Curriculum vitæ

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Interessi di Ricerca

Teoria delle categorie e tutto ciò che la riguarda.

– ∞-categorie stabili,

– algebra omotopica,

– derivatori di Groth(endieck),

– 2-categorie e teoria formale delle categorie,

– categorie localmente presentabili e logica categoriale,

– teoria dei tipi e programmazione funzionale

Posizioni   2012 | OGGI

1 | **Postdoctoral fellow**   Jul 2019 |
CMUC | Coimbra PT

2 | **Postdoctoral fellow**   Sep 2018 | Feb 2019
Max Planck Institute for Mathematics | Bonn D

3 | **Postdoctoral fellow**   Mar 2017 | Apr 2018
Masaryk University | Brno CZ

4 | **Postdoctoral fellow and Assistant Professor**   Sep 2016 | Nov 2016
University of Western Ontario | London CA

Formazione   2008 | 2012

1 | **Dottorato in Matematica**   Oct 2012 | Jun 2016
SISSA | Trieste
thesis: *t-strutture su ∞-categorie stabili*

2 | **Laurea Magistrale in Matematica**   Oct 2010 | Jul 2012
Università degli studi di Padova
thesis: *Teorema di ricostruzione di Orlov*

3 | **Laurea Triennale in Matematica**   Jan 2008 | Jun 2010
Università degli studi di Padova
thesis: *Monadi e teorema di Beck*

1 | **Hearts and towers in stable infinity-categories**   w/D. Fiorenza, G. Marchetti |
1501.04658 | in uscita su *Journal of Homotopy and Related Structures* (2019)
We exploit the equivalence between t-structures and normal torsion theories on a stable ∞-category to show how a few classical topics in the theory of triangulated categories, i.e., the characterization of bounded t-structures in terms of their hearts, their associated cohomology functors, semiorthogonal decompositions, and the theory of tiltings, as well as the more recent notion of Bridgeland's slicings, are all particular instances of a single construction, namely, the tower of a morphism associated with a *J*-slicing of a stable ∞-category **C**, where *J* is a totally ordered set equipped with a monotone $\mathbb{Z}$-action.

2 | **A standard theorem on adjunctions in two variables**
1902.06074 | accettato su Preprints of the MPIM
We record an explicit proof of the theorem that lifts a two-variable adjunction to the arrow categories of its domains.

3 | **A Fubini rule for ∞-coends**
1902.06086 | accettato su Preprints of the MPIM
We prove a Fubini rule for ∞-co/ends of ∞-functors $F : C^{op} \times C \to D$. This allows to lay down "integration rules", similar to those in classical co/end calculus, also in the setting of ∞-categories.

4 | **Categorical notions of fibration**   w/E. Riehl |
1806.06129 | in uscita su *Expos. Math.* (2019)
Fibrations over a category *B*, introduced to category theory by Grothendieck, encode pseudo-functors $B° \rightsquigarrow$ **Cat**, while the special case of discrete fibrations encode presheaves $B° \to$ **Set**. A two-sided discrete variation encodes functors $B° \, x \, A \to$ **Set**, which are also known as profunctors from *A* to *B*. By work of Street, all of these fibration notions can be defined internally to an arbitrary 2-category or bicategory. While the two-sided discrete fibrations model profunctors internally to **Cat**, unexpectedly, the dual two-sided codiscrete cofibrations are necessary to model *V*-profunctors internally to *V*-**Cat**.

5 | **Homotopical Algebra is not concrete**   w/I. Di Liberti |
1704.00303 | *Journal of Homotopy and Related Structures* (2017): 1-15.
We generalize Freyd's well-known result that "homotopy is not concrete", offering a general method to show that under certain assumptions on a model category *M*, its homotopy category ho(*M*) cannot be concrete. This result is part of an attempt to understand more deeply the relation between set theory and abstract homotopy theory.

6 | **Sober Ontic Structural Realism and Yoneda lemma**
abstract at the *Triennial conference of the SILFS*, Bologna
A note on why the Yoneda lemma prevents to take too strong a position towards the non-existence of relata (*radical* ontic structural realism posits that only relations exist).

