

Δ_{12} -workshop on logic

11 January 2020

Schedule

All talks are held in Room 506, Siyuan West Building, Beijing Jiaotong University.

Time	Speakers	Titles
9:00–9:50	Nan Fang	On the converging speed of d. c. e. approximations
9:50–10:40	Xi Li	贝叶斯框架下通用先验的选择问题
10:40–11:00	Coffee Break	
11:00–11:50	Jixin Liu	Weakly Aggregative Modal Logic: Characterization, Interpolation and Model transformation
12:00–14:00	Lunch Time	
14:00–14:50	Xianghui Shi	An I_0 -analogue of an AD theorem
14:50–15:40	Yue Yang	实数上的递归集是 Δ_1 的? Δ_2 的? 还是 Δ_{12} 的?
15:40–16:00	Tea Break	
16:00–16:50	Jian Yu	基于认知的机器学习公理化

On the converging speed of d.c.e. approximations

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Based on a work about derivation on d.c.e. reals by Barmpalias and Lewis-Pye, and by Miller, one can prove that for a random d.c.e. real, all of its d.c.e. approximations converge at the same speed. On the other hand, we prove that for a nonrandom d.c.e. real, there exist two d.c.e. approximations which have different converging speeds. This gives us a characterization of random reals among all d.c.e. reals. Another way to look at the result is by relativization. We prove that one function is possible to speed up the approximation of Ω if and only if it is dominated by another function which is in a degree of low for Ω . This is a joint work with George Barmpalias.

贝叶斯框架下通用先验的选择问题

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根据“无免费午餐定理”，只要“假设空间”上的概率分布是“块均匀的”，任何算法都不可能真正具有“通用性”。没有足够好的“先验知识”打破“块均匀性”，通用学习不可能。这里好的“先验”可看作可能世界的某种性质的分布。为了分析先验分布的合理性问题，我们将讨论几种先验概率的选择标准，探讨信息编码最优原则、奥卡姆剃刀原则、最大熵原则、最大期望误差界/平均冗余/信道容量原则限制下的先验概率的优缺点。先验概率的“最优”，都是基于某种约束原则下的最优。如果不要求“最优性”，在贝叶斯归纳预测的框架下，可以获得预测意义上的“通用性”。但是如果将贝叶斯方法应用于序贯决策问题，则先验概率会与效用函数相纠缠，连“通用性”也无法保证，在不合理的先验下甚至极端的差。为了解决这个问题，可能需要刻画某种乐观的自然齐一性。

Weakly Aggregative Modal Logic: Characterization, Interpolation and Model transformation

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Joint work with Yanjing Wang and Yifeng Ding. Weakly Aggregative Modal Logic (WAML) is a collection of disguised polyadic modal logics with n -ary modalities whose arguments are all the same. WAML can be treat as a class of monotonic modal logics and it has some interesting applications on different areas of philosophical logic, so we study some basic model theoretical aspects of WAML here. Specifically, first we give a van Benthem-Rosen characterization theorem of WAML based on an intuitive notion of bisimulation. Then we show that each basic WAML system K_n lacks Craig Interpolation. Finally, we also show that there is a transformation between relational models and neighborhood models which can preserve K_n -validity.

An I_0 -analogue of an AD theorem

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It follows from the Axiom of Determinacy that there is no ω_1 -sequences of distinct countable sets of reals (in $L(\mathbb{R})$). John Steel asked if the λ -version of this conclusion holds in $L(V_{\lambda+1})$ under axiom $I_0(\lambda)$. We answer Steel's question positively. In the talk we will discuss a few attempts for proving the result and the possibility/obstacles of generalizing the relevant ingredients to the I_0 context.

实数上的递归集是 Δ_1 的？ Δ_2 的？还是 Δ_{12} 的？

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报告的主要内容是回答标题中的问题。在给出答案之前，我会定义其中涉及的概念，即什么是实数？什么是递归集？什么是 Δ_1 ？什么是 Δ_2 ？如果时间允许，我会定义 Δ_{12} 。报告中的结果是与Keng Meng Ng和Nazanin Tavarna合作的。

基于认知的机器学习公理化

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摘要：在大数据时代，因应用需求的驱动，大量新机器学习方法不断产生。这些新算法理论依据各异，彼此之间的关系极其复杂，对学习算法的使用者要求极高。但是，儿童的学习能力虽高，却不能掌握现今机器学习的理论。是否能够提出一套符合人类认知的机器学习理论，是当前一个亟待解决的问题。本次报告试图提出一个统一基于认知的机器学习公理化框架，其基本假设是：归哪类，像哪类；像哪类，归哪类。该机器学习理论可以推演出归类方法的三条设计原则，以统一的方式重新解释了数据降维、密度估计、回归，聚类和分类等问题，而且与日常生活中的认知原则一致。

于剑，现任北京交通大学人工智能研究院常务副院长，二级教授，交通数据分析与挖掘北京市重点实验室主任，CCF会士，CCF人工智能与模式识别专业委员会主任，CAAI副秘书长兼常务理事，CAAI机器学习专业委员会副主任。著有学术专著《机器学习：从公理到算法》，是CAAI组织编写教材《人工智能导论》的执行主编。