Neural Monkey: The Current State and Beyond

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March 19, 2018
Neural Monkey

- Open-source toolkit for sequential learning
- Suited for research and education
- Three (overlapping) user groups considered:
  - Students
  - Researchers
  - Newcomers to deep learning
Goals

1. Code readability
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2. Modularity along research concepts
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3. Up-to-date building blocks
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2. Modularity along research concepts
3. Up-to-date building blocks
4. Fast prototyping
Development

• Implemented in Python 3.5 using TensorFlow
• thanks to TensorFlow GPU support using CUDA, cuDNN
• Actively developed using GitHub as the main communication platform

Source code here:

https://github.com/ufal/neuralmonkey
• Multimodal translation  
  (Charles University, ACL 2017)
• Bandit learning  
  (Heidelberg University, ACL 2017)
• Graph Convolutional Encoders  
  (University of Amsterdam, EMNLP 2017)
Simple MT Configuration Example

[main]
output="output_dir"
batch_size=64
epochs=20
train_dataset=<train_data>
val_dataset=<val_data>
trainer=<my_trainer>
rungerset=[<my_runner>]
evaluation=[
    ("target", evaluators.BLEU)]
logging_period=500
validation_period=5000
[en_vocabulary]
class=vocabulary.from_wordlist
path="en_vocab.tsv"
[de_vocabulary]
class=vocabulary.from_wordlist
path="de_vocab.tsv"
[train_data]
class=dataset.from_files
s_source="data/train.en"
s_target="data/train.de"
[val_data]
class=dataset.from_files
s_source="data/val.en"
s_target="data/val.de"
[my_encoder]
class=encoders.SentenceEncoder
rnn_size=500
embedding_size=600
data_id="source"
vocabulary=<en_vocabulary>
[my_attention]
class=attention.Attention
encoder=<my_encoder>
state_size=500
[my_decoder]
class=decoders.Decoder
encoders=[<my_encoder>]
attentions=[<my_attention>]
rnn_size=1000
embedding_size=600
data_id="target"
vocabulary=<de_vocabulary>
[my_trainer]
class=trainers.CrossEntropyTrainer
decoders=[<my_decoder>]
clip_norm=1.0
[my_runner]
class=runners.GreedyRunner
decoder=<my_decoder>
Define how to load images:

[imagenet_reader]
class=readers.image_reader.imagenet_reader
prefix="/lnet/troja/projects/wmt17-multimodal/data/flickr30k-images"
target_width=229
target_height=229
zero_one_normalization=True

And replace encoder with ImageNet network:

[imagenet_resnet]
class=encoders.ImageNet
name="imagenet"
data_id="images"
network_type="resnet_v2_50"
spatial_layer="resnet_v2_50/block4/unit_3/bottleneck_v2/conv3"
slim_models_path="tensorflow-models/research/slim"
Keep the encoder and replace the decoder (and update the rest)

```python
[my_classifier]
class=decoders.Classifier
data_id="labels"
encoders=[<my_encoder>]
vocabulary=<label_vocabulary>
layers=[200]
```

```python
[my_runner]
class=runners.PlainRunner
decoder=<my_classifier>
```

```python
[my_trainer]
class=trainers.CrossEntropyTrainer
decoders=[<my_classifier>]
clip_norm=1.0
```

Pre-trained model parts
Parameters of model parts can be fixed using the gradient blocking module
Supported Features

- Recurrent encoder and decoder with attention
- Beam search decoding with model ensembling
- Deep convolutional encoder
- Self-attentive encoder and decoder
- Wrappers for ImageNet networks
- Custom CNNs for image processing

- ConvNets for sequence classification
- Self-attentive embeddings for sentence classification
- Hierarchical attention over multiple source sequences
- Generic sequence labeler
- Connectionist temporal classification
Console Logging during Training

source: it started the French League season with two wins and two draws, and on Sunday it defeated St. Etienne 5 : 0 .

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target: ten do sezony francouzské ligy odevzdal dvěma výhrami a dvěma remizami, v neděli rozstřílel St . Etienne 5 : 0 .

target (ref): ten do sezoany francouzské ligy odevzdal dvěma výhrami a dvěma remizami, v neděli rozstřílel St . Etienne 5 : 0 .

source: it is putting the most pressure on AS Monaco .

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target: relativně nejvíce tláčí bota Klub AS Monaco .

target (ref): relativně nejvíce tláčí bota Klub AS Monaco .

source: it so far has a balance of 1-1-2 in the league .

source: it so far has a balance of 1-0-0 in the league .

source: it so far has a balance of 1-1-2 in the league .

target: 1-1-2 v lize, a ověření se rozšiřuje 1-0-0 v lile.

source: v <unk> <unk> <unk> (0 <unk> a <unk> je <unk> <unk> <unk> <unk>.

source: v <unk> <unk> <unk> <unk> a <unk> je <unk> <unk> <unk> <unk>.

source: today news appeared on tableau English-language websites stating that the Queens Park Rangers may want Czech .

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Validation (epoch 1, batch number 214968):

Variable file saved in experiments/czeng-rnn-variables.data
Best scores saved so far: [0.8549028005382579] Variable file saved in experiments/czeng-rnn-variables.data
Variables of 'encoder' saved to 'experiments/czeng-rnn-encoder.cpt'
Variables of 'encoder_input' saved to 'experiments/czeng-rnn-encoder_input.cpt'
Best target/BLU-4 on validation: 9.855 (in epoch 1, after batch number 214968)
Validation time: 1713.46s, Inter-validation: 7391.83s, per-instance (train): 0.02s, per-instance (val): 4.4s
Validation period setting is inefficient.
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Scalar Values in TensorBoard

Losses, evaluation metrics, parameter norms, histograms of gradients
Attention in TensorBoard
Conclusions

Neural Monkey is:

- Actively developing open-source GitHub project
- Suited for researchers, students, and other DL enthusiasts
- Large collection of interesting features from across the NLP sub-topics
- Simple tool to use because of clear and readable configuration files
- Highly modular, therefore also relatively easy to debug
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Thank you for your attention!