Heterogeneous Model Reuse
via Optimizing Multiparty Multiclass Margin

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Problem setting

- Flu detection
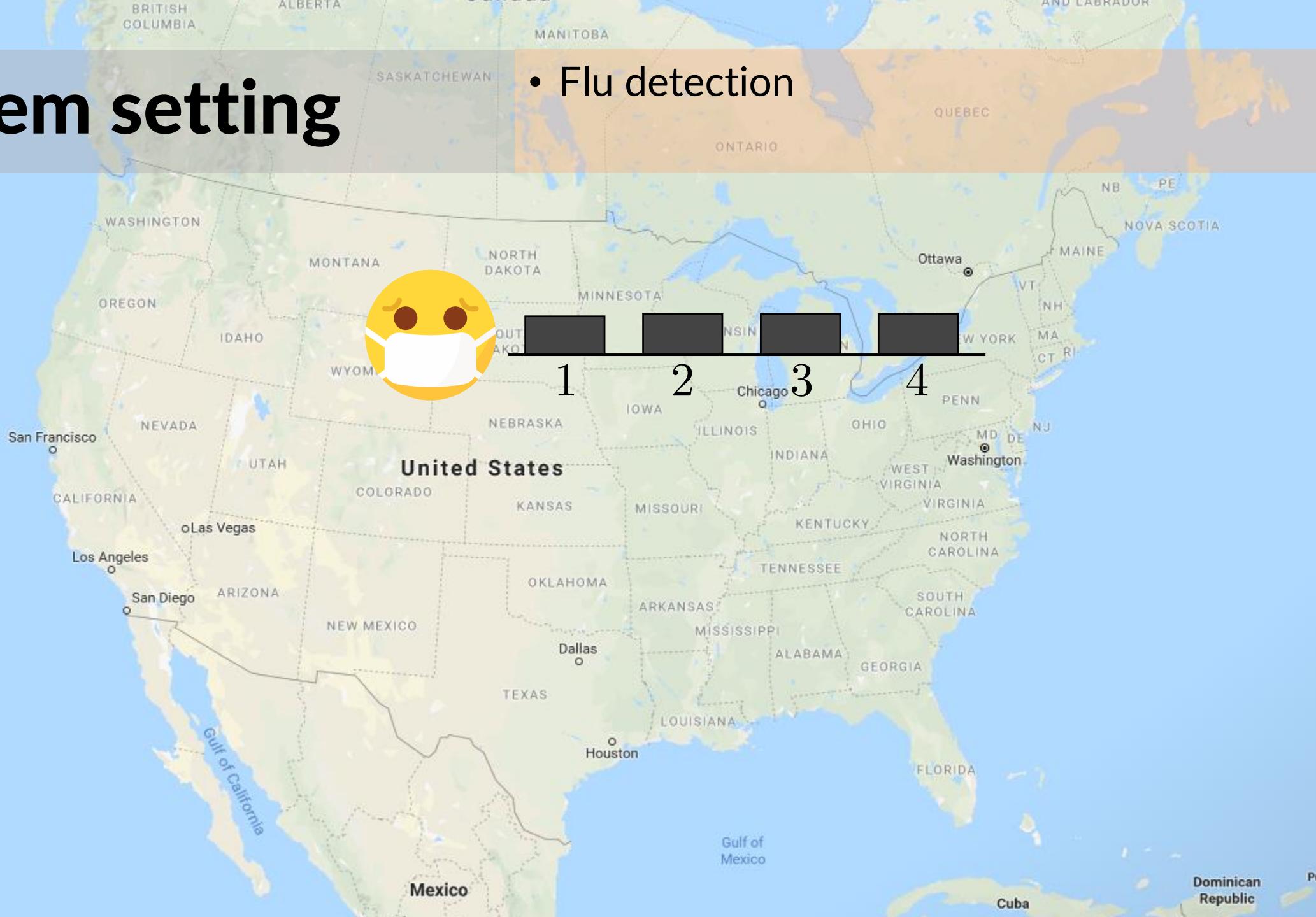
Problem setting

- Flu detection
- Merge local models, not local datasets
