Alessio before deep inference

Dale Miller

Inria Saclay &
LIX, Institut Polytechnique de Paris

A Celebration for Alessio Guglielmi
18 September 2024, Bath, UK

1991: Starts his PhD studies at the University of Pisa

Alessio started his Ph.D. with **Professor Giorgio Levi** of the University of Pisa.

At that time, Giorgio was a leading researcher in the theory of logic programming.

Alessio described the large influence that Giorgio had on his development as a researcher and a person in

> *Personal Portrait of Giorgio Levi by Alessio Guglielmi,*
> *Theoretical Computer Science 410(46): 4605-4607 (2009).*
> *This article is part of the Festschrift for Giorgio.*

1994 Spring: Alessio had a 3 month visit to the University of Pennsylvania

Alessio was keen to move beyond the classical approaches to understanding the relationships between computation and logic.

He took an interest then, as many of us did, in linear logic: this was seven years after Girard's 1987 paper.

At the time, I was one of the few people publishing connections between logic programming and linear logic.

Giorgio arranged for Alessio to visit me for a few months in the Spring of 1994.

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During his visit, I remember often being confused by his goals and perspectives.

- ▶ I was mostly new to "structural proof theory".
- ▶ He was excited about "relational webs," . . ..

In his 2007 "A system of Interaction and Structure", Alessio claims his work on deep inference (aka the calculus of structures) start during 1994.

TD - 4/96

Abstract Logic Programming in Linear Logic
Independence and Causality in a First Order Calculus

Alessio Guglielmi

dipartimento di informatica

università di pisa

- ▶ Alessio wrote his Ph.D. thesis on logic programming, sequent calculus, and linear logic.
- ▶ I was an external examiner for his PhD in December 1995.
- ▶ He struggled to deal with parallelism, independence, and causality within the sequent calculus.
- ▶ He became critical of the sequent calculus at this time: his criticism came from a real attempt to use it.
- ▶ His dissatisfaction with the sequent calculus forced him to look elsewhere for a better theory of proof.

1995 Dec: Even then, LaTeX strained to be enough

From his dissertation:

FIG. 18 Labelled event structure LES*⟦G⟧ for example 3.13

Inductive cases:
(3) G_1. Let Π be

where $k' + k'' > 0$. By the induction hypothesis, for $1 \le j \le k''$ and $1 \le i \le k'$, there are $\vdash_{G_1}$-free proofs Π'_j and Π_i, corresponding, respectively, to

and

Two cases are possible. If G is not the selected goal in the G_1 instance, or if it is selected and either $G \in \Psi'$ or $G \in \Gamma'$, then take Π as:

His only journal paper using the sequent calculus was co-authored with Paola.

On structuring proof search for first order linear logic by P. Bruscoli and A. Guglielmi, TCS, 360(1-3), 42–76, 2006.

I credit this as the first paper to prove the cut-elimination theorem in a system using synthetic inference rules.

This is more abstract and challenging (and more insightful) than the usual approach based on introduction rules.

1996 Mar 21: a wedding in Pisa

Foreground: Giorgio Levi, Catuscia, Dale, Maurizio Gabbrielli
Background: reps from the mayor's office, Alessio

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Wedding gift from Alessio and Paola: a tandem bicycle:

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