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DI URBINO  
CARLO BO

Università degli Studi di Urbino Carlo Bo	
Amministrazione Centrale	
DATA	- 9 APR 2019
PROT.	11809
CLASS.	III/12 FASC.

**COMPETITION FOR YOUNG RESEARCHERS (under 40)  
AT THE URBINO UNIVERSITY  
SUPPORTED BY ACRI "YOUNG INVESTINGATOR TRAINING PROGRAM 2018"**

Attachment 1

**Application form**

The following declarations are given according to articles 46 and 47 of D.P.R. n. 445/2000.

**Title: Professor**

**Name and Surname: Alessio Fiscella**

**Date of Birth:**

**E-mail:**

**Phone number:**

**Home Address:**

**Languages skills:**

I carry out research activities in the following areas:  Non Linear Analysis  Calculus of Variations  
 Algebraic Geometry

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**Affiliation:**

**Role:**

**Contact Person at the affiliated Institution:**

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**Proposed title for the conference talk**

**Selected hosting institution:**

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1<sup>st</sup> choice:

2<sup>nd</sup> choice:

**Proposed visiting period:**

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Please fill in the following details (insert additional fields if needed)

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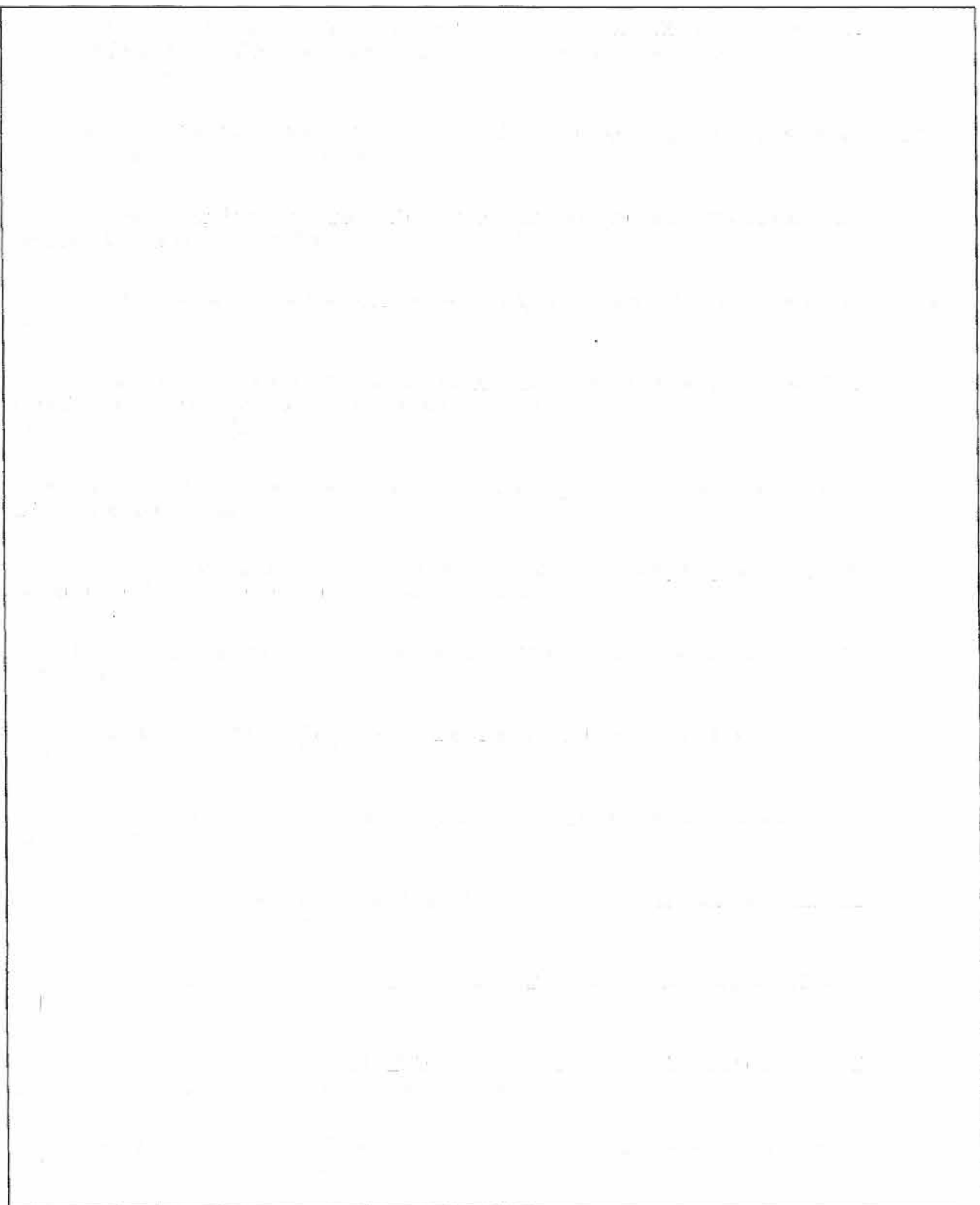
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<b>PUBLICATIONS (max 20)</b>



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**PROPOSED RESEARCH PROJECT DURING THE VISITING PERIOD (max 30 lines)**

The main focus of the present research statement concerns the Nonlinear Analysis. More precisely, it is devoted to the study of systems driven by  $(p,q)$  elliptic operators and involving different critical nonlinearities. The importance of studying problems involving  $(p,q)$  operators, or operators with non-standard growth conditions, begins with the pioneering papers of Marcellini and Zhikov. Since then the subject has been attracting increasing attention on existence, regularity and qualitative properties of solutions of different problems. In paper [10] of the list of Publications above, written with Prof. Pucci (Università degli Studi di Perugia), we proved an existence result for a critical  $(p,q)$  Hardy-Schrödinger system, set on the whole space  $\mathbb{R}^N$ . First aim of the project is to generalize this result by adding Kirchhoff coefficients. Even using a variational approach, the study of this nonlocal generalization would be fairly delicate because of the double structure of the elliptic part, and so also of the related functional norm. For this, we should need to split the study of the compactness property of the related Euler-Lagrange functional in different cases, depending on the behavior of the Kirchhoff coefficient. Anyway, taking inspiration to our other work [15], we expect to prove the existence of a solution, satisfying suitable asymptotic properties.

The second direction of the present project concerns the multiplicity results for  $(p,q)$  systems involving critical Trudinger-Moser nonlinearities of exponential growth, and so with  $q=N$ , where  $N$  corresponds to the dimension. A similar problem has been studied on the scalar case by Yang and Perera in Bull. London Math. Soc. 48 (2016), but on bounded domains. In our system, in order to overcome the lack of compactness at critical level, we would strongly need a Brézis-Lieb type lemma for a coupled exponential nonlinearity. Using this lemma, combined with also a tricky step analysis as similarly done in [15], we should be able to provide a multiplicity result by minimization and the mountain pass theorem. This result would generalize on a vectorial  $(p,N)$  situation recent works from several authors, like Alves, Cassani, Figueiredo, de Freitas, Tavares, Zhang and others.

Last but not least, the previous directions can be extended on a fractional framework, taking inspiration from the works of Ambrosio and Isernia in Mediterr. J. Math. 15 (2018), and of Bhakta and Mukherjee in Adv. Differential Equations 24 (2019).



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Place and date

Signature