





Directorial Decree

SELECTION FOR AWARDING RESEARCH SCHOLARSHIPS

THE DIRECTOR OF THE DEPARTMENT OF COMPUTER SCIENCE

Having regard to the law 10.04.1991, n. 125 concerning "Positive actions for the achievement of equality between men and women in work";

Given Law 30/12/2010 no. 240, and in particular Art.s 22 and 18(1b), in the version of the text valid before the entry into force of Law no. 79-2022 of 29/06/2022;

Given the "Regulations for the Awarding of Research Scholarship Collaborations", issued by Rectoral Decree no. 2979-2023, Prot. no. 149094 of 31/03/2023;

Given Legislative Decree 30/06/2003 no. 196;

Having regard to the Presidential Decree 06/16/2023, n. 82, "Regulation containing amendments to the decree of the President of the Republic 9 May 1994, n. 487, concerning rules on access to jobs in public administrations and the methods of carrying out competitions, single competitions and other forms of hiring in public jobs";

Given the request of the Director of the Department of Computer Science, Prot. n. 440016 of 30.10.2023:

And having evaluated every appropriate element;

DECREES

ART. 1 – SELECTION FOR AWARDING 1 (ONE) RESEARCH SCHOLARSHIP

This document announces the selection process AdR4497/23 to award 1 (ONE) research scholarship in the disciplinary sector MAT/02 ALGEBRA, to perform the research on the topic "Structures for Quivers, Algebras and Representations", financed under European Union funds – NextGenerationEU, M4C2 component, investment 1.1, PRIN2022 project entitled "Structures for Quivers, Algebras and Representations (SQUARE)", project code 2022S97PMY, CUP code B53D23009430006.

The research scholarship is for fourteen months, with the possibility of renewal in accordance with the law

The candidate who, according to the order of the merit ranking, will obtain the highest overall score in the evaluation of qualifications and in the interview, will be the assignee of the research grant. In the event of equal merit, in compliance with the provisions of art. 47 "Equal opportunities, generational and gender, in PNRR and PNC public contracts" of D.L. May 31, 2021, n. 77, converted into law July 29, 2021, n. 108, the position announced will be assigned as a priority to a female candidate. Admission to the selection process, and the selection procedure itself, are governed by the following Articles.









ART. 2 - REQUIREMENTS

For admission to the selection process referred to in Art. 1, potential candidates must fulfil the following requirements:

- a) PhD;
- b) Knowledge of the following foreign language: English;
- Other requirements: documented research and/or development experience in the disciplinary sector: MAT/02 ALGEBRA.

Both Italian and foreign nationals are admitted to the selection process, as long as the latter have the equivalent qualifications or an ideal academic and professional background for the intended research (If a candidate has not applied for official recognition of equivalency in the Italian system for any qualifications gained abroad, the suitability of their academic and professional background will be evaluated by the Selection Committee).

Foreign citizens must have an appropriate level of knowledge of the Italian language according to the needs of the research. The level of adequacy will be defined by the Selection Committee.

Those with any relationship to, or ties with, a professor of the Department of Computer Science, the Rector, the Director-General or any member of the university Board of Directors, up to the fourth degree inclusive, may not participate.

The scholarship may not be awarded to any permanent staff of universities, public institutions or public entities for research and experimentation, the National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) or the Italian Space Agency (ASI), nor to permanent staff at any institution whose advanced academic degree has been recognised as equivalent to a PhD pursuant to Art. 74(4), Presidential Decree no. 382 of 11/07/80.

In order to be admitted to the selection process, potential candidates must meet the stated requirements at the time of the application deadline. Failure to meet these requirements may result in the applicant being excluded from the selection process with due decree by the Director of the Department of Computer Science.

ART. 3 - APPLICATIONS AND RULES FOR SUBMISSION

Applications, written on plain paper following the outline attached to this call for applications (appendix: Form A) and addressed to the Director of the Department of Computer Science, may be submitted in the following way:

- Sending the documentation in pdf format, to the e-mail address ufficio.protocollo@pec.univr.it, within the peremptory deadline indicated above. The submission may also be made by an unaudited electronic mail address.

No other forms of application submission are admitted.

All applications, by whichever of the above means they are submitted, must be received by the strict deadline of 1.00 p.m. (Italian time), 20 days after the call for applications is concurrently published in the electronical Official University Register on the web page: http://www.univr.it/it/albo-ufficiale. If the deadline falls on a public holiday, it will be postponed to the next working day.









