Collective Model Fusion for Multiple Black-Box Experts

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Collaborative AI: A health-care scenario
Related work: Data Fusion

Clinical Notes

Medical Codes

Vital Signs over time

Challenge: Private, heterogeneous data
Related work:
White-Box Homogeneous Model Fusion

Medical Codes - DNN
Vital Signs - RNN

Clinical Notes – Topic Model

Challenge: Private, heterogeneous model architecture
A real-world setting: Black-Box Model Fusion

Black-Box Setting: pre-trained model API to query probabilistic prediction
Collective Inference via Gradient Aggregation (CIGAR)

Light-weight Fusion
Collective Learning via Black-Box Imitation (COLBI)

\[ \minimize_{w_i} D_{KL}(q_i \parallel p_i(y|x; w_i)) \]

Guarantee: Disagreement rate is upper-bounded by a constant given sufficient training data.
CIGAR fusion improves performance

- More accurate prediction with more fusion iterations
- Up to 10% decrease in error for all black-box experts
- High prediction variance PRE-FUSION
- Low prediction variance POST-FUSION
- Before: Poor agreement
- After: Better consensus
COLBI fusion improves performance

More accurate prediction with more fusion iterations

High prediction variance PRE-FUSION

Low prediction variance POST-FUSION

Up to 18% decrease in error for all black-box experts

Before: Poor agreement
After: Better consensus
Thank you for listening!

Our poster session:

6:30pm Wednesday, Jun 12, 2019
Pacific Ballroom #184
Paper - Collective Model Fusion for Multiple Black-box Experts