الجمهورية الشعبية الديمقراطية الجزائرية
République Algérienne Démocratique et Populaire
وزارة التعليم العالي و البحث العلمي
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
المدرسة العليا للإعلام الآلي 08 ماي 1945 بسيدي بلعباس
École Supérieure en Informatique, 08 Mai 1945- Sidi Bel Abbès

HIGHER SCHOOL OF COMPUTER SCIENCE, 08 MAY 1945 – SIDI BEL ABBES

Field: **Computer Science**
Specialty: **Artificial Intelligence and Data Science**

Analysis of Multi-View Majority Vote Learning Algorithms Through PAC-Bayesian Bounds

Prepared by: **Abdelkrim Zitouni**

Supervised by: **Souleyman Chaib**
Khalid Benabdeslem
Mehdi Hennequin

Date: **June 30, 2024**

In front of the jury composed of:

Mr. Belkacem Khaldi	President
Mr. Mohamed Bekkouche	Examiner
Mr. Souleyman Chaib	Supervisor
Mr. Khalid Benabdeslem	Co-Supervisor

Submitted in fulfilment of the requirements for the MSc Diploma of ESI-SBA

Abstract

The PAC-Bayesian framework has significantly advanced our understanding of statistical learning's generalization capabilities, particularly through majority voting methods. However, its application within multi-view learning remains underexplored. This manuscript extends PAC-Bayesian analysis to address the complexities of multi-view scenarios in majority voting. We introduce novel multi-view PAC-Bayesian bounds that incorporate Rényi divergence as a nuanced complexity measure, replacing the traditional Kullback-Leibler divergence. Furthermore, we refine our theoretical framework by advancing both first and second-order bounds, as well as the C-bound. These theoretical advancements provide a robust foundation for developing generalizable machine learning models in multi-view contexts.

Keywords— majority vote, multi-view, ensemble methods, learning theory, PAC-Bayesian theory, Rényi divergence