7 | **This is the (co)end, my only (co)friend**
1501.02503v4 | libro in uscita per Cambridge Univ. Press su *LMS Lecture Note Series* (2020?)
A survey of the most striking and useful applications of *co/end calculus*. We put a considerable effort in making arguments and constructions rather explicit: after having given a series of preliminary definitions, we characterize co/ends as particular co/limits; then we derive a number of results directly from this characterization. The last sections discuss the most interesting examples where co/end calculus serves as a powerful abstract way to do explicit computations in diverse fields like Algebra, Algebraic Topology and Category Theory. The appendices serve to sketch a number of results in theories heavily relying on co/end calculus; the reader who dares to arrive at this point, being completely introduced to the mysteries of co/end fu, can regard basically every statement as a guided exercise.

8 | **t-structures are normal torsion theories**   w/D. Fiorenza |
1408.7003 | Applied Categorical Structures 24.2 (2016): 181-208
We characterize t-structures in stable ∞-categories as suitable quasicategorical factorization systems. More precisely we show that a t-structure t on a stable ∞-category **C** is equivalent to a normal torsion theory $\mathbb{F}$ on **C**, i.e. to a factorization system $\mathbb{F} = (E, M)$ where both classes satisfy the 3-for-2 cancellation property, and a certain compatibility with pullbacks/pushouts.

1 | **On the unicity of formal category theories**   w/I. Di Liberti |
1901.01594v1 | Spedito a TAC, January 2019

We prove an equivalence between cocomplete Yoneda structures and certain proarrow equipments on a 2-category **K**. In order to do this, we recognize the presheaf construction of a cocomplete Yoneda structure as a relative, lax idempotent monad sending each admissible 1-cell $f : A \to B$ to an adjunction $\mathbb{P}_! f \dashv \mathbb{P}^* f$. Each cocomplete Yoneda structure on **K** arises in this way from a relative lax idempotent monad "with enough adjoint 1-cells", whose domain generates the ideal of admissibles, and the Kleisli category of such a monad equips its domain with proarrows. We call these structures "yosegi". Quite often, the presheaf construction associated to a yosegi generates an ambidextrous Yoneda structure; in such a setting there exists a fully formal version of Isbell duality.

2 | Accessibility and presentability in 2-categories
w/I. Di Liberti |
1804.08710v4 | Spedito a JPAA, January 2019

We outline a definition of accessible and presentable objects in a 2-category **K** endowed with a Yoneda structure; this perspective suggests a unified treatment of many "Gabriel-Ulmer like" theorems (like the classical Gabriel-Ulmer representation for locally presentable categories, Giraud theorem, and Gabriel-Popescu theorem), asserting how presentable objects arise as reflections of generating ones. In a 2-category with a Yoneda structure, two non-equivalent definitions of presentability for $A \in$ **K** can in principle be given: in the most interesting, it is generally false that all presheaf objects $\mathbb{P}A$ are presentable; this leads to the definition of a Gabriel-Ulmer structure, i.e. a Yoneda structure rich enough to concoct Gabriel-Ulmer duality and to make this asymmetry disappear. We end the paper with a roundup of examples, involving classical (set-based and enriched), low dimensional and higher dimensional category theory.

3 | Localization theory for derivators
1802.08193v1 | Spedito a TAC, March 2018

We outline the theory of reflections for prederivators, derivators and stable derivators. In order to parallel the classical theory valid for categories, we outline how reflections can be equivalently described as categories of fractions, reflective factorization systems, and categories of algebras for idempotent monads. This is a further development of the theory of monads and factorization systems for derivators.

4 | Factorization systems on (stable) derivators
w/S. Virili |
1705.08565v3 | Spedito a JoA, June 2017

We define triangulated factorization systems on triangulated categories, and prove that a suitable subclass thereof (the normal triangulated torsion theories) corresponds bijectively to t-structures on the same category. This result is then placed in the framework of derivators regarding a triangulated category as the base of a stable derivator. More generally, we define derivator factorization systems in the 2-category PDer, describing them as algebras for a suitable strict 2-monad (this result is of independent interest), and prove that a similar characterization still holds true: for a stable derivator $\mathbb{D}$, a suitable class of derivator factorization systems (the normal derivator torsion theories) correspond bijectively with t-structures on the base $\mathbb{D}(\mathbf{1})$ of the derivator. These two result can be regarded as the triangulated- and derivator- analogues, respectively, of the theorem that says that 't-structures are normal torsion theories' in the setting of stable ∞-categories, showing how the result remains true whatever the chosen model for stable homotopy theory is.

