Ice-breaker talk

David de Laat (ICERM/MIT)

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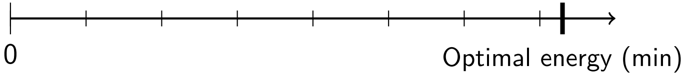

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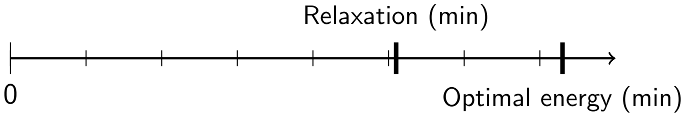

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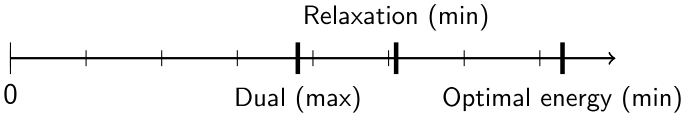

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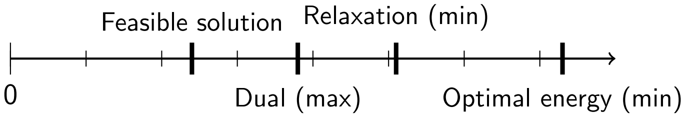

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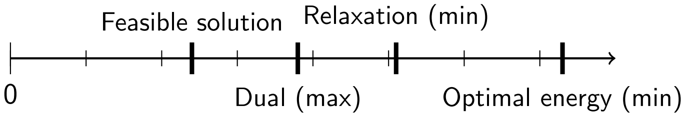

- Current problem: Try to find stronger relaxations for sphere packing (noncompact!)

- Maximize *center density* $\limsup_{r\to\infty} |P \cap B_r|/\mathrm{vol}(B_r)$ over sphere packings P in $\mathbb{R}^n$ consisting of unit diameter spheres

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$$\inf \left\{ f(0) : f \in S(\mathbb{R}^n),\ \hat{f}(0) = 1,\ \hat{f} \geq 0,\ f(x) \leq 0 \text{ for } \|x\| \geq 1 \right\}$$

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Currently working on the following ideas:

- Adaptation of Lasserre hierarchy to the noncompact setting
- Copositive formulation for sphere packing:

$$\inf\Big\{f(0) + g(0) : f, g \in S(\mathbb{R}^n),\ \hat{f}(0) = 1,\ \hat{f} \geq 0,$$
$$g \text{ is copositive},\ f(x) + g(x) \leq 0 \text{ for } \|x\| \geq 1\Big\}$$

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- Three point bound (only for Lattice packings):

$$\inf\Big\{f(0,0) : f \in S(\mathbb{R}^{2n}),\ \hat{f}(0,0) = 1,\ \hat{f} \geq 0, f \leq 0 \text{ on } C_2\Big\}^{1/2}$$

$$C_2 = \big\{(x,y) \in \mathbb{R}^{2n} : \|x\|, \|y\|, \|x - y\| \in \{0\} \cup [1, \infty)\big\} \setminus \big\{(0,0)\big\}$$