Pursuant to Art. 76, Presidential Decree 445/2000 and aware of the criminal penalties for false statements, candidates must state in their application:

- 1) their name and surname;
- 2) their date and place of birth;
- 3) their permanent address, including street name, street number, city, province, postcode, telephone number, tax identification number and email address;
- 4) the number of the selection process in which they wish to participate;
- 5) their nationality;
- 6) that they have no prior criminal convictions, or otherwise report any criminal convictions (even if they have been granted amnesty, cancellation, pardon or legal pardon) or criminal proceedings against them;
- 7) that they have the required qualification as given in Art. 2 of this call for applications, and state the qualification and the date and place where it was awarded.

 Foreign nationals must also specify if their qualification, if it was awarded abroad, has received official recognition for equivalency to an Italian qualification;
- 8) that they fulfil the other requirements specified in Art. 2 of this call for applications;
- 9) not to have any relationship to, or ties with, a professor of the Department of Computer Science, the Rector, the Director-General or any member of the university Board of Directors, up to the fourth degree inclusive;
- 10) their contact address for the purpose of the application.

Administration does not assume any responsibility if the applicant is unable to be contacted or for the loss of documents due to errors in the address provided by the applicant, or for a failure to/delay in notifying a change of the address stated in the application, nor for any postal delivery errors or otherwise which are attributable to third parties, unforeseeable circumstances or force majeure. In any case, any applications which are not signed or that, for any reason, including force majeure, are received by the University of Verona after the above mentioned deadline, will not be considered.

For the evaluation of qualifications and experience, candidates must attach to their application:

- 1) a declaration in lieu of an affidavit regarding their qualifications gained (PhD and/or Master's degree or Bachelor's degree), stating the award date, the issuing university and any grade reported.
- 2) their academic and professional CV, publications and relevant qualifications as per Art. 6 of this call for applications;
- 3) a copy of a valid identity document
- 4) a list of the documents and publications attached to their application;









- 5) a letter of motivation (no longer than one page) describing the coherence of the candidate's scientific skills and interests with the themes of the project;
- 6) letters of reference, no more than two, to be sent by the persons who will write them to Prof. Lidia Angeleri at the e-mail address lidia.angeleri@univr.it.

The aforementioned documents must be submitted by the application deadline as plain paper photocopies accompanied by a statement that they are identical to the original. Alternatively, the candidate may produce a substitutive declaration reporting the important information contained in these documents. For this, candidates may use appendix Form B, also attaching a plain paper photocopy of their valid ID document.

Administration reserves the right to perform checks to verify the truthfulness of substitutive declarations. If such investigations reveal that any declarations are false, the applicant will be excluded from any benefits they may have been awarded from provisions made on the basis of the false declaration, notwithstanding the previsions of Art. 76, Presidential Decree no. 445/2000.

Pursuant to Law no. 104 of 05/02/92, candidates with a disability must make a specific request in their application regarding any aid required, as well as any additional time that may necessary to complete the test.

The signature at the bottom of the application is not subject to authentication, in accordance with Presidential Decree no. 445/2000.

ART. 4 - EXCLUSION FROM THE SELECTION PROCESS

Candidates are admitted to the selection process under the condition that the Director of the Department of Computer Science, may with due reason exclude those who do not fulfil the selection requirements from the selection process at any time.

ART. 5 - SELECTION COMMITTEE

The Selection Committee, made up of three members (lecturers or experts in the disciplinary sector related to the subject, or similar) as established by Art. 20 (1b) of the Regulations referred to in the introduction, shall be constituted after the expiry of the call and its composition will be made known promptly by means of a Directorial Decree and will be made public through electronic publication on the website, referred to at the link: http://www.univr.it/it/albo-ufficiale.

ART. 6 - SELECTION PROCEDURE

The selection procedure takes into consideration an evaluation of each candidate's qualifications and experience, as well as an interview. For the evaluation, the Selection Committee can award up to 100 points to each candidate: up to 60 points for the written documents submitted (proof of qualifications and experience) and up to 40 points for the interview.

Candidates are considered suitable if they gain at least 35 points for qualifications/experience and at least 25 points for the interview.

Candidates' qualifications and experience will be evaluated before the interview, based on the documents submitted.

The candidate's academic qualifications and experience must be related to the following fields:









MAT/02 ALGEBRA.