5 | Recollements in stable ∞-categories
w/D. Fiorenza |
1507.03913v2

We develop the theory of recollements in a stable ∞-categorical setting. In the axiomatization of Beilinson, Bernstein and Deligne, recollement situations provide a generalization of Grothendieck's "six functors" between derived categories. The adjointness relations between functors in a recollement $\mathbf{D}^0, \mathbf{D}, \mathbf{D}^1$ induce a "recollée" t-structure $\mathsf{t}_0 \uplus \mathsf{t}_1$ on $\mathbf{D}$, given t-structures $\mathsf{t}_0, \mathsf{t}_1$ on $\mathbf{D}^0, \mathbf{D}^1$. Such a classical result, well-known in the setting of triangulated categories, is recast in the setting of stable ∞-categories and the properties of the associated (∞-categorical) factorization systems are investigated. In the geometric case of a stratified space, various recollements arise, which "interact well" with the combinatorics of the intersections of strata to give a well-defined, associative $\uplus$ operation. From this we deduce a generalized associative property for n-fold gluing $\mathsf{t}_0 \uplus \cdots \uplus \mathsf{t}_n$, valid in any stable ∞-category.

Convegni e seminari

1 | The formal category theory of derivators
Apr 2019
Relatore su invito | Workshop on Derivators - Regensburg

2 | On the unicity of the formal theory of categories
Dec 2018
Seminario su 1901.01594 | ULB - Bruxelles

3 | Accessibility and Presentability in 2-categories
Nov 2018
Seminario su 1804.08710 | Università degli studi di Torino

4 | Homotopical algebra is not concrete
Sep 2017
Contributed talk | *British Topology Meeting* | Leicester

5 | **The formal category theory of derivators**   Sep 2017
Relatore su invito | *Some trends in Algebra* | Prague

6 | **Sober Ontic Structural Realism**   Jun 2017
Relatore su invito | *SILFS* | Bologna

7 | **Model categories**   May 2017
Relatore su invito | *A categorical day in Turin* | Torino

8 | **t-derivators**   Feb 2017
Relatore su invito | *Young researchers in homotopy theory*, Bonn

9 | **Coend calculus**   May 2016
Seminario su 1501.02503 | Leeds

ATTIVITÀ DI INSEGNAMENTO

1 | **membro della *Adjoint school 2019***   Mar 2019 | oggi
Un seminario online di lettura di articoli di teoria delle categorie e ricerca in wiki.

2 | **2-categorie**   Padova - IT
Un breve corso di teoria delle categorie superiori, tenuto in italiano all'Università di Padova tra maggio e giugno 2018

3 | **PSSL 103 - Brno**   MU Brno - CZ
Sono stato uno degli organizzatori del 103esimo "Seminario itinerante di teoria dei fasci e logica".

4 | **Teoria delle categorie formale**   MU Brno - CZ
Una serie di lezioni per fare breccia nella teoria sintetica delle ∞-categorie di Riehl-Verity.

5 | **Elements of Finite Mathematics**   UWO London - CA
Combinatoria degli insiemi finiti ed elementi di Statistica; corso undergraduate alla University of Western Ontario.

6 | **Algebra Omotopica**   unipv | 2014
Un'introduzione elementare all'algebra omotopica e alle categorie modello; otto lezioni da settembre a dicembre 2014

7 | **membro del Kan *Extension Seminar I***   Jan 2014 | Jul 2014
Un seminario online di lettura di articoli di teoria delle categorie e ricerca in wiki.

8 | **corelatore laurea triennale in Matematica | Università di Bologna**   *studente: Giovanni Ronchi*
Adjoint Functors | amslaurea.unibo.it

9 | **corelatore laurea triennale in Fisica**   *studente: Davide Bosetti*
Internal logic of topoi and constructive categorical quantum mechanics | Università di Milano Bicocca

ALTRO

1 | **Varie**
Mi interessa l'arte di fabbricare libri e disegnare mappe; questo é co-causato dal mio amore per la matematica. Sono un TeXnico piuttosto bravo (il sorgente di questo CV è una repo di github in costante evoluzione here). Mi interessa la programmazione funzionale, so scrivere qualcosa in Haskell e Python, e nel linguaggio Wolfram. Mi interessano i linguaggi artificiali (mi ŝatus verki vortaron al matematiko, kun terminoj el teoria kategorioj); di nuovo, questo è causato dal mio essere un matematico.

2 | **Reviewer per**
zbMath, AMS Math. Rev.