

# IMS DISTINGUISHED VISITOR LECTURE SERIES

## Set-limited functions and polynomial-time interior-point methods

Yurii Nesterov

12 December 2022 (Monday)  
9.30–10.15am, GMT +8 (Singapore Time)

In this talk, we revisit some elements of the theory of self-concordant functions. We replace the notion of self-concordant barrier by a new notion of set-limited function, which forms a wider class. We show that the proper set-limited functions ensure polynomial time complexity of the corresponding path-following method (PFM). Our new PFM follows a deviated path, which connects an arbitrary feasible point with the solution of the problem. We present some applications of our approach to the problems of unconstrained optimization, for which it ensures a global linear rate of convergence even in for nonsmooth objective function.

## New perspectives for higher-order methods in convex optimization

Yurii Nesterov

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10.45–11.30am, GMT +8 (Singapore Time)

In the recent years, the most important developments in Optimization were related to clarification of abilities of the higher-order methods. These schemes have potentially much higher rate of convergence as compared to the lower-order methods. However, the possibility of their implementation in the form of practically efficient algorithms was questionable during decades. In this talk, we discuss different possibilities for advancing in this direction, which avoid all standard fears on tensor methods (memory requirements, complexity of computing the tensor components, etc.). Moreover, in this way we get the new second-order methods with memory, which converge provably faster than the conventional upper limits provided by the Complexity Theory.

### Venue

Lecture Theatre 33  
National University Of Singapore, Kent Ridge Campus  
S17, 10 Kent Ridge Crescent, Singapore 119260



Professor Yurii Nesterov  
UCLouvain, Belgium

Professor Yurii Nesterov is professor at the University of Louvain (UCLouvain). He obtained his PhD in applied mathematics at Moscow State University. He was at the Central Economic Mathematical Institute of the Russian Academy of Sciences from 1977 to 1992. Since 1993, he has been working at UCLouvain, specifically in the Department of Mathematical Engineering from the Louvain School of Engineering, Center for Operations Research and Econometrics.

He was a visiting professor at the Stewart School of Industrial and Systems Engineering (ISyE) at Georgia Tech in 2010. His awards include the Dantzig Prize (2000), John von Neumann Theory Prize (2009), EURO Gold Medal (2016) and Lanchester Prize from INFORMS (2022). He is member of the Academy of Europe (2021) and member of the National Academy of Sciences (2022).

Professor Nesterov is a well-recognized expert for inventing the Fast Gradient Method (1983) and developer of Lexicographic Differentiation (1985). His other achievements include the development of Smoothing Technique (2005) and promotion of the higher-order methods (2019). He was an ICM speaker in 2010, and his research interests include optimization, numerical analysis and control theory.

The talks are part of the program on  
*Optimization in the Big Data Era (5–16 December 2022)*

Program webpage  
<https://tinyurl.com/OptimizationNov2022>

Registration  
<https://tinyurl.com/IMSOptimizeReg>

