Optimal Stopping and Free-Boundary Problems
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1) Contents

The lectures will disclose a fascinating connection between optimal
stopping problems in probability and free-boundary problems in
analysis. The focus will be on explaining the key concepts and
principles through examples. The topics to be covered and linked
to free-boundary problems include:

1) Optimal stopping problems;
2) Optimal prediction problems;
3) Nonlinear optimal stopping problems;
4) Quickest detection problems;
5) Optimal stopping games.

References: (i) Peskir, G. and Shiryaev, A. N. (2006). Optimal
stopping and free-boundary problems. Lectures in Mathematics,
ETH Zurich, Birkhauser, Basel (500 pp); (ii) Various research
articles (2006-2023).

2) Learning outcomes

On successful completion of the course, the student will know (i)
what an optimal stopping problem (OSP) is; (ii) how to classify
OSPs; (iii) how to establish a one-to-one correspondence between a
given OSP and a free-boundary problem (FBP); (iv) how to solve a
FBP; (v) how to verify that a solution to FBP is the sought solution
to OSP; (vi) how to make use of the derived solutions in various
theoretical and applied settings.

3) Prerequisites

In addition to being familiar with basic probability and analysis
concepts, some knowledge of (i) Markov processes (Brownian motion &
Poisson process), (ii) martingales (optional sampling theorem), and
(iii) stochastic calculus (Ito's formula) will be helpful although
not necessary.