Points for qualifications and experience will be allocated as follows:

•	Laurea Magistrale (Ministerial Decree 270/04), Laurea Specialistica (Ministerial Decree 509/99), Bachelor's degree (pre Ministerial Decree		
	509/99)	Max. points	3
•	PhD	Max. points	15
•	Academic publications	Max. points	12
•	Work experiences in the research field	Max. points	5
•	Reference letters	Max. points	5
	Letter of motivation: competences and scientific interests of the candidate with the topics of the project	Max. points	15
•	TOTAL	Max. points points	60 60

The interview will focus on the following topics: representation theory of algebras, silting theory, stability theory, model theory of modules.

During the interview, the candidates' knowledge of English language will be checked.

To take part in the interview, candidates must provide a current, valid ID document.

Candidates who do not show an ID document or have only an expired ID document will not be admitted to the interview.

The interview will take place at 10.00 a.m. (Italian time) on 24th January 2024 at the Meeting Room, Department of Computer Science, 2nd floor, Ca' Vignal 2, Strada Le Grazie 15 – Verona.

The results of the selection process will be communicated to the candidates by the Selection Committee after the interview.

The candidate who wins the scholarship must go in person within the 26th January 2024, at the Secretary of the Department of Computer Science, Ca' Vignal 2, ground floor (room R118), Strada Le Grazie 15, Verona – tel. 00 39 (0) 458027067/7069, e-mail address: segreteria.di@ateneo.univr.it, to officially accept the scholarship and to present the originals of the documents listed in their substitutive declaration. If the winning candidate is abroad and unable to go in person to the Secretary of the Department of Computer Science by the aforementioned date, the candidate should contact it by email: segreteria.di@ateneo.univr.it or phone 00 39 (0) 458027067/7069, by the same date, to establish the procedure and timeframe to send the necessary documents in order to activate the research scholarship.

In the event that the submission of the required substitute declarations is made after the 31st January 2024, the first month of the research grant will be credited together with that of the first useful month, after the first month of activation of the grant.

ART. 7 - RANKING LIST

The steps of the selection procedure, including the ranking list, shall be approved by Directorial Decree. The ranking list will be concurrently published in the electronical Official University Register on the web page: http://www.univr.it/it/albo-ufficiale.









ART. 8 - CONTRACT

Research scholarships are awarded through the stipulation of a personal contract for research collaboration. Such contracts do not imply any form of employment and do not give the holder any priority for accessing permanent university positions.

Recipients who do not present themselves by the specified date, do not sign the contract or do not start the research at the determined time shall lose their right to the scholarship, except in cases provided for by the university's "Regulations for the Awarding of Research Scholarship Collaborations" referred to in the introduction.

The scholarship recipient's responsibilities are those established in the aforementioned University Regulations. In particular, the scholarship recipient shall collaborate on research regarding the project for which this call for applications was announced.

The total amount of the scholarship, net of administrative burden, is € 23.780,00, to be paid to the recipient in deferred monthly instalments.

Research scholarships are subject to taxation under the provisions of Art. 4, Law 476/84 and subsequent amendments and additions, as well as social security, under the provisions of Art. 2(26) and following of Law 335/95 and subsequent amendments and additions.

The University provides insurance cover of accidents related to conducting the research. The expenses are to be paid by the scholarship recipient and the premium is deducted from the scholarship amount. The University also provides cover for third party liability, the expenses being covered by the university.

Scholarships cannot be accumulated with other scholarships of any kind, except those granted by national or foreign institutions that are intended to contribute towards conducting a part of the recipient's research assignment abroad.

At the time of signing and for the total duration of the contract, scholarship recipients may not be employed, nor may they establish an employment contract, even temporary, with any private entity or public administration. Should they be already employed, a scholarship contract will not be stipulated unless the recipient is put on leave without pay by their employer by a date given by the University.

Provided they perform their assigned tasks, scholarship recipients may carry out professional activities or other independent work if this is authorised beforehand by the Board of the Department/Research Centre, having consulted with the academic supervisor, and provided that the activity:

- is compatible with conducting research activities;
- does not represent a conflict of interest with the specific research being conducted by the scholarship recipient;
- does not lead to prejudice to the University in relation to the activities being carried out.

Scholarship recipients may not attend Bachelor's, Master's or PhD programmes with a scholarship, nor medical specialisation programmes, in Italy or abroad.

ART. 9 - SAFEGUARD PROVISIONS

For matters not provided for by this announcement, please refer to the relevant applicable provisions insofar as compatible.









The University of Verona is the owner of the processing of the personal data of the participants in the selections, pursuant to EU Regulation 2016/679; detailed information on the purposes of the processing, recipients of the data and exercise of the data subject's rights is available on the University's institutional website: http://www.univr.it/it/privacy.

