McDiarmid-Type Inequalities for Graph-Dependent Variables and Stability Bounds

Yuyi Wang

joint work with **Rui (Ray) Zhang**, **Xingwu Liu** and **Liwei Wang**

Statistical Learning Theory

	i.i.d.	
PAC bounds	Hoeffding Inequality	

Statistical Learning Theory

	i.i.d.	
PAC bounds	Hoeffding Inequality	
Stability bounds	McDiarmid Inequality	

Statistical Learning Theory

	i.i.d.	??
PAC bounds	Hoeffding Inequality	
Stability bounds	McDiarmid Inequality	

i.i.d. is not a realistic assumption in many scenarios

Graph-dependent examples

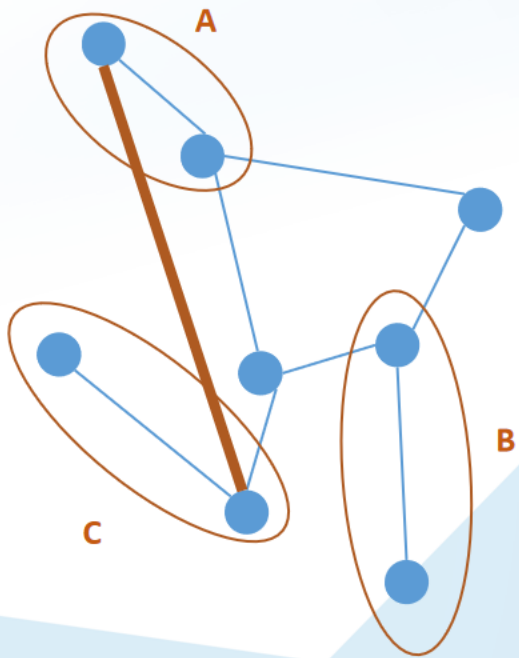
Key Components

- every **node** is a training **example**
- two groups of examples are **independent** if they have **no connection**

Graph-dependent examples

Key Components

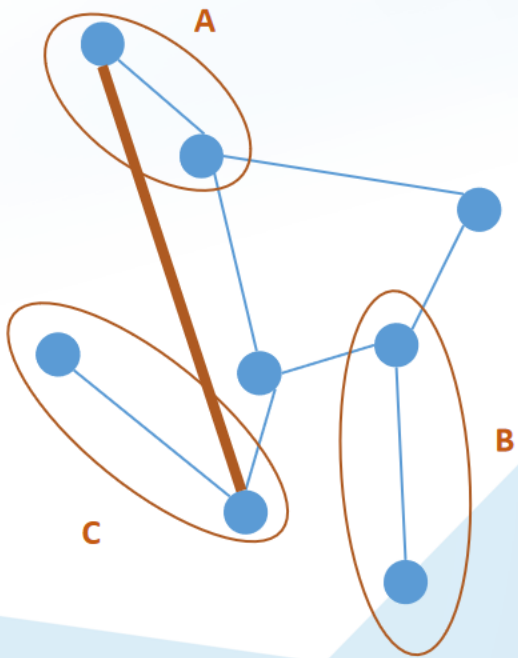
- every **node** is a training **example**
- two groups of examples are **independent** if they have **no connection**
  - **A** and **B** are independent
  - **B** and **C** are independent
  - **A** and **C** may be dependent



Graph-dependent examples

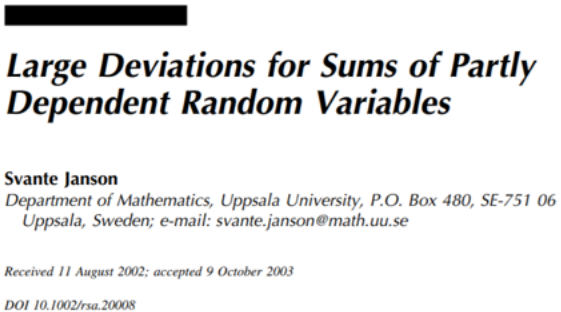
Key Components

- every **node** is a training **example**
- two groups of examples are **independent** if they have **no connection**
  - **A** and **B** are independent
  - **B** and **C** are independent
  - **A** and **C** may be dependent
- can model
  - Rankings
  - β-mixing
  - …



Statistical Learning Theory

	i.i.d.	graph-dependent
PAC bounds	Hoeffding Inequality	Janson's Method
Stability bounds	McDiarmid Inequality	



Large Deviations for Sums of Partly Dependent Random Variables

Svante Janson
Department of Mathematics, Uppsala University, P.O. Box 480, SE-751 06 Uppsala, Sweden; e-mail: svante.janson@math.uu.se

