

Threats Detection for Airport Body Scan Images

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Motivations

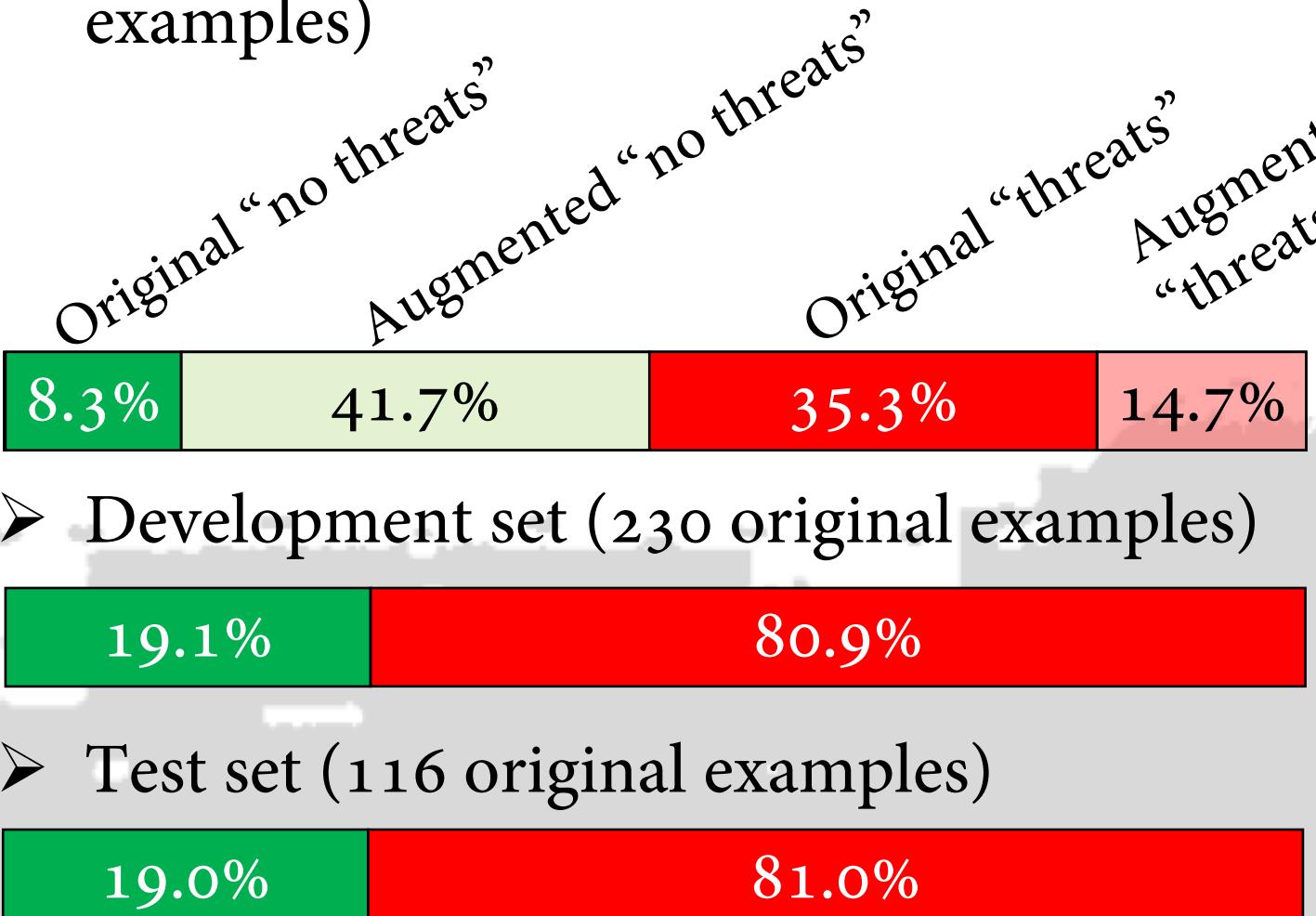
- Strengthen algorithm accuracy to reduce false alarms and improve traveler safety
- Reduce processing time compared to the 3D CNN
- Speed-up the passenger screenings at the airport

