

Spatiotemporal Traffic Matrix Synthesis – Public Review

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Understanding and generating traffic matrices (TMs) is a long-standing problem that has implications for, e.g., network operators, network measurement studies, evaluating new network concepts. Indeed, traffic matrices are key components for almost all traffic modeling and engineering tasks.

This paper revisits the problem of traffic generation from first principles: rather than following up on previous work of providing an explanatory model for why observed traffic matrices look the way they do, this paper generates TM instances subject to user specified spatial and temporal constraints. The authors hereby rely on the Maximum Entropy (MaxEnt) framework. Maximum Entropy is a powerful set of statistical methods that are loosely analogous to maximum likelihood estimation which has provided useful guarantees on the solutions for a variety of underlying model assumption. Using the maximum entropy framework this paper shows that much of prior work, which ranges from simple gravity models up to the most complex models that have recently been suggested, can be captured by the proposed framework. Indeed, the paper gives multiple examples which illustrate how previous work can be seen as special cases of the MaxEnt approach proposed in this paper.

The paper also includes a useful discussion about how the MaxEnt properties lead to useful decompositions for the network practitioner, for example, the model's treatment of traffic classes as independent systems that can be optimized independently. In addition, the authors demonstrate the benefit of their approach using a non-obvious application. In this application they investigate the interplay between topologies and traffic matrices. The authors ask, if spatiotemporal variation in traffic matrices can lead to more robust network design when used together with topology generation.

Overall, the PC appreciated the unifying MaxEnt approach coupled with an accessible presentation of the complex material. However, there are some concerns to which extend all previous work can be fitted into the framework. Indeed, there may be alternative ways for finding TMs that cannot be captured by the MaxEnt

approach. Moreover, a more detailed discussion of the limitations of the framework would have been appreciated. What the PC appreciated in particular appreciated about the MaxEnt framework its contribution to our understanding of what is necessary for traffic matrix generation.