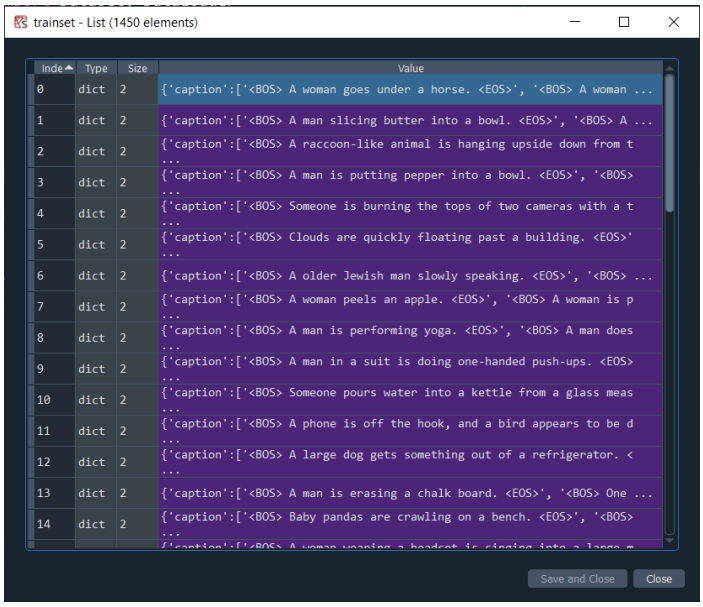
CPSC8430 HW2
03/25/2022
Hao Wang

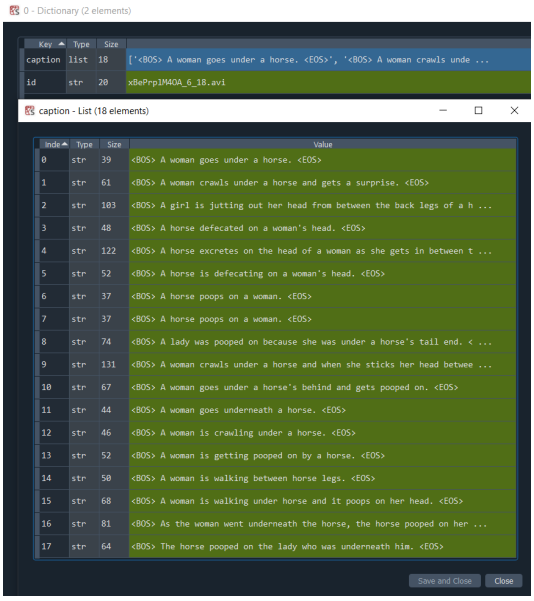
HW2 Video caption generation:

1. Model summary:

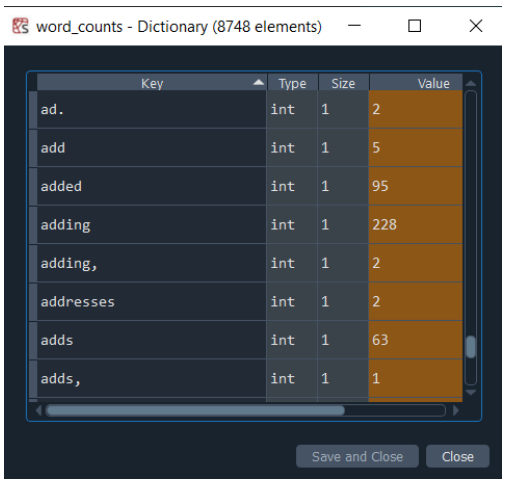
```
In [65]: print(s2vt)
S2VT(
  (drop): Dropout(p=0.5, inplace=False)
  (linear1): Linear(in_features=4096, out_features=500, bias=True)
  (linear2): Linear(in_features=500, out_features=8748, bias=True)
  (lstm1): LSTM(500, 500, batch_first=True, dropout=0.5)
  (lstm2): LSTM(1000, 500, batch_first=True, dropout=0.5)
  (embedding): Embedding(8748, 500)
)
```

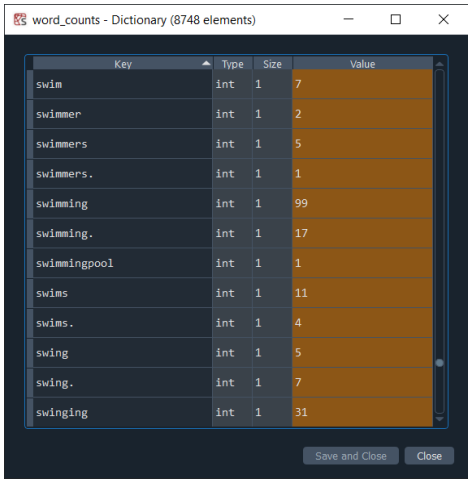
2. Data prepare:





