

Consider the following questions:

- Are there large prime numbers with simple descriptions?
- Is it computationally hard to detect patterns in data?
- Is there a fast deterministic algorithm that, given an integer  $n$ , outputs an  $n$ -bit prime?

Despite the interest of mathematicians and computer scientists, these problems remain far from being solved. In this talk, I will explain how an emerging theory of probabilistic (time-bounded) Kolmogorov complexity leads to new insights and perspectives on some of these questions.