Related studies

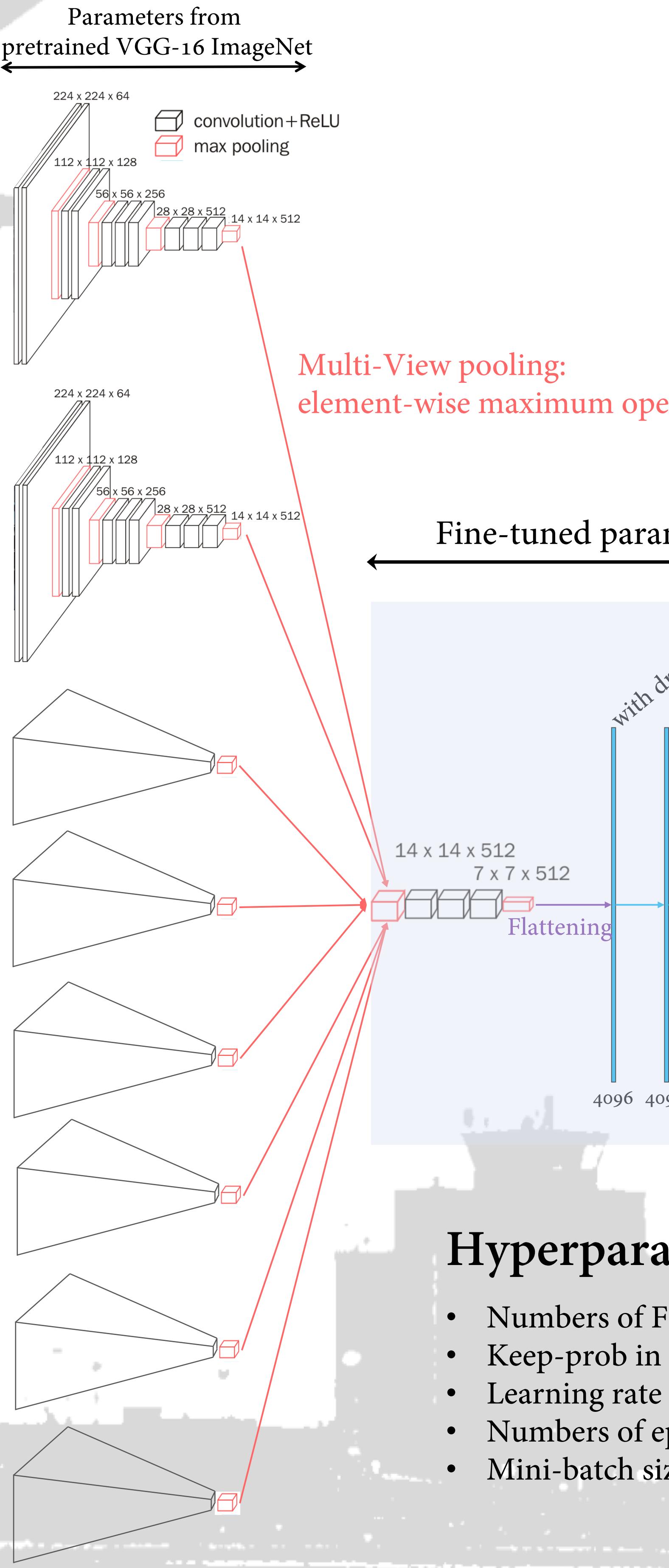
- Multi-View Convolutional Neural Networks (MVCNN)
 - 3D shape recognition (Su et al., 2015)
 - 3D shape retrieval from ShapeNet Core55 (Savva et al., 2016)
 - Cancer screening (Geras et al., 2017)
- Pretrained CNN model
 - VGG-16 on ImageNet (Simonyan and Zisserman, 2015)