3. Build vocabulary:





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4. Training setup:
    - Dataset = MSVD (1450/100, training/testing)
    - Epochs = 30
    - iteration = 2000
    - Batch size = 10
    - Learing rate= 0.0001

5. Training process tracking:

- Epoch 1: Training just started, weights are initializing, results tend to randomness.

```
Epoch: 0  iteration: 1000 , loss: 0.394902, time: 106.066846
Epoch: 1  iteration: 0 , loss: 0.349419, time: 105.669187
Epoch: 1 iter: 0 save successed!
.........................
Output Caption:

 A man is playing a guitar.
 A man is slicing a bowl.
 A man is slicing a piece of a bowl.
 A woman is slicing a piece of a bowl.
 A woman is slicing a piece of a bowl.
 A man is playing a guitar.
 A man is playing a guitar.
 A man is playing a guitar.
 A man is playing a guitar.
 A woman is slicing a piece of a bowl.
.........................
GT Caption:

 <BOS> A gymnast is doing back flips then falls.
 <BOS> The cat swatted someone from inside a box.
 <BOS> A woman is putting a dish of liquid in a microwave.
 <BOS> A woman is skewering shrimp.
 <BOS> A man empties rice roni from a small carton box to a pan containing melted butter.
 <BOS> A band is playing instruments.
 <BOS> A small car explodes in a field.
 <BOS> A man shoots another man on a horse.
 <BOS> A boy is kicking a ball.
 <BOS> The lady cut up shrimp and put it in the salad.
.........................
```

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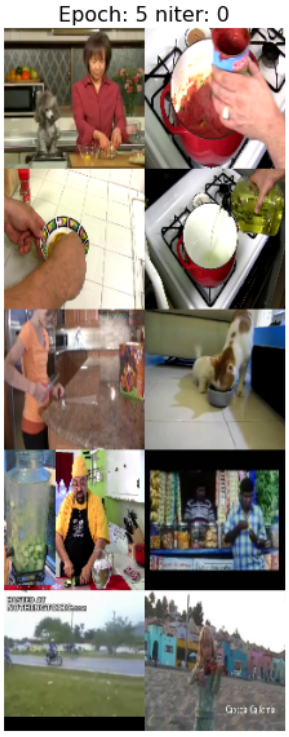
- Epoch 2: The model started to generate some right sentences in the correct order.

```
Epoch: 3  iteration: 0 , loss: 0.488642, time: 106.471864
Epoch: 3 iter: 0 save successed!
.............................
Output Caption:

 A woman is slicing a potato.
 A group of people are dancing.
 A dog is walking on a dog.
 A woman is riding a horse.
 A dog is eating a dog.
 A man is pouring a gun.
 A panda is eating a dog.
 A man is cutting a piece of a knife.
 A man is putting a gun.
 A woman is slicing a potato.
.............................
GT Caption:

 <BOS> The lady poured soy sauce and seasonings on the tomatoes.
 <BOS> A wall of bouncing balls descend a street.
 <BOS> A dog is waving its tail and barking.
 <BOS> A girl is climbing a rock.
 <BOS> Someone with gloved hands is listening to a baby panda through a stethoscope.
 <BOS> A man is cutting a bottle with a sword.
 <BOS> Two bears investigate a pile of dirt.
 <BOS> A large green ball is rolling into a potato.
 <BOS> The cartoon girl flipped a pancake in a frying pan.
 <BOS> A woman is cutting mushrooms.
.............................
```

- Epoch 5: Output accuracy improves.

```
Epoch: 5  iteration: 0 , loss: 0.319838, time: 118.111180
Epoch: 5 iter: 0 save successed!
.............................
Output Caption:

 A woman is putting ingredients in a bowl.
 A person is adding a piece of meat in a bowl.
 A woman is putting a piece of bread.
 A man is slicing a piece of bread.
 A man is riding a horse.
 A man is pouring oil into a pot.
 A man is pouring oil into a pot.
 A cat is playing with a ball.
 A woman is talking on a phone.
 A girl is playing a flute.
.............................
GT Caption:

 <BOS> A woman is cracking eggs.
 <BOS> A man is beating two eggs in a bowl with a fork.
 <BOS> A girl is cutting a piece of plastic.
 <BOS> A man is slicing a cucumber.
 <BOS> The boy hit a sign on his bike and fell off.
 <BOS> The man put water into the tomato sauce can.
 <BOS> A man is adding oil to a bowl.
 <BOS> A cat is eating out of a bowl and a puppy is biting the cats ear.
 <BOS> The man ate a banana.
 <BOS> A girl plays the violin.
.............................
```



