# Moral Emotions and Risk Politics

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My recently awarded NWO-VIDI-project will offer a philosophical investigation of how moral emotions can be incorporated into political decision making and communication about risky technologies.

Risks arising from technologies raise important ethical issues for people living in the 21st century. Although technologies such as nanotechnology, biotechnology, ICT, and nuclear energy can improve human well-being, they may also convey risks for our well-being due to, for example, accidents and pollution. As a consequence of such side-effects, technologies can trigger emotions, including fear and indignation, which often leads to conflicts between experts and laypeople. How should we deal with such emotions in political decision making about risky technologies?

Emotions have often been met with suspicion in political debates about risky technologies, because they are seen as contrary to rational decision making. Indeed emotions can cloud our understanding of quantitative information about risks. However, as I have shown in my VENI-project (2005-2009), moral emotions are necessary in order to judge ethical aspects of technological risks, such as justice, fairness and autonomy.

This VIDI-project will build on my VENI-project by extending my ideas to risk politics. 1. I will develop a procedural approach for policy making such that emotional responses to technological risks, and the ethical concerns that lie behind them, are taken seriously. 2. A PhD-student will investigate the extent to which existing models for political decision making about risks can include moral emotions. 3. The manner in which risks are presented is an important factor in decision making about risks, therefore, a postdoc will develop a theoretical framework on how moral emotions should be included in risk communication.

This VIDI-project will lead to recommendations for institutional reforms, enabling morally better political decisions about risky technologies and a better understanding between experts and laypeople, by genuinely incorporating moral emotions into risk politics and risk communication.

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# Semidefinite Programming and Fourier Analysis

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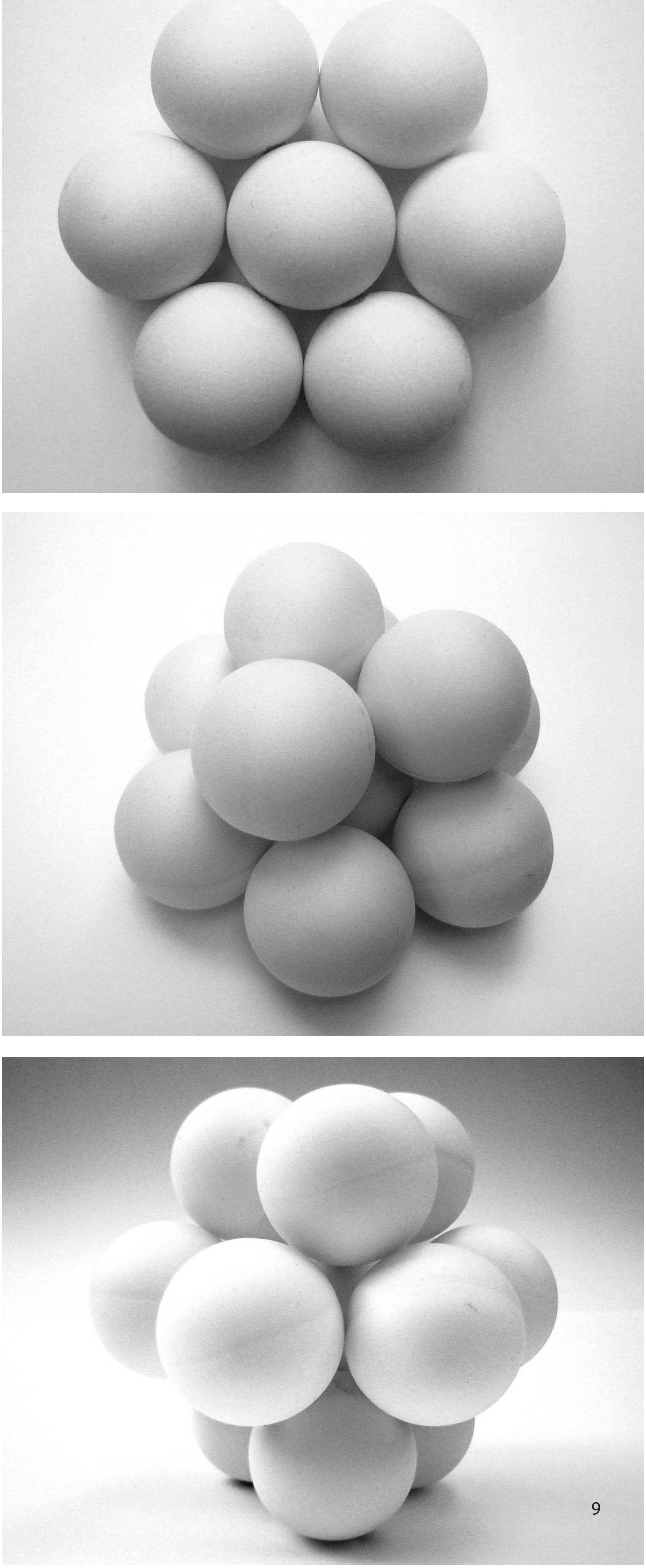
The field of mathematical optimization started in 1947 when Dantzig invented the simplex method for linear programming. In the 1980's the field was revolutionized when the first efficient algorithms for linear programming were found. Nowadays, a popular and far-reaching generalization of linear programming is semidefinite programming. Over the last two decades semidefinite programming became one of the strongest general purpose tools for the design and analysis of efficient algorithms in optimization.

Over the last two centuries Fourier analysis became the strongest general purpose tool to exploit qualitative and quantitative structure of mathematical objects, like functions and operators. Now Fourier analysis is omnipresent in our modern technological life. One can find implemented pieces of Fourier analysis in every device in which information (audio, images, video) is processed; their basic actions, like coding, decoding, compression, prediction, filtering, approximation, quantization, are unthinkable without the use of Fourier analysis.

The main objective of my research is the combination of semidefinite programming and Fourier analysis. The goal is to use this combination to solve computational difficult problems in mathematics and mathematical engineering which cannot be attacked by current techniques. These problems come from different areas: continuous combinatorial optimization, energy minimization in geometry and mathematical physics, statistics, and engineering.

First successes have already been booked: The kissing number problem is the maximum number of non-overlapping equally-sized spheres that can simultaneously touch a central sphere. This number is only known for dimensions 1, 2, 3, 4, 8 and 24. It is easy to see that the kissing number in dimension 1 is 2, and in dimension 2 it is 6. The kissing number problem has a rich history. In 1694 Newton and Gregory had a famous discussion about the kissing number in three dimensions. The story is that Gregory thought 13 spheres could fit while Newton believed the limit was 12. We found the best known bounds for the kissing number in several dimensions. The kissing number

Figure:
Construction of 12 kissing spheres.
(Image credit: Anja Traffas)



problem can be viewed as an energy minimization problem which is related to many problems in science and technology. As engineers advance in gaining control of the microscopic and even nanoscopic world, energy minimization principles become increasingly important for synthetic fabrication and design.

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