Applied Category Theory 2019

Adjoint School Application

Dear Committee:

I would like by means of this document to give you some information regarding my application to the adjoint school of ACT 2019.

I am currently a first-year PhD candidate under the supervision Michael Moortgat and Henk Stoof on a project that aims add to the current literature on the compositional distributional semantics and it's relation with structures in physics, in particular to tackle problems related with incrementality and simultaneous description of ambiguities, due to finish in March 2022. The project was inspired by the existing literature that intersects linguistics and physics through category theory, in particular some work by one of the lecturers at the school, Mehrnoosh Sadrzadeh, and as such I am by now very familiar with most of the related papers. In addition, I have a theoretical physics background, which, although not overlapping, has many relations with the quantum computation framework that drives the analogies in the literature. Due to its the power of abstraction, category theory has proved very relevant in this context, and most of what I know about category theory is what has been used there. There is still much I need to learn, and this school would provide me with a unique opportunity for that.

Thus, my first choice is "Formal and experimental methods to reason about dialogue and discourse using categorical models of vector spaces", led by Mehrnoosh Sadrzadeh, due to its overlap with my own project, and my second choice is "Simplifying quantum circuits using the ZX-calculus", led by Miriam Backens, which due to my background is the one I can relate with more (after the first), since I have also been acquainted with the diagrammatic calculus for quantum processes.

Presently there are no impediments to come to Oxford at the dates of the school. However, in case my application is accepted, any funding aid would be very much appreciated.

Participating in this school would give me a unique chance to work on a problem that is related with what I am looking at in my own research, namely how to express unfinished utterances. Besides learning more about the particulars of this problem, it would allow me to meet other people that are working on compositional distributional models of meaning, allowing me to build a network that will certainly be important for my career.

I hope you find me suitable for participation and I wish the school great success.

Sincerely,

Adriana Correia

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Education

Utrecht University **Utrecht, Netherlands**
PhD Student *March 2018 – Present*

- **Research Focus:** Modelling of Compositional Distributional Semantics with features from Quantum Mechanics. **Supervision:** Michael Moortgat (UIL-OTS) and Henk Stoof (ITF). Integrated in the Center for Complex Systems Studies.
- **Topics:** Natural Language Processing; Quantum Mechanics, Processes and Information; Category Theory; Compositional Semantics and Systems; Categorical Grammars.

Utrecht University **Utrecht, Netherlands**
Master's Degree in Theoretical Physics - Cum Laude *September 2015 – January 2018*

- **Research Focus:** Modeling symmetric and asymmetric games on a network using a magnetic field description, part of the Complex System Profile. **Supervision:** Henk Stoof.
- **Topics:** Quantum and Statistical Field Theory; General Relativity; Field Theory in Particle Physics; Low-dimensional Condensed Matter; Computer Modelling; Complex Networks.

University of Coimbra **Coimbra, Portugal**
Bachelor's Degree in Physics, Final Mark: 17/20 *September 2012 – July 2015*

- **Topics:** Advanced Calculus and Algebra; Classical Mechanics; Classical Field Theory; Quantum Mechanics; Statistical Physics; Waves and Optics; Programming; Chemistry; Experimental Physics.

Publications

Nash Equilibria in the Response Strategy of Correlated Games
Preprint. Accepted for publication in "Scientific Reports". *2018*

- https://arxiv.org/abs/1809.03860

Conferences, meetings and workshops

Workshops

Logical Aspects of Quantum Information **Leiden, Netherlands**
Lorentz Institute *July 2018*

Conferences

Physics @ Veldhoven **Veldhoven, Netherlands**
Nederlands Organisation for Scientific Research (NWO) *January 2019*
Poster Presentation

4th Lancaster Game Theory Conference **Lancaster, UK**
Lancaster University Management School *November 2018*
Poster Presentation

Meetings

Symposium on Compositional Structures 2 — **Glasgow, UK**
University of Strathclyde — *December 2018*

Symposium on Compositional Structures 1 — **Birmingham, UK**
University of Birmingham — *September 2018*

Experience

Teaching

Utrecht University — **Utrecht, Netherlands**
Teaching Assistant — *November 2018 – January 2019*

- Undergraduate level course "Quantum Mechanics", covering the Schrödinger Equation and its solutions for specific potentials, Hilbert space and related formalisms, the hydrogen atom, perturbation theory and variational principle.

University College Utrecht — **Utrecht, Netherlands**
Teaching Assistant — *September – December 2017*

- Undergraduate level course "Mathematical Methods", covering PDEs in different coordinate systems and boundary conditions, and Fourier Analysis.

Internship

Laboratory of Instrumentation and Experimental Particle Physics — **Coimbra, Portugal**
Summer Scientific Internship — *July – August 2014*

- Experimental measurements of the mobility of ions in their parent gases, using an experimental system already assembled for this purpose at the laboratory.

Voluntary Projects

Erasmus Student Network Utrecht — **Utrecht, Netherlands**
Several Committees — *February 2016 – June 2018*

- President of Journalism Committee:
  - Responsible for ESN Utrecht Blog and involved with Abroad Magazine;
- Project and Pubquiz Committee Member:
  - Organization of events that integrate international students in the Dutch community.

2015 "Ribbon Burning" Parade — **Coimbra, Portugal**
President - Organizing Commission for Physics and Physics Engineering — *2013–2015*

- General supervision of committee created with the goal to raise funds for an allegoric car parading in "Queima das Fitas", as well as organization of the specifics of the car;

Resistance Junior Enterprise — **Coimbra, Portugal**
Marketing, Editing and Publishing Collaborator — *2012–2015*

- Marketing Department: business planning, technical and scientific consulting, market studies;
- Editing and Publishing Department: planning and construction of the biannual Resistance Magazine.

Skills

Languages

Portuguese: Native

English: Fluent (C2)

Spanish: Good (B2)

Dutch: Elementary (A2)

Computer

Programming Languages: C, C++, Python

Scientific Software: Gnuplot, Maxima, Mathematica, LaTeX

Microsoft Office: Excel, Word, PowerPoint

Competitive Sports

7th Shitoryu Karate Do World Championships — **Tokyo, Japan**
Participation in the world style championships — *September 2013*

Shitoryu Karate Union — **Loulé, Portugal**
Practice of Shitoryu Karate — *2002–2013*
Technical Supervision: Renshi Daniel Coelho
Achievements:

- Graduation: Shodan Ho;
- Several places on the podium throughout the annual Portuguese National Karate Championships;
- Experience with teaching children;
- Resilience, teamwork, dedication.