MSc thesis defense presentation

<u>Evangelos Anagnostopoulos defends his MSc thesis</u>

Date:	Monday, 29 May 2017
Time:	14:00
Location:	Univeristy of Athens, Department of Informatics and Telecommunications, A56
Thesis title:	[Polytope Membership in High Dimension](#)
Committee:	• [Ioannis Emiris](#) • [D. Gounopoulos](#) • [Vassilis Zissimopoulos](#)

<u>Thesis abstract</u>

Polytopes in optimization and sampling problems are usually given by implicit representations through oracles. The most basic oracle is the polytope membership oracle which can identify whether a query point q lies inside P or not and is often used as the basis for more complex oracles, such as the separation oracle or the boundary oracle. In this work we aim to design, implement and analyze algorithms for approximating the membership oracle in polytopes given as the intersection of halfspaces in high dimension, by trading exactness for efficiency. Previous approaches were based on classic polytope approximation techniques which, however, have complexity that scales exponentially in the dimension and are, thus, intractable in high dimension. We establish a straightforward reduction from approximate polytope membership to approximate nearest neighbor search among points and obtain complexity bounds polynomial in the dimension, by exploiting recent progress in the complexity of nearest neighbor search. We then employ this new membership oracle to obtain a solution for the boundary oracle in high dimension. Lastly, we evaluate our algorithms experimentally and report results.