



Machine Learning in pure maths, predicting conjectures in knot theory

