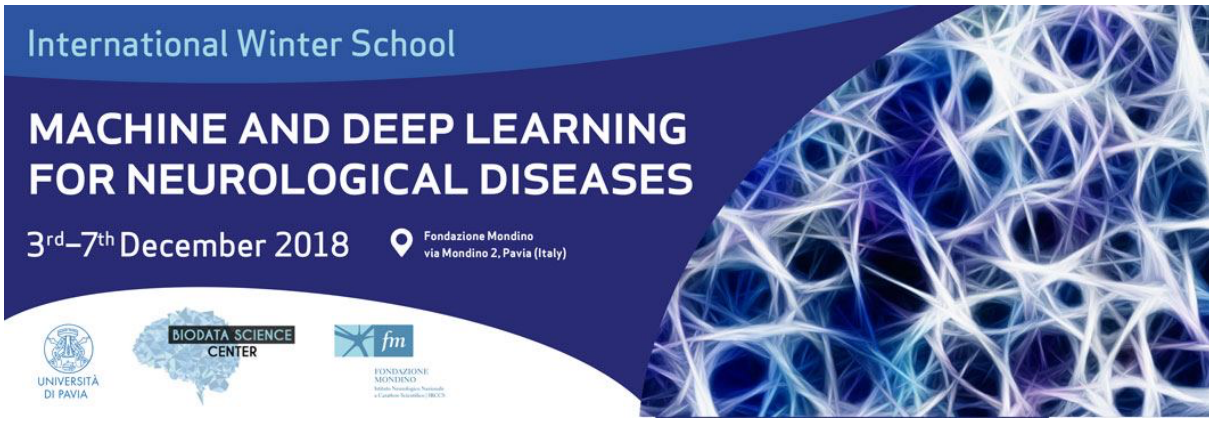

Probabilistic Graphical Models and Causal Network Models

Probabilistic graphical models are graphical representations of joint probability distributions. They represent graphically conditional independencies inherited in the joint probability distribution, therefore graph theoretic properties can be exploited for doing efficient inferences. These elegant models have many scientific and engineering applications such as probabilistic expert systems, models of uncertainty reasoning, enhanced classifiers, etc.

This short course covers theory, methods and algorithms associated with probabilistic graphical models. Mainly directed acyclic graphical models (Bayesian networks) and undirected graphical models (Markov networks) are discussed; their representations (conditional independence relationships), inference methods with related algorithms such graph moralization, junction tree algorithm, etc., model learning and some applications of them. Some applications of graphical models are also presented

Furthermore, graphical models can be used for performing causal inferences, however under strict conditions. This course also covers theory and method of representing causal knowledge in a given context, using graph theoretic methods and intervention calculus for estimating causal effects, biases, mediation effects, etc. Concepts of confounding is discussed along with so-called back-door and front-door criteria. If time allows potential outcome framework and propensity score methods for causal inference is introduced.

Free software such as R is used for modeling and inference tasks.

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