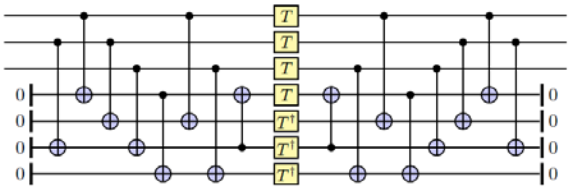
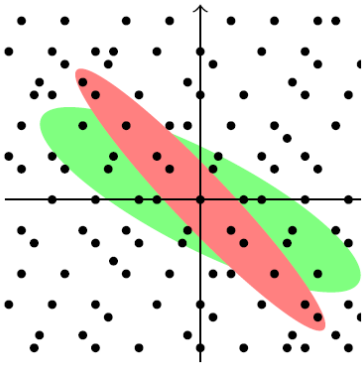
Peter Selinger

Algebra and Category Theory

Dr. Selinger's research is on **mathematical foundations of computer science**. His research interests include the semantics of programming languages, and applications of category theory and number theory in **quantum computing**. He has helped pioneer the field of quantum programming languages, as well as categorical quantum mechanics. Some topics of interest are:

Quantum programming languages: Dr. Selinger and his team have developed Quipper, a programming language for quantum computing based on the functional programming paradigm. Quipper has been used to implement seven difficult quantum algorithms from the literature and to generate quantum circuits containing trillions of gates. He is currently working on the mathematical underpinnings of Quipper, and on developing a way to use proof assistant software to formally specify and prove the correctness of quantum programs.





Unitary approximation: Dr. Selinger and his students have developed efficient methods for approximating unitary operators by quantum circuits using a fixed finite gate set. He is also interested in the presentation of groups of unitary operators in terms of generators and relations. This research uses methods from number theory, and in particular the solution of Diophantine equations, as well as the problem of finding the intersection of integer lattices and convex sets.

For more information, contact:
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