This call for applications shall be publically published in the electronical Official University Register on the web page: http://www.univr.it/it/albo-ufficiale.

For more information, contact the Research Office – PhD Unit of the University of Verona, Via San Francesco 22, ph. +39(0)458028204, e-mail address <u>elena.cordioli@univr.it</u>.

THE DIRECTOR OF THE DEPARTMENT OF COMPUTER SCIENCE (PROF. ALESSANDRO FARINELLI)

This document is digitally signed and recorded in the report system of the University of Verona, under Legislative Decree 82/2005 and subsequent amendments.









In attachment – RESEARCH PROGRAM

Structures for Quivers, Algebras and Representations

Representation theory studies algebras via their action on vector spaces. Such an action turns a vector space into an A-module. Our focus lies on two categories associated to A: the category of representations, that is, the category ModA of A-modules, and its associated derived category D(ModA). The objects of D(ModA) are chain complexes of A-modules, where two chain complexes are isomorphic whenever there is a chain map inducing isomorphisms on their homology groups. This category essentially encodes the homological properties of ModA. One of the main goals of representation theory is to understand the complexity of these two categories.

The tools used to quantify and describe the complexity of ModA and D(ModA) come in form of different but interrelated organisational structures, ranging from combinatorial objects such as lattices of torsion classes to topological spaces such as the Ziegler spectrum and Bridgeland's stabilty manifold. In this project we intend to develop new links between these different structures and use these insights to achieve a new understanding of the representation theory of certain classes of algebras.

Torsion pairs are widely used in algebra, geometry and topology to decompose a category into smaller parts. Every torsion pair in an abelian category A leads to a similar decomposition of the associated derived category D(ModA), more precisely, to a t-structure in D(ModA). This t-structure, in turn, gives rise to an abelian category B, called the heart. The connection between A and B was studied by Happel, Reiten and Smalø in [HRS], and their work opened up the way to important developments linking representation theory of algebras with other areas of mathematics, most prominently with algebraic geometry.

The collection of all torsion classes in a module category, ordered by inclusion, forms a complete lattice. The lattice of torsion classes torsA in the category modA of finitely presented modules over a finite dimensional algebra A is currently receiving a lot of attention due to its connection with silting theory and mutation. Silting theory is a young and dynamic branch of representation theory with many unexpected connections to other areas. One of its highlights is the interplay with cluster mutation first observed in [Al]: the categorification of cluster algebras via representation theory achieved in [BMRRT] allows us to interpret clusters as silting objects and cluster mutation as an operation that produces a new silting object from a given one by exchanging a summand.

It is shown in [AIR] that compact silting objects of length 2 control certain torsion pairs and silting mutation is encoded in the corresponding part of the Hasse quiver of torsA. In [ALSV] we propose a new approach to mutation, based on the dual concept of a cosilting object. Here one has to work with "large" (not necessarily compact) cosilting complexes, but one gains an interpretation of the whole lattice torsA in terms of mutation which sheds a new light on the brick labelling of the Hasse quiver of torsA studied in [DIRRT, BCZ]. The cosilting complexes appearing in this context are known to be pure-injective objects in D(ModA), and mutation is reflected in the **Ziegler spectrum** of A, a topological space originating from model theory whose points correspond to indecomposable pure-injective objects [ALS].

Ring epimorphisms with fixed domain A form another complete lattice which encodes valuable









information on the underlying ring A. Basic examples of ring epimorphisms include classical localization in commutative algebra, but also the more general concept of universal localization developed by Cohn, Bergman and Schofield [S]. Over commutative noetherian rings, different types of localizations are classified geometrically in terms of subsets of the prime spectrum by work of Gabriel and Neeman, and properties of ring epimorphisms are controlled by geometric invariants [AMSTV]. From a representation-theoretic angle, ring epimorphisms induce full embeddings of module categories and are relevant to central questions related to representation type.

We intend to investigate how ring epimorphisms interact with torsion pairs and t-structures. In the setting of finite-dimensional algebras, there is a well-understood connection between torsA and the lattice of ring epimorphisms in the case where the lattice torsA is finite. The algebras satisfying this condition are called T-tilting finite [DIJ] and have the remarkable property that all their universal localizations are finite dimensional. Are there non-T-tilting finite algebras with this property?

The concept of stability originates in algebraic geometry and appears in many different contexts, ranging from geometric invariant theory to cluster algebras, quantum field theory, and mirror symmetry. In recent years it has become evident that there are deep, but still underdeveloped connections between stability, silting theory and universal localization.

