novelty - Convex Optimization & Euclidean Distance Geometry

p.120 *Conic independence* is introduced as a natural extension to linear and affine independence; a new tool in convex analysis most useful for manipulation of cones.

p.148 Arcane theorems of alternative *generalized inequality* are simply derived from cone *membership relations*; generalizations of *Farkas' lemma* translated to the geometry of convex cones.

p.229 We present an arguably good 3-dimensional polyhedral analogue, to the isomorphically 6-dimensional positive semidefinite cone, as an aid to understand semidefinite programming.

p.256, p.273 We show how to constrain rank in the form $\operatorname{rank} G \leq \rho$ and cardinality in the form $\operatorname{card} x \leq k$. We show how to transform a rank constrained problem to a rank-1 problem.

p.321, p.325 *Kissing-number of sphere packing* (first solved by Isaac Newton) and *trilateration* or *localization* are shown to be convex optimization problems.

p.336 We show how to elegantly include *torsion* or *dihedral* angle constraints into the *molecular conformation problem.*

p.367 Geometrical proof: *Schoenberg criterion* for a Euclidean distance matrix.

p.385 We experimentally demonstrate a conjecture of Borg & Groenen by reconstructing a map of the USA using only ordinal (comparative) distance information.

p.6, p.403 There is an equality, relating the convex cone of Euclidean distance matrices to the positive semidefinite cone, apparently overlooked in the literature; an equality between two large convex Euclidean bodies.

p.447 The *Schoenberg criterion* for a Euclidean distance matrix is revealed to be a discretized *membership relation* (or *dual generalized inequalities*) between the EDM cone and its dual.