Relax! The Case For Rockafellian Relaxation In Stochastic Optimization and Learning

ABSTRACT - We can approach stochastic optimization and learning conservatively through distributionally robust formulations and adversarial training. This is often meaningful, but not always as we illustrate through several examples. Rockafellian relaxation is an alternative technique. It approaches optimization and learning optimistically, which is especially useful in the presence of distributional shifts, label noise, outliers, and low-prevalence classes. Rockafellian relaxation explores a decision space broadly and discovers solutions that remain hidden for conservative, "robust" approaches. We review Rockafellian relaxation, its underpinning Rockafellian functions, and their central role in sensitivity analysis, optimality conditions, algorithmic developments, and duality theory. The theory is illustrated with examples from computer vision and natural language processing with applications to toxic online comments.

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SPEAKER BIO – Dr. Johannes O. Royset is a Professor of Operations Research at the Naval Postgraduate School. His research focuses on formulating and solving stochastic and deterministic optimization problems arising in data analytics, sensor management, and reliability engineering. Dr. Royset is the co-inventor of epi-splines, a functional approximation tool with wide applications in data fitting and forecasting, and of superquantile regression, second-order superquantile risk, and buffered probability. He was awarded a National Research Council postdoctoral fellowship in 2003, a Young Investigator Award from the Air Force Office of Scientific Research in 2007, and the Barchi Prize as well as the MOR Journal Award from the Military Operations Research Society in 2009. He received the Carl E. and Jessie W. Menneken Faculty Award for Excellence in Scientific Research in 2010 and the Goodeve Medal from the Operational Research Society in 2019. Dr. Royset was a plenary speaker at the International Conference on Stochastic Programming (2016), the SIAM Conference on Uncertainty Quantification (2018), and the INFORMS Conference on Security (2022). He has a Doctor of Philosophy degree from the University of California at Berkeley (2002). Dr. Royset has been an associate or guest editor of SIAM Journal on Optimization, Operations Research, Mathematical Programming, Journal of Optimization Theory and Applications, Naval Research Logistics, Journal of Convex Analysis, Set-Valued and Variational Analysis, and Computational Optimization and Applications. He has published more than 100 papers and two books, including the textbook "An Optimization Primer."

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