Data set

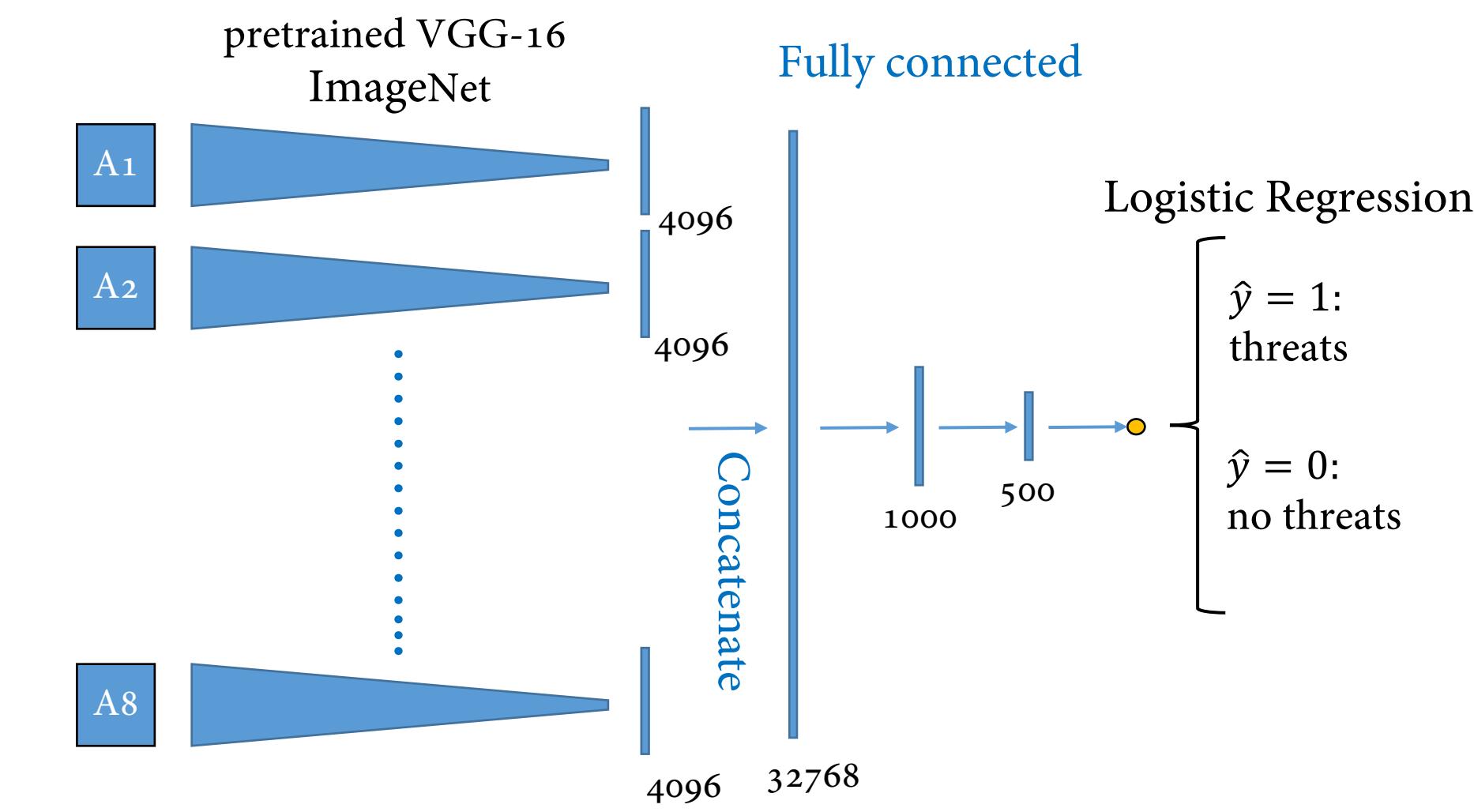
- Originally 1147 examples of full body scan images
 - 219 (19%) of “no threat” examples
 - 928 (81%) of “threat” examples
- Data augmentation using combinations of:
 - Shifting 20-100 pixels
 - Sharpening and brightening
- Final data sets:
 - Training set (801 original and 1035 augmented examples)



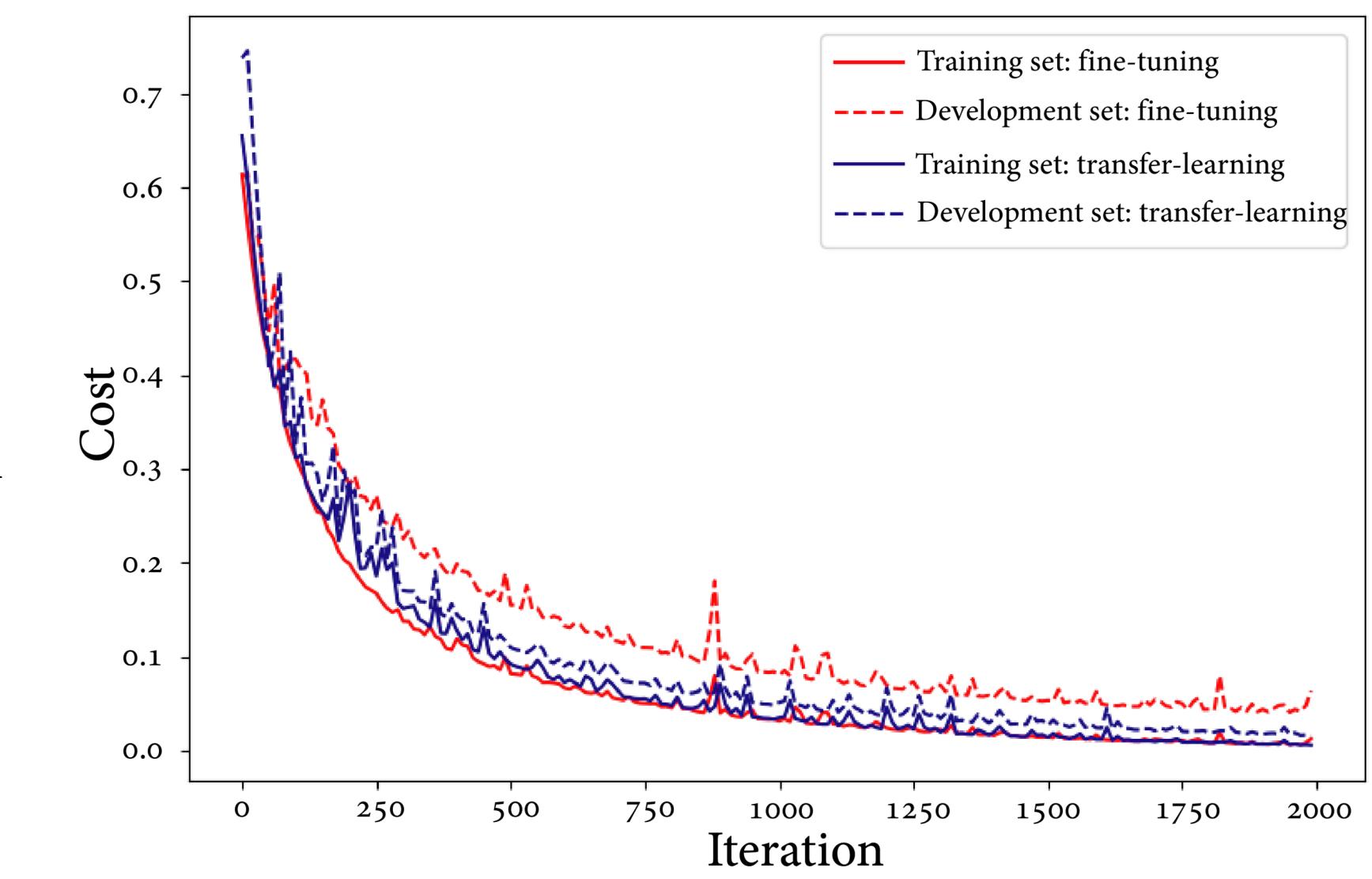
Fine-tuning Multi-View CNN (MVCNN)



Transfer learning MVCNN



Learning curves



Predictions

Evaluation	Fine-tuning MVCNN	Transfer learning MVCNN
Training accuracy	99.7%	100%
Dev accuracy	97.8%	100%
Test accuracy	95.7%	99.14%
Test recall	98.9%	100%
Test precision	95.9%	98.95%
Test f1 score	97.4%	99.5%

Hyperparameters tuning

- Numbers of FC layers
- Keep-prob in dropout
- Learning rate
- Numbers of epoch
- Mini-batch size

The transfer learning is slightly better than fine-tuned MVCNN on this dataset