

70 GODINA OD ROĐENJA KOSTE DOŠENA

Datum: 13. i 14. jun 2024.

Mesto: Matematički institut, sala 301f

Organizatori: Matematički institut i
Filozofski fakultet u Beogradu

PRELIMINARNI PROGRAM

ČETVRTAK, 13. JUN		
VREME	NASLOV	PREDAVAČ
10:00 – 10:20	Otvaranje skupa	Zoran Ognjanović i Mašan Bogdanovski
10:30 – 10:50	On permuting cut with contraction	Mirjana Borisavljević
11:00 – 11:20	Coherence for logicians	Zoran Petrić
11:30 – 11:50	How do we know what we know when we know the axioms?	Miloš Adžić
12:00 – 12:20	Simplified axioms of Arrow-Sen theory	Branislav Boričić
12:30 – 12:50	Self-reference and intensionality	Jovana Kostić
13:00 – 15:00	Pauza za catering u biblioteci Instituta	
15:00 – 15:20	The Verifier-Falsifier Games with Restrictions on Computational Complexity of Strategies	Sergej Solovjov
15:30 – 15:50	First Order Logic with Dependent Sorts	Đorđe Čubrić
16:00 – 16:20	Term rewriting on hypergraph polytopes	Pjer-Luj Kirijen

ČETVRTAK, 13. JUN

VREME	NASLOV	PREDAVAČ
16:30 – 16:50	Bipartite graphs and the (0,1)-matrices	Žana Kovijanić Vukićević
17:00 – 17:20	On the paths of meaning	Katarina Maksimović
18:00 – 21:00	Okupljanje u kafeu Paideia, Dunavski kej 9, Dorćol	

PETAK, 14. JUN

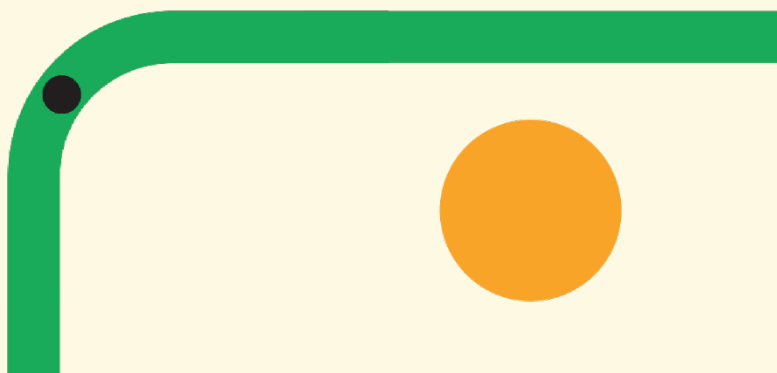
VREME	NASLOV	PREDAVAČ
09:00 – 11:00	Šetnja po Kalemegdanu	
11:00 – 11:20	Reflecting on beauty: the aesthetics of mathematical discovery	Filip Jevtić
11:30 – 11:50	Kosta Došen – a colleague and friend, whom I am missing	Vladimir Dragović
12:00 – 12:20	On syntactic and semantic foundation of logic	Zvonimir Šikić
12:30 – 12:50	Where is modern Platonist argumentation in mathematics going?	Vladimir Drekalović
13:00 – 13:20	Curry-Howard correspondence: new challenges	Silvia Gilezan
13:30 – 15:00	Pauza za katering u klubu Akademije	

PETAK, 14. JUN

VREME	NASLOV	PREDAVAČ
15:00 – 15:20	O modalnim i deskriptivnim logikama	Milenko Mosurović
15:30 – 15:50	Implication in constructive semantics	Tomas Piha
16:00 – 16:20	Pravedna raspodela sa zmajem	Rade Živaljević
16:30 – 16:50	Semi-mathematical statements	Slobodan Vujošević

SUBOTA, 15. JUN

VREME	
10:00	Okupljanje na Dunavskom keju i vožnja bicikloma do Ade Ciganlije



Седамдесет година од рођења Косте Дошена

АПСТРАКТИ-ABSTRACTS

Miloš Adžić, Faculty of Philosophy, Belgrade

How do we know what we know when we know the axioms?

We will present some views attributed to Frege by Tyler Burge regarding the epistemology of basic logical laws. We will find the arguments presented in support of these views lacking in several respects, particularly concerning the importance of pragmatic considerations in Frege's euclideanism.

