Video Object Segmentation using Deep Learning

Update Presentation, Week 3

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1. Previous Work

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Previous Work
Read the following:

- **Tube Convolutional Neural Network (T-CNN) for Action Detection in Videos** by Hou, Chen, & Shah (arXiv, April 2017)
- **Learning Spatiotemporal Features with 3D Convolutional Networks** by Tran et al. (arXiv, October 2015)
- **The 2017 DAVIS Challenge on Video Object Segmentation** by Pont-Tuset et al. (arXiv, April 2017)
- **FusionSeg: Learning to combine motion and appearance for fully automatic segmentation of generic objects in videos** by Jain, Xiong, & Grauman (arXiv, April 2017)
- **Semantically-Guided Video Object Segmentation** by Perazzi et al. (arXiv, December 2016)
- **Learning Video Object Segmentation from Static Images** by Caelles et al. (arXiv, April 2017)
Focusing on semantic segmentation, using the DAVIS 2017 dataset to start.

Working on the implementation.
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Working on the implementation.
Current Work
Goals

■ Finishing the initial literature review.

■ Gaining a deeper understanding of the SegNet, T-CNN, and C3D papers.

■ Understanding the current implementation.

■ Becoming familiar with the DAVIS 2017 dataset.
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Literature Review

- **Learning Video Object Segmentation with Visual Memory** by Tokmakov et al. (arXiv, April 2017)
  - Uses a GRU as the *memory module* which continuously learns the appearance of the object(s) in the scene.

- **A Benchmark Dataset and Evaluation Methodology for Video Object Segmentation** by Perazzi et al. (CVPR, 2016)
  - DAVIS 2016 paper
  - More detail in describing metrics, necessity of dataset
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**SegNet**

- **SegNet: A Deep Convolutional Encoder-Decoder Architecture for Image Segmentation** by Badrinarayanan et al. (arXiv, Oct. 2016)
  - Encoder network is first 13 convolutional layers from VGG-16
  - Uses pooling indices from max-pooling step when upsampling
**T-CNN and C3D**

- *Tube Convolutional Neural Network (T-CNN) for Action Detection in Videos* by Hou, Chen, & Shah (arXiv, April 2017)
  - Uses C3D to gain spatio-temporal information.

- *Learning Spatiotemporal Features with 3D Convolutional Networks* by Tran et al. (arXiv, October 2015)
  - Better than 2D CNN architectures on various benchmarks.
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Implementation

So far, there are 4 core files:

1. dataset_input.py
   • Reads/decodes data from TFRecords file and provides data batches.

2. jhmdb_iter_size_train.py
   • Trains the JHMDB (Joint-annotated Human Motion Data Base) dataset using iter_size, originally from Caffe.

3. jhmdb_to_records.py
   • Converts items in JHMDB dataset to the TFRecords file format.

4. train_net.py
   • Implements the C3D pipeline but replaces fully-connected layers with convolution-transpose layers for semantic segmentation.
   • Also provides visual summaries for activation functions, loss functions, etc.
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Offered in both 480p and full-resolution, the set includes:

- Folder of annotations for the first frame of each sequence
- .txt files of each video sequence’s label
- Folders of the sequence frames
Upcoming Work
Plan for Next Week

- Setting up the current code to work on the DAVIS 2017 dataset.

- Reading related material and doing tutorials as needed.
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