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Data Science meets Optimization

Data science and optimization have evolved separately over several decades. The concerns on either side were different as was the background of the community [1,2]. The concern of data science is how to infer knowledge from unstructured data; optimization starts from highly structured models to analyze highly complex solution spaces. Explicit knowledge is the aim of data science, while it is the starting point for optimization. On the other hand, problems in data science can often be stated as optimization problems and the behavior of algorithms for optimization is highly dependent on the distribution of the problem instances and hence the data entering into the models. The two broad domains have evolved apart while the needs were often similar. This has led to similar concepts being developed on the two sides and researchers have missed opportunities for cross-fertilization.

We discuss and compare some typical examples on both sides. We illustrate how potential cross-fertilization was missed. We discuss recent developments in data science as well as in optimization illustrating that things are actually happening. We identify opportunities for improvement and research questions to be tackled.

A related issue is lack of penetration and assimilation by practitioners of highly competitive techniques as they have been developed in the first decades of the 21st century. We argue that in fact, both domains suffer from such a lack of assimilation. The reason for this discrepancy between theory and practice may lie in a missing standardization effort as well as in the lack of expressivity and accessibility of newly developed methodology for non-data science or optimization experts. We argue in favor of some recent efforts along this line [3].

All this was the motivation to create the EWG Data Science meets Optimization. We briefly comment on the activities of this working group [4].

References

- [1] Several plenary speakers touched upon these issues at <http://www.kuleuven-kulak.be/benelearn/index.html>.
- [2] The foundational workshop for EWG/DSO: <http://set.kuleuven.be/codes/dfofoundationalmeeting>.
- [3] J. Swan et al. “A Research Agenda for Metaheuristic Standardization”. In: Proceedings of the Eleventh Metaheuristics International Conference (MIC), Agadir, Morocco. 2015. url: <https://goo.gl/kC06p5>.
- [4] The official EWG/DSO websites <https://www.euro-online.org/web/ewg/40/ewg-dso-euro-working-group-on-data-science-meets-optimization> and <http://ds-o.org/>.