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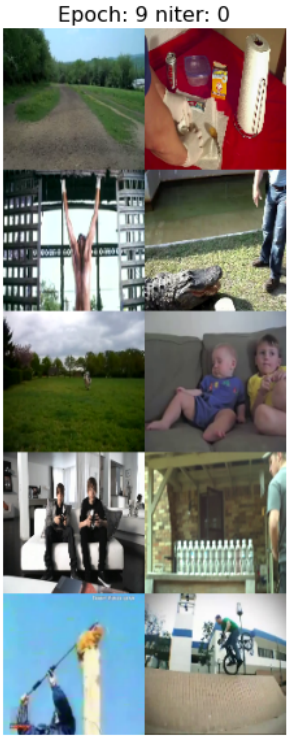
- Epoch 9: Loss decreased, the result is getting better.

```
Epoch: 9  iteration: 0 , loss: 0.263892, time: 114.495699
Epoch: 9 iter: 0 save successed!
.........................
Output Caption:

 A woman is riding a horse.
 A man is doing push ups.
 A woman is riding a horse.
 Two women are playing video games.
 A cat is jumping into a car.
 A man is cleaning a cd.
 A man is cutting a dead deer.
 A baby is falling asleep on a couch.
 A man is cutting a piece of wood.
 A man is riding a motorcycle.
.........................
GT Caption:

 <BOS> A woman is riding on a horse.
 <BOS> The man did chin-up in the doorway.
 <BOS> The rider trotted on the horse across the field.
 <BOS> Two boys are playing video game.
 <BOS> A cat jumps from a utility pole.
 <BOS> A man is cleaning a DVD.
 <BOS> The man pet the nose of the alligator.
 <BOS> A boy is slipping while sitting on a couch.
 <BOS> Using a knife, a man cuts through a row of bottles that are full of water.
 <BOS> A man is performing stunts with his bike.
.........................
```

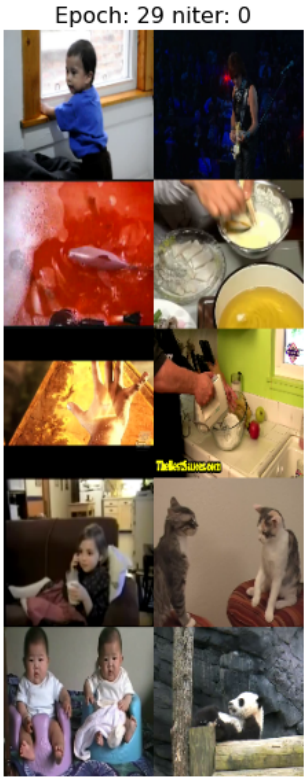


- Epoch 29: Training done, the result is very close to the ground truth.

```
Epoch: 29  iteration: 0 , loss: 0.173709, time: 105.581422
Epoch: 29 iter: 0 save successed!
.........................
Output Caption:

 A boy is looking out a window.
 A toy fish is moving in the water.
 A man is staring at his hand.
 Two girls are talking on the phone.
 A baby is sneezing and other baby.
 A man is playing the guitar.
 A person is frying something.
 A man is mixing ingredients in a bowl.
 Two cats are fighting.
 A panda is lying on logs.
.........................
GT Caption:

 <BOS> A small boy has placed his hands on the window pane and
 <BOS> Bath toys are swimming.
 <BOS> A bright triangle shape appears on the hand of a man.
 <BOS> Two girls are talking in telephone.
 <BOS> The babies are sitting down.
 <BOS> A man is playing a guitar.
 <BOS> The woman is frying vegetables.
 <BOS> The man mixed the dough in a bowl.
 <BOS> Two cats are playing while sitting on stools.
 <BOS> A panda is lounging around.
.........................
```



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6. Bleu evaluation:
    - Score: 0.61 > baseline = 0.6

```
\MLDS_hw2_1_data>python bleu_eval.py test
_output.txt
Average bleu score is 0.6128513171038914
```

7. Summary:

    - Total time cost: 6340 seconds ~ 1.8 hours

    - Loss plot: