Heterogeneous Model Reuse via Optimizing Multiparty Multiclass Margin

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Problem setting

- Flu detection
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- Flu detection
- Merge local models, not local datasets
Our HMR method

- Multiple heterogeneous models
- Trained separately
- Different label spaces

• Calibrate confidence scores
• By optimizing MPMC-margin

• One global model
• On full label space
Q: How to measure the global behavior?
A: Multiparty multiclass (MPMC) margin.

Q: How to optimize the global behavior?
A: The HMR method, which maximizes MPMC-margin. by modifying local models, without merging local datasets.
Experiments

- Toy example on LR/SVM/GBDT
  - Heterogeneous learning models
  - Selectively exchanged 20 examples
  - Nearly perfect performance

(a) Five-class data
(b) Iter 0: 37.90%
(c) Iter 1: 71.60%
(d) Iter 5: 85.10%
(e) Iter 10: 95.60%
(f) Iter 20: 99.30%
Experiments

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  • Heterogeneous learning models
  • Selectively exchanged 20 examples
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• Benchmarking on fashion-MNIST
  • Tested various data partitions setting
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• Multi-lingual handwriting experiment
  • 1600+ classes, 94.32% accuracy
  • Only exchanged 300 out of 420k examples (about 0.07% data)
Conclusion

Q: How to measure the multiparty global behavior?
A: Multiparty multiclass margin

Q: How to optimize the global behavior?
A: The HMR method, which reuses local models and max margin

Thank you!

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Code: https://github.com/YuriWu/HMR

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