Fusion Learning: Fusing Inferences from Multiple Sources for More Powerful Findings

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Inferences from multiple databases or studies can often be fused together to yield a more powerful overall inference than individual studies alone. Fusion learning refers to the development of effective approaches for synergizing learnings from different data sources. Effective fusion learning is of vital importance, especially in light of the ubiquitous information and data collection nowadays. Decision-making processes in many domains such as medicine, life science, finance, social studies, etc. often benefit greatly from considering data from different sources, possibly with varying forms of complexity and heterogeneity in their data structure.

This talk presents some new fusion methodologies for extracting and merging useful information. Some methodologies are motivated by challenges arising from massive complex structures from different data sources, and some others by specific target-directed applications similar in spirit to precision (or individualized) medicine. Underlying those methodologies is the tool of "confidence distribution" (CD), which, simply put, is a versatile distributional inferential scheme (unlike the usual point or interval inferences) without priors. Some simulation and real analysis of aircraft landing data are also presented.