Bridgeland's stability manifold [Bri] encodes homological information about hearts of t-structures. The associated partition of the real Grothendieck group induced by the stability conditions over modA, called the wall and chamber structure, is used to introduce the scattering diagram of a finite dimensional algebra A. The chambers turn out to be in bijection with compact silting objects, and wall crossing can be interpreted as mutation [BST, As]. But not all walls in the scattering diagram are captured by this approach. We want to use the approach to mutation via cosilting objects to investigate phenomena arising from stability theory.

By combining King's foundational work on stability theory in representation theory with a fundamental result in semi-invariant theory, one can translate problems related to the complexity of semistable representations into representation theoretic questions on universal localizations. In Schofield's work [S], universal localization is intimately connected with the concept of a Sylvester rank function. These functions, a classical topic in the context of C*-algebras and von Neumann regular rings, are currently object of renewed interest [CL]. They are closely related with the notion of a character studied by Crawley-Boevey [CB] and with length functions [V]. Work of Ringel and Crawley-Boevey also reveals a fundamental connection with generic modules: infinite dimensional indecomposable pure-injectives that have finite length over their endomorphism ring. We will employ character theory to study the lattice of ring epimorphisms and the Ziegler spectrum of a ring.

The gentle algebras are an important family of finite dimensional algebras that often arise at the interface of representation theory and other subjects such as dimer models, cluster algebras and homological mirror symmetry. We will make concrete classifications of large cosilting objects over gentle algebras. Such classifications are made possible by the fact that gentle algebras are both tame and derived tame; they therefore form an effective 'test class' that informs our intuition for general tame phenomena. Moreover, we can make explicit computations using oriented surfaces with boundary that model the structure of the categories [OPS].

We intend to describe large cosilting objects and their mutations in the derived category of a gentle algebra. The bounded t-structures in the bounded derived category D^b(modA) of A determine large cosilting objects in D(ModA). We will characterise such large cosilting objects and we will consider their role in the structure of the Bridgeland stability manifold of D^b(modA), whose points consist of a









bounded t-structure with an appropriate stability function. This will generalise known results for small silting complexes [QW].

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APPENDIX: FORM A

TO THE DIRECTOR OF COMPUTER SCIENCE UNIVERSITY OF VERONA

I, the undersigned	,			
born in		(province) on	
residing in				(province
street			n°	postcode
admission to the s in order to create "Structures for NextGenerationE Quivers, Algebi	election process AdR4 a ranking list for the a Quivers, Algebras and U, M4C2 components and Representa	497/23 on the merit of awarding of 1 (ONE) rd Representations", t, investment 1.1, Ftions (SQUARE)",	my qualifications research scholar financed unde PRIN2022 proje project code	, reques s/experience and an interview ship to conduct the research r European Union funds - ct entitled "Structures for 2022S97PMY, CUP code
b) I have no repo	nip in the following cour	ntry:s nor pending criminal	proceedings; or:	
by Only for q recognise 2. a PhD in underwith sch	ualifications gained abr d as equivalent to an Ita nolarship / □ without sch	oad or for foreign cand alian qualification by the molarship by	rarded on the data with the fina didates: the above the relevant author	
Rector, the Dir inclusive;	•	ember of the university	y Board of Direct	Computer Science, the cors, up to the fourth degree
•	ne interview via videoco		□ yes	□ no
•	cations as specified in Aspondence:		•	
Prov	Postcode	. Phone	•	
declaration exc		context and for th	e institutional	formation contained in this purposes of the Public ng of personal data
VORODO		Signature		

APPENDIX: FORM B

SUBSTITUTIVE DECLARATION OF CERTIFICATION and/or SUBSTITUTIVE DECLARATION IN LIEU OF AFFIDAVIT

(Art.s 46 and 47, Presidential Decree no. 445 of 28/12/00)

I, the undersigned,							
SURNAME							
NAME(for women: indicate maiden name)							
TAX ID NUMBER							
BORN IN	PROVINCE	ON					
PERMANENT ADDRESS: CITY		PROVINCE					
ADDRESS		POSTCODE					
PHONE	EMAIL						
as referred to in Art. 76, Presidential	I Decree 445/2000 I declare:						
exclusively within the context and for the current legislation on the process	dge that the University may use the inform the institutional purposes of the Publicating of personal data. Signed	ic Administration, in compliance with					
	ecree 445/2000, this substitutive decl f a suitable employee or signed and su person concerned.						