Branislav Boričić, Faculty of Economics, Belgrade

Simplified axioms of Arrow-Sen theory

The traditional Arrow-Sen Social Choice Theory **TSCT** is a mathematical theory built apparently on higher-order formal language. In this paper, we propose a reformulation and reclassification of the **TSCT** axioms in order to obtain a simpler theory based on the first-order language axioms, keeping the spirit of original ideas. This new theory, called Simplified Social Choice Theory, denoted by **SSCT**, presents a sub-theory of **TSCT**. Roughly speaking, we extract all quantifications over n -tuples of binary relations from the axioms of **TSCT** and move them to the meta-level obtaining a sub-theory **SSCT** of **TSCT**. More accurately, we assign to each traditional higher-order axiom **TA** its simplified first-order version **SA** such that $\mathbf{TA} \vdash \mathbf{SA}$, i.e. **SA** can be logically derived from **TA**. In this way we define a simpler and more accessible set of principles that provide a context in which we can prove many propositions analogous to well-known theorems including the Arrow's impossibility of Paretian non-dictatorship and Sen's impossibility of Paretian liberal. These simplifications are the result of decades of lecturing by the author with the aim of bridging the barriers between this beautiful complex theory and his students.

Mirjana Borisavljević, Faculty of Traffic Engineering, Belgrade

Prikaz rada "On permuting cut with contraction" autora K. Došena, Z. Petrića i M. Borisavljević

U radu je predstavljena procedura eliminacije sečenja za intuicionističku iskaznu logiku takva da (a) pravilo sečenja eliminiše direktno, bez korišćenja višestrukog sečenja, pravila miksa, (b) ima redukcijske korake koji premeštaju sečenje iznad kontrakcije. Analizirano je da li redukcijski koraci procedure eliminacije miksa iz Gencenovog dokaza Hauptsatz-a ([2] i [3]) sadrže premeštanje sečenja iznad kontrakcije ili ne. Pokazano je i da, u odsustvu implikacije, premeštanje sečenja iznad kontrakcije ne pravi probleme u direktnom eliminisanju sečenja.

Literatura:

[1] Borisavljević, M., Došen, K., and Petrić, Z. [2000] On permuting cut with contraction. *Mathematical Structures in Computer Science*, vol. 10, pp. 99-136.

[2] Gentzen, G. [1935] Untersuchungen über das logische Schliessen. *Mathematische Zeitschrift* 39 176-210, 405-431 (English translation in [3]).

[3] Gentzen, G. [1969] *The Collected Papers of Gerhard Gentzen*, Szabo, M.E. (ed.), North-Holland.

Pierre-Louis Curien, Directeur de Recherche au CNRS émérite

Term rewriting on hypergraph polytopes

We show that all faces of hypergraph polytopes (introduced by Došen and Petrić) are named by terms over some signature, and we define a generalised Tamari relation (conjectured to be an order) as a term rewriting system (correspondingly conjectured to be terminating). We discuss a subclass of hypergraph polytopes, called contextual, where these rewriting systems look even nicer and allow us to recover the coherence for categorified non-symmetric operads (also due to Došen and Petrić).

Dorđe Čubrić, Mathematical institute SANU

First Order Logic with Dependent Sorts

We give a brief introduction to Michael Makkai's First Order Logic with Dependent Sorts. This logic is "intended to be a framework for a formalization, and the meta-theory of that formalization, of structuralist mathematics".

Vladimir Dragović, Mathematical institute SANU

Kosta Došen – a colleague and friend, whom I am missing

Vladimir Drekalović, University of Montenegro, Faculty of Philosophy, Nikšić

Where is modern Platonist argumentation in mathematics going?

At the beginning of this century, Alan Baker, a Platonist in mathematics, tried to improve the traditional, so-called Quine-Putnam indispensability argument. This is how the Enhanced Indispensability Argument (EIA) was born. In the literature, we find many doubts and criticisms accompanying this argument. We will point out two disputed points of EIA that were inherited from an older ancestor and which did not disappear by improving the older version of the argument. First refers to the ontological leap that the argument implies and the second to the disagreement in the ideas of the mathematical and physical understanding of existence. Also, we will point out two disputed points on which the new argument differs from the old one: the domain of the argument and the definition of indispensability.

All these problematic points give a wind at the back of Platonists who are more inclined to rely on the old metaphysical argument of Plato, but also to opponents of Platonism.

Silvia Ghilezan, University of Novi Sad, Mathematical institute SANU

Curry-Howard correspondence new challenges

The Curry-Howard correspondence, a.k.a. formulae-as-types and proofs-as-terms correspondence is a foundational concept that connects logic and computation. Starting from intuitionistic logic and lambda calculus, it has been extended to a wide range of different logical systems and formal calculi. Nowadays it is at the heart of formal verification of mathematical proofs. We will discuss some unpublished results in this framework initiated by Kosta Došen, which are related to substructural logics, back then called weak logics.

