



**H.F.R.I.**  
Hellenic Foundation for  
Research & Innovation

**Description of the funded research project**  
**1st Call for H.F.R.I. Research Projects to Support Faculty**  
**Members & Researchers and Procure High-Value**  
**Research Equipment**

**Title of the research project:** Geometric Functional Analysis and Applications

**Principal Investigator:** Apostolos Giannopoulos

**Reader-friendly title:** GFAA

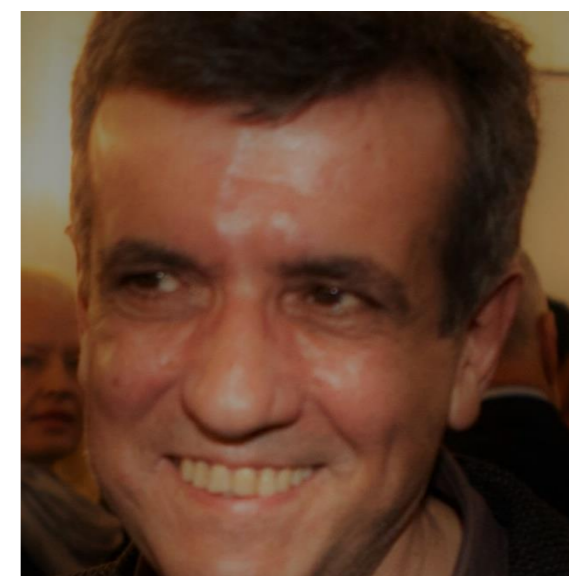
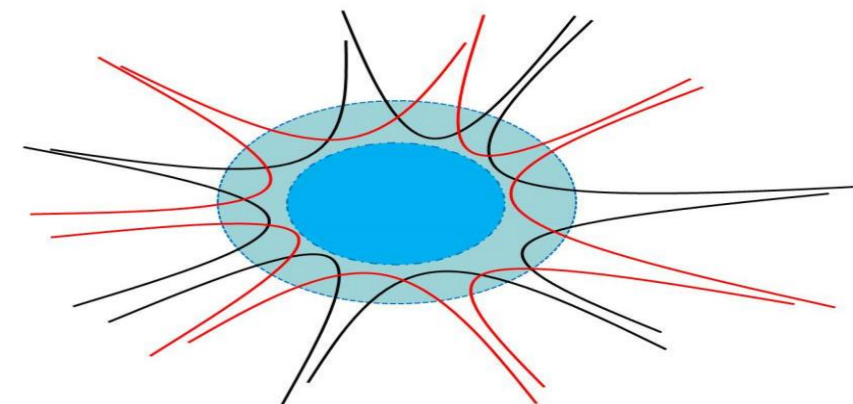
**Scientific Area:** Mathematics

**Institution and Country:** NKUA - Greece

**Host Institution:** National and Kapodistrian University of Athens

**Collaborating Institution(s):-**

**Project webpage:**  
<http://users.uoa.gr/~apgiannop/ELIDEK/>



**Budget:** 170.000 euros

**Duration:** 36 months

## Research Project Synopsis

**This project is devoted to the study of geometric properties of high dimensional objects and normed spaces, and the asymptotics of their quantitative parameters as the dimension tends to infinity. We focus on powerful methods from the field of geometric functional analysis that successfully interact with several areas including harmonic analysis, probability and convex geometry. Our main directions of research are:**

- Distribution of volume in high-dimensional convex bodies.**
- Rearrangement inequalities and applications to convex geometry.**
- Complexity of random 0/1 polytopes.**
- Spectral sparsification and applications to geometric functional analysis**

## Project originality

**Understanding the typical behavior of high-dimensional systems and the ability to describe their basic features mathematically is increasingly important. Such systems appear in a variety of branches of mathematics and adjacent sciences; in particular, physics and computing. Asymptotic geometric analysis plays a crucial role in a much broader interdisciplinary area with applications to probability theory, statistical physics, algorithmic geometry, combinatorics and complexity. It is clear that the ability to describe basic features of such systems will be increasingly important in adjacent sciences. Because of this, progress in the research directions of the proposed project will be very useful for researchers working in all these fields.**

## Expected results & Research Project Impact

**High-dimensional systems are very frequent in mathematics and applied sciences hence understanding of high-dimensional phenomena is becoming increasingly important. Our aim is the development of new theoretical tools and techniques of geometric functional analysis that may prove useful in the study of such high-dimensional systems.**

## The importance of this funding

**The emphasis is given to the support of young researchers in the field. The proposal gives the opportunity to postdoctoral researchers and PhD Students, who are already involved in different aspects of geometric functional analysis, to gain experience and play an important role in this project. The postdoctoral and predoctoral researchers who are involved in the project will have exposure to a variety of influences and will identify contemporary research fields in which they might work in the future.**



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## COMMUNICATION

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