2e-5	71.32163618950554	62.10974456007568
3e-5	71.70155482579143	62.677388836329236
5e-5	71.87163841462082	62.535477767265846

Table 1: Performance of the fine-tuned BERT and linear projection layer.

[Q3] Fine-tune both BERT and the MLP projection layer with different learning rates. Report its QA performance on the SQuAD dataset. Please set 'num_train_epochs'=5.

Learning Rate	F1	EM
2e-5	68.05708071355338	59.31882686849574
3e-5	69.3980603967649	60.45411542100284
5e-5	69.60020608231572	61.116367076631974

Table 2: Performance of the fine-tuned BERT and MLP projection layer.

[Q4] Freeze BERT and only update the weights of the linear projection layer with different epochs. Report its QA performance on the SQuAD dataset. Please set the learning rate as $5e{-}4$.

Epoch	F1	EM
5	6.341292117011257	0.47303689687795647
10	0.6450318437629917	0.0946073793755913
20	0.6450318437629917	0.0946073793755913

Table 3: Performance of the fixed BERT and the optimized linear projection layer.