Filip Jevtić, Mathematical institute SANU

Reflecting on beauty: the aesthetics of mathematical discovery

Mathematical research is often motivated by the desire to reach a beautiful result or to prove it in an elegant way. Mathematician's work is thus strongly influenced by his aesthetic judgments. However, the criteria these judgments are based on remain unclear. In this talk, we focus on the concept of mathematical beauty, as one of the central aesthetic concepts in mathematics. We argue that beauty in mathematics reveals connections between apparently non-related problems or areas and allows a better and wider insight into mathematical reality as a whole. We also explain the close relationship between beauty and other important notions such as depth, elegance, simplicity, fruitfulness, and others. Predavanje se bazira na radu:

Filip D. Jevtić, Jovana Kostić, Katarina Maksimović. Reflecting on beauty: the aesthetics of mathematical discovery. <https://doi.org/10.48550/arXiv.2405.05379>

Jovana Kostić, Faculty of Philosophy, Belgrade

Self-reference and intensionality

The problem of establishing a formal study of intensionality has been bothering philosophers and logicians for a long time. While others doubted its feasibility, Kurt Gödel was convinced that the future of logic lies in this direction. Among his mostly tentative remarks on how this project should be pursued, one stood out as constant and particularly suggestive: the focus should be on self-reference. This talk presents

some observations on the relationship between self-reference and intensionality, aiming to offer insight into how far self-reference can take us in exploring the formal properties of concepts.

Žana Kovijanić Vukićević, University of Montenegro, Faculty of Science and Mathematics

Bipartite graphs and the $(0,1)$ -matrices

Temperley-Lieb algebras play an important role in knot theory and topology of small dimensions. Based on Brauer's representation theorem, there are Temperley-Lieb algebras that can be represented by $(0,1)$ -matrices. In the paper Self Adjunctions and Matrices, published in 2003 in Journal of Pure and Applied Algebra authors, prof. Došen and prof. Petrić, have formulated an assumption about the linear independence of one such family of $(0,1)$ -matrices. In the paper A New proof of the Faithfulness of Brauer's Representation of Temperley-Lieb Algebras (K. Došen, Ž. Kovijanić, Z. Petrić, International Journal of Algebra and Computation, 2006.) this assumption is proven. Here we will talk about graph theory details of this proof. Keywords: Kronecker product of matrices, König's graphs, $(0,1)$ -matrices.

Katarina Maksimović, Faculty of Philosophy, Belgrade

On the paths of meaning

It is not a simple task to describe the mathematical and philosophical significance of Kosta Došen's work in one talk, and this is certainly not something I can hope to achieve with this presentation. Nevertheless, I would like to focus on some of his ideas, perhaps some of them less well-known than others, that have been particularly influential in my work. All these ideas, in one way or another, revolve around the problem of language and meaning. Kosta believed that philosophy of language can help us to better understand mathematics, but he also thought that mathematics provides deeper insights into meaning itself. In this talk I will briefly present some of my results that stem from this perspective.

Milenko Mosurović, University of Montenegro, Faculty of Science and Mathematics

O modalnim i deskriptivnim logikama

U ovoj prezentaciji će biti riječi o nekim modalnim logikama kao što su K, S5, KD45 i nekim od njihovih aksioma. Takođe biće spomenute logike linearnog vremena i iskazna dinamička logika. Od deskriptivnih logika biće navedene neke od logika AL familije poput ALC, CIQ, SROIQ. Na kraju će biti navedeni rezultati o složenosti deskriptivnih logika s modalnim operatorima.

Zoran Petrić and Mladen Zekić, Mathematical institute SANU

Coherence for logicians

This talk is a result of a joint work with Mladen Zekić and it is addressed to logicians not familiar with category theory. A new proof of coherence for symmetric monoidal closed categories, proven by Kelly and Mac Lane in early 1970s is the main subject of the talk. We find this result of great importance for proof theory. We will formulate it in pure logical terminology free of categorial notions. Coherence is related to the generality conjecture in general proof theory and we hope that our reformulation of this result will make it closer to the proof-theoretical community.

Thomas Piecha, Tuebingen University

Implication in constructive semantics

We examine the treatment of implication in certain constructive semantics.