Received 11 August 2002; accepted 9 October 2003

DOI 10.1002/rsa.20008

Statistical Learning Theory

Entropy-Based Concentration Inequalities for Dependent Variables

Liva Ralaivola LIVA.RALAIVOLA@LIF.UNIV-MRS.FR
QARMA, LIF, CNRS, Aix-Marseille University, F–13288 Marseille cedex 9, France
Massih-Reza Amini MASSIH-REZA.AMINI@IMAG.FR
AMA, LIG, CNRS, University Grenoble Alpes, Centre Equation 4, BP 53, F–38041 Grenoble Cedex 9, France

	i.i.d.	graph-dependent
PAC bounds	Hoeffding Inequality	Janson's Method
Stability bounds	McDiarmid Inequality	

not very precise

Generalization error bounds for classifiers trained with interdependent data

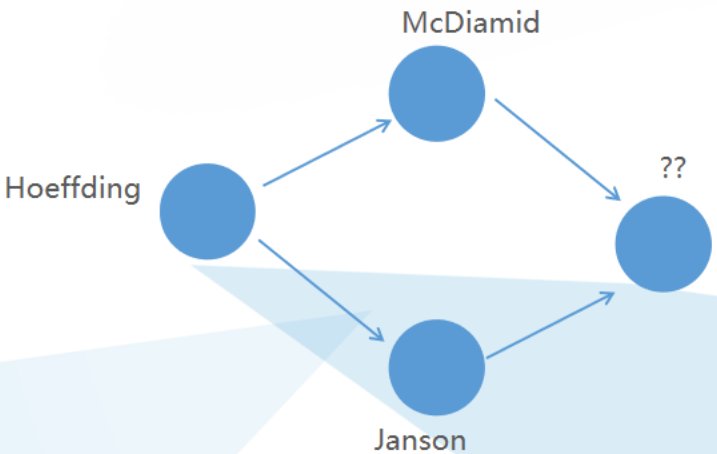
Nicolas Usunier, Massih-Reza Amini, Patrick Gallinari
Department of Computer Science, University of Paris VI
8, rue du Capitaine Scott, 75015 Paris France
{usunier, amini, gallinari}@poleia.lip6.fr

Chromatic PAC-Bayes Bounds for Non-IID Data

Liva Ralaivola, Marie Szafranski, Guillaume Stempfel
Laboratoire d'Informatique Fondamentale de Marseille
CNRS, Aix-Marseille Universités
39, rue F. Joliot Curie, F-13013 Marseille, France
{liva.ralaivola,marie.szafranski,guillaume.stempfel}@lif.univ-mrs.fr

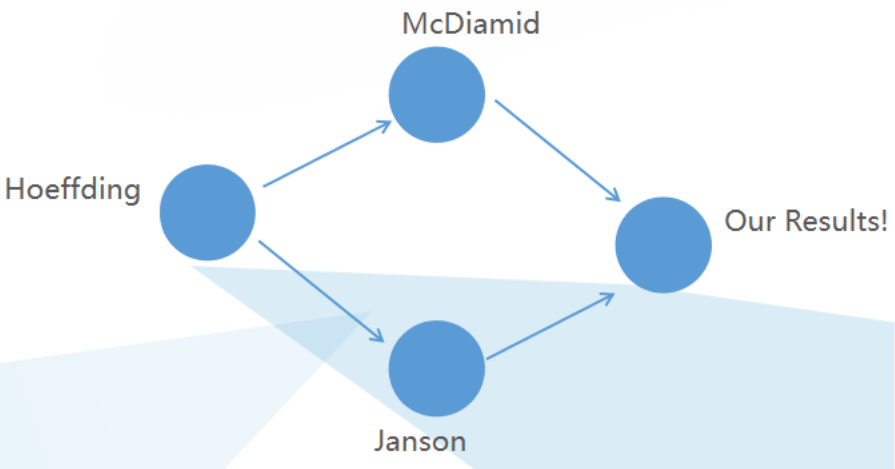
Statistical Learning Theory

	i.i.d.	graph-dependent
PAC bounds	Hoeffding inequality	Janson's Method
Stability bounds	McDiarmid Inequality	??



Statistical Learning Theory

	i.i.d.	graph-dependent
PAC bounds	Hoeffding inequality	Janson's Method
Stability bounds	McDiarmid Inequality	Our Results!



McDiarmid-Type Inequalities for Graph-Dependent Variables and Stability Bounds

Rui (Ray) Zhang *
School of Mathematics
Monash University
rui.zhang@monash.edu

Xingwu Liu †
Institute of Computing Technology,
Chinese Academy of Sciences.
University of Chinese Academy of Sciences
liuxingwu@ict.ac.cn

Yuyi Wang
ETH Zurich, Switzerland
X-Order Lab, China
yuyiwang920@gmail.com

Liwei Wang
Key Laboratory of Machine Perception, MOE,
School of EECS, Peking University
Center for Data Science, Peking University
wanglw@cis.pku.edu.cn

McDiarmid-Type Inequalities for Graph-Dependent Variables and Stability Bounds

Wed Dec 11th 05:00 -- 07:00 PM @ East Exhibition Hall B + C #223

Rui (Ray) Zhang, Xingwu Liu, Yuyi Wang and Liwei Wang