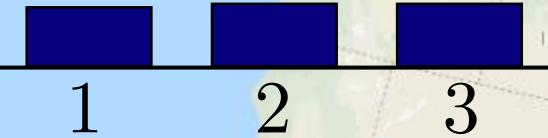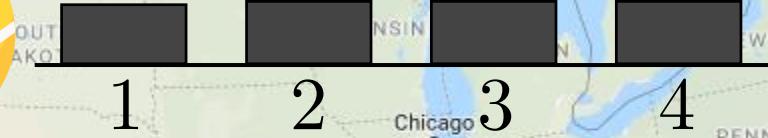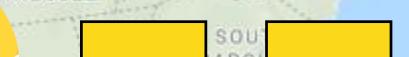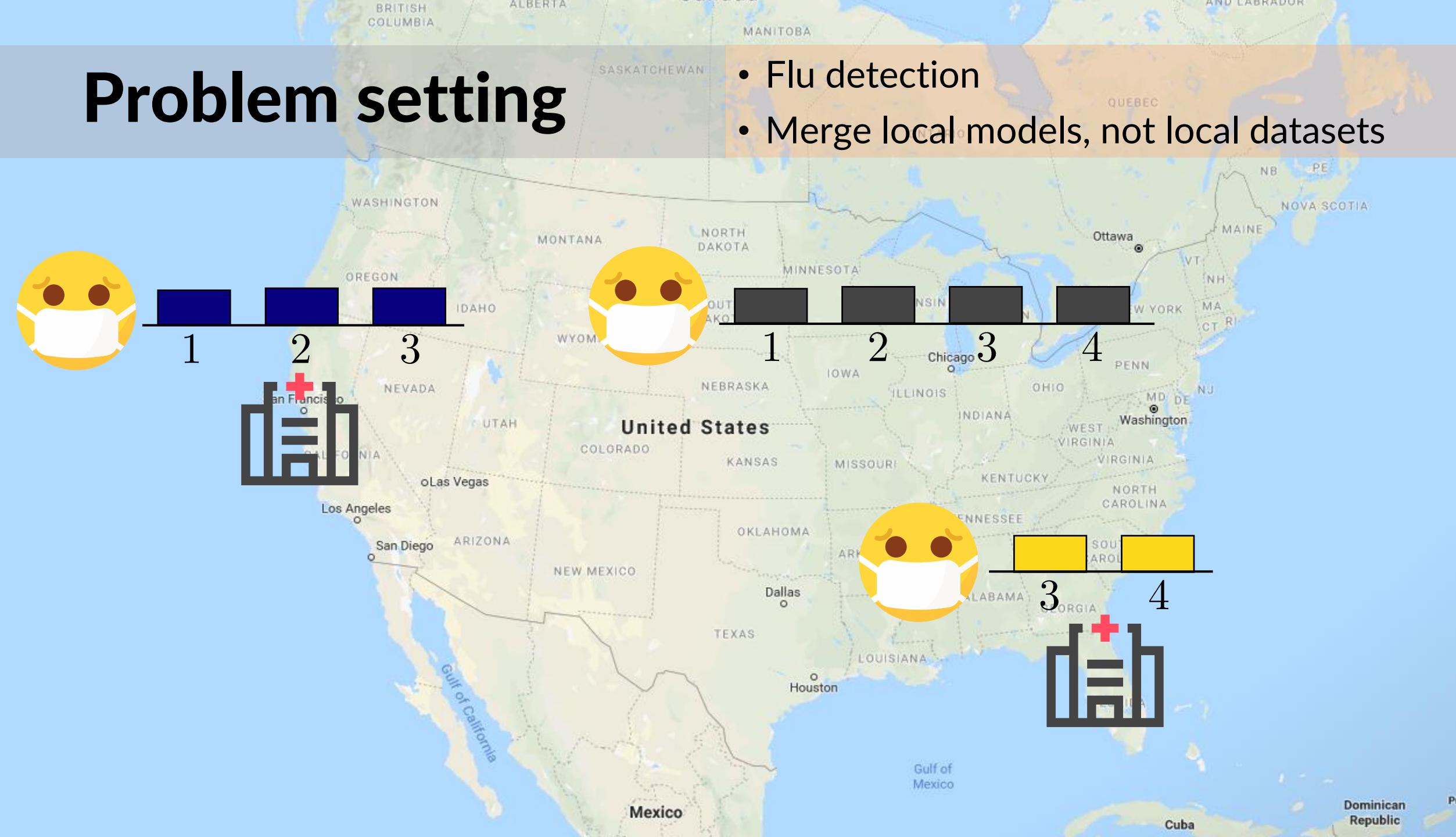
Our HMR method
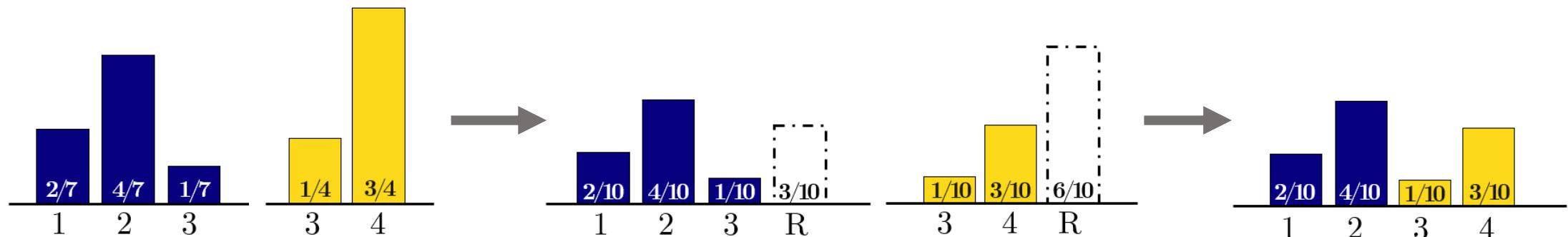
- Multiple heterogeneous models
- Trained separately
- Different label spaces