Sergei Soloviev, Institut de Recherche en Informatique de Toulouse (IRIT)

The Verifier-Falsifier Games with Restrictions on Computational Complexity of Strategies (updated++)

Originally, the Game Theoretic Semantics (GTS) was developed as a variant of verification procedure for existing logical semantics. This semantics could be classical, constructive etc. References related to this talk: Thierry Coquand (1995), Denis Bonnay (2004), Boyer and Sandu (2012), Odintsov, Speranski,

Shevchenko (2018). In this talk I will first outline the bases of the game theoretic approach. I will also consider briefly some variants of this approach and problems studied in the literature. I plan to explore (or, rather, to start the exploration) of how the GTS may be modified, or even “perverted”, if there are significant differences in the computational power of players.

Zvonimir Šikić, University of Zagreb

On syntactic and semantic foundation of logic

Gentzen’s singular sequential system of first-order logic was an alternative notation for his system of natural deductions. His multiple sequential system was his symmetric generalization that was more appropriate to classical logic. Beth’s tableaux system was a system that was derived directly from the semantic analysis of connectives and quantifiers. It was soon realized that the Beth’s system and the Gentzen’s multiple system were only notational variants of each other. Kneale’s system of multiple natural deductions was a generalization of Gentzen’s system of natural deductions. We prove that Kneale’s natural deductions are also a notational variant of Beth’s tableaux. Finally, we argue that Beth tableaux are the most natural foundation of classical logic.

[1] E. W. Beth, Semantic Entailment and Formal Derivability, *Mededelingen van de Koninklijke Nederlandse Akademie van Wetenschappen, Afd. Letterkunde n.s.* 18, 309–42, 1955.

[2] E. W. Beth, *The Foundations of Mathematics, Studies in Logic and the Foundations of Mathematics*, North-Holland Publishing Company, Amsterdam 1959.

[3] M. Fitting, *Proof Methods for Modal and Intuitionistic Logics*, D. Reidel Publishing Co., Dordrecht, 1983.

[4] G. Frege, *Begriffsschrift: eine der arithmetischen nachgebildete Formelsprache des reinen Denkens*, Verlag von Louis Nebert, 1879.

[5] G. Gentzen, *Untersuchungen ueber das logische Schliessen I*, *Mathematische Zeitschrift*, 39 (2), 176–210, 1935.

[6] G. Gentzen, *Untersuchungen ueber das logische Schliessen II*, *Mathematische Zeitschrift*, 39 (3), 405–431, 1935.

[7] W.M. Kneale, *The Development of Logic*, Clarendon Press, 1962.

[8] D. J. Shoesmith, T. J. Smiley, *Multiple Conclusion Logic*, Cambridge University Press, 1978.

[9] Z. Šikić, Kneale’s natural deductions as a notational variant of Beth’s tableaux, *Logica Universalis* 16, 11–26, 2022.

Slobodan Vujošević, Mathematical institute SANU

Semi-mathematical statements

Rade Živaljević, Mathematical institute SANU

Pravedna raspodela sa zmajem

Bavimo se matematikom pravedne raspode (pravedna = raspodela bez zavisti) u kojoj učestvuje i “zmaj” (= nekooperativan igrač koji ne poštuje pravila). Razmotrićemo dve osnovne varijante problema.

1. U podeli učestvuje $r - 1$ igrača zmaj. Nakon što je “kolač” podeljen u r delova, zmaj (bez dogovora) zgrabi jedno parče kolača i odleti. Nakon toga ostali igrači dele preostale delove. Pitanje je kako unapred podeliti kolač tako da, bez obzira koje je parče uzeo zmaj, na kraju niko nikome ne zavidi na dobijenom parčetu.

2. U podeli učestvuje $r + 1$ igrača a kolač se deli u r delova. Krvoločni zmaj iznenada doleće i proguta jednog od igrača. Potrebno je kolač unapred podeliti tako da, bez obzira ko je nesrećni igrač koga je zmaj progutao, preostali igrači mogu da podele delove kolača tako da niko nikom ne zavidi. Rešenje oba problema se bazira na idejama kombinatorne (algebarske topologije). Predavanje završavamo sa nekoliko filozofskih opaski (iz ugla topologa) o mogućnosti pravednog deljenja u nemilosrdnom svetu. Ukratko, nije neophodno da kooperativni igrači imaju potpuno iste želje (preferencije) ali je ipak neophodno da žele isto (do na homotopiju!). Predavanje se bazira na radu:

G. Panina, R. Živaljević. Envy-free division in the presence of a dragon. *J. Fixed Point Theory Appl.* (2022) 24:81, <https://doi.org/10.1007/s11784-022-00997-y>