Ranking big performance tableaux with multiple incommensurable criteria and missing data

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In the context of the ongoing GDRI-Algodec "Algorithmic Decision Theory", supported o.a. by the CNRS (France) and the FNR (Luxembourg), we develop multicriteria ranking algorithms for large sets of potential decision alternatives : up to several thousand of alternatives evaluated on multiple incommensurable ordinal performance criteria. This research is motivated by the development of a visualization tool - a **heat map** - for performance tableaux showing the decision alternatives linearly ordered form the best to the worst, and the individual performances colored by quantiles equivalence classes [1] as shown in Figure 1.

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Color legend:															
quantile 0.14% 0.29% 0.43% 0.57% 0.71% 0.86% 1.00%															

FIGURE 1 - Example heat map from a CloudCom 2015 conference paper by Shyam Wagele et al. [2]

By using Python3.5 multiprocessing resources and the Digraph3 multicriteria software library [3], it is possible, on the UL HPC cluster [4], and more specifically on the gaia-80 machine with 120 single threaded cores and a CPU memory of 1.5 TB, to linearly rank (without ties) in less than an hour (see Figure 2) a huge set of 250000 alternatives evaluated on 21 performance criteria by balancing economic, ecological and societal decision objectives.

Data input is, on the one side, a 250000x21 performance tableau of size 825 MB, and on the other side, a theoretical preference space consisting of 62 000 000 000 (billions) of pairwise outranking comparisons [5, 6].

A "small" set of 1000 decision alternatives, in a similar setting, may thus be ranked typically in less than 5 seconds.

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# Components	: 2060									
Minimal size	: 10									
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Median size	: 13									
Fill rate	: 0.162%									
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Total time	: 3416.89821									
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0 19:09:21 rbisdor	ff@access(gaia-cluster) (svn:641:642) BigDigraphs \$									

FIGURE 2 – UL HCP gaia cluster console session trace [4]

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