- Calibrate confidence scores
- By optimizing MPMC-margin

- One global model
- On full label space

Contribution

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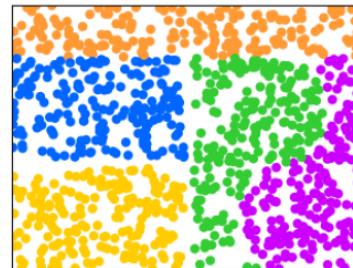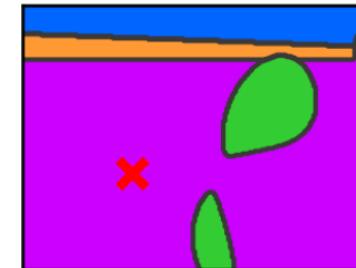
(a) Five-class data (b) Iter 0: 37.90% (c) Iter 1: 71.60%
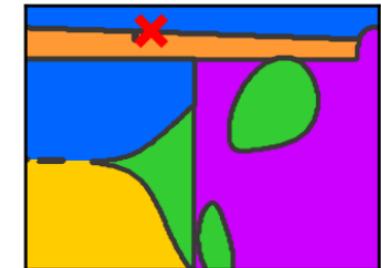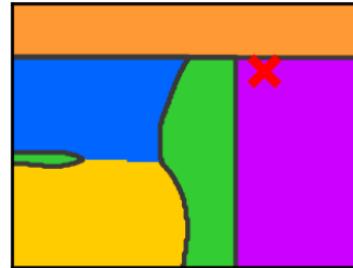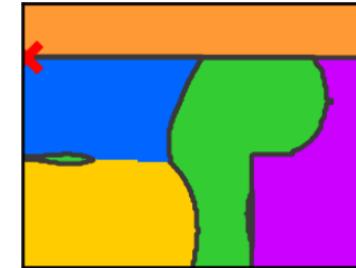
(d) Iter 5: 85.10% (e) Iter 10: 95.60% (f) Iter 20: 99.30%
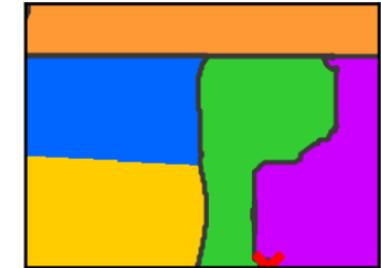
Experiments

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

- Benchmarking on fashion-MNIST
  - Tested various data partitions setting

(a) 2 parties – A (b) 2 parties – B (c) 2 parties – C

(d) 3 parties – A (e) 3 parties – B (f) 7 parties
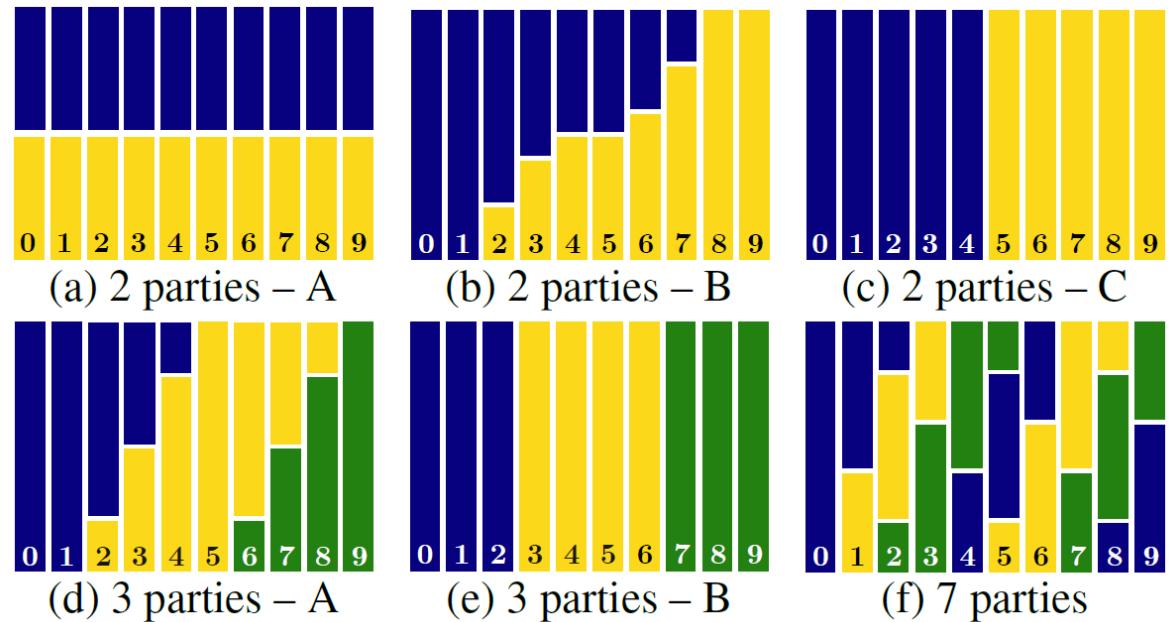
Experiments

- Toy example on LR/SVM/GBDT
  - Heterogeneous learning models
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- Multi-lingual handwriting experiment
  - 1600+ classes, 94.32% accuracy
  - Only exchanged 300 out of 420k examples
    (about 0.07% data)
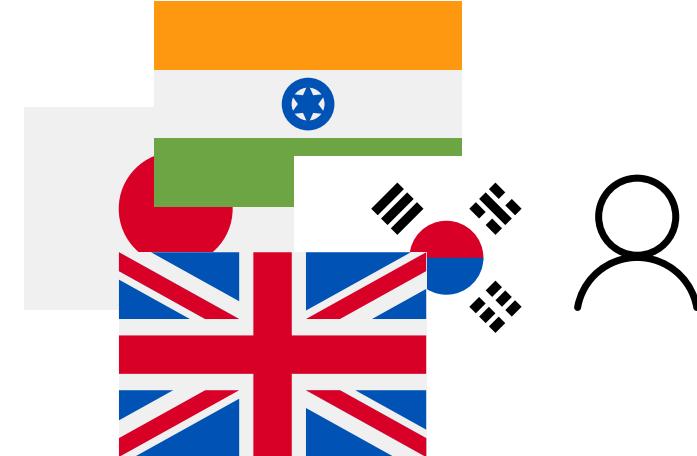
Conclusion

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
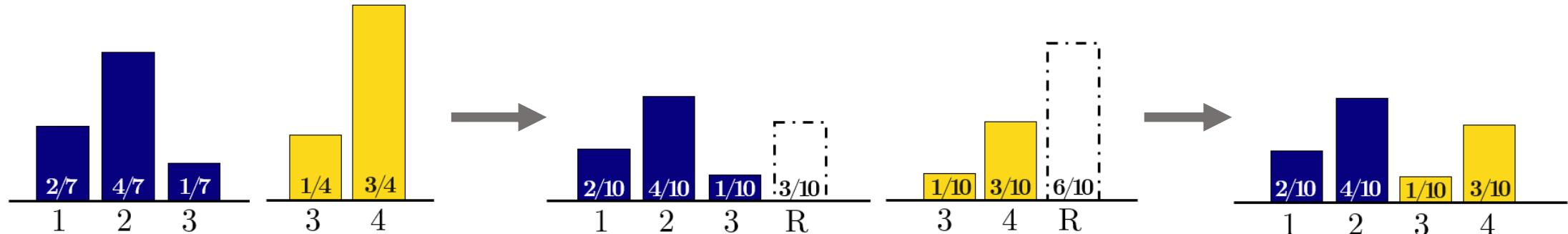
Thank you!

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

Poster #139
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