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## ONE WORLD OPTIMIZATION SEMINAR

November 16<sup>th</sup> 2020 @ 15:30 CET (Central European Time)

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### **Robustness in Machine Learning and Optimization: A Minmax Approach**

**Abstract.** Minmax problems arise in a large number of problems in optimization, including worst-case design, duality theory, and zero-sum games, but also have become popular in machine learning in the context of adversarial robustness and Generative Adversarial Networks (GANs). This talk will review our recent work on solving minmax problems using discrete-time gradient based optimization algorithms. We focus on Optimistic Gradient Descent Ascent (OGDA) and Extra-gradient (EG) methods, which have attracted much attention in the recent literature because of their superior empirical performance in GAN training. We show that OGDA and EG can be seen as approximations of the classical proximal point method and use this interpretation to establish convergence rate guarantees for these algorithms. These guarantees are provided for the ergodic (averaged) iterates of the algorithms. We also consider the last iterate of EG and present convergence rate guarantees for the last iterate for smooth convex-concave saddle point problems. We finally turn to analysis of generalization properties of gradient based minmax algorithms using the algorithmic stability framework defined by Bousquet and Elisseeff. Our generalization analysis suggests superiority of gradient descent ascent (GDA) compared to GDmax algorithm (which involves exact solution of the maximization problem at each iteration) in the nonconvex-concave case provided that similar learning rates are used in the descent and ascent steps.

*The link of the zoom-room of the meeting and the corresponding password will be announced the day before the talk on the mailing list of the seminar, to which one can subscribe on <https://owos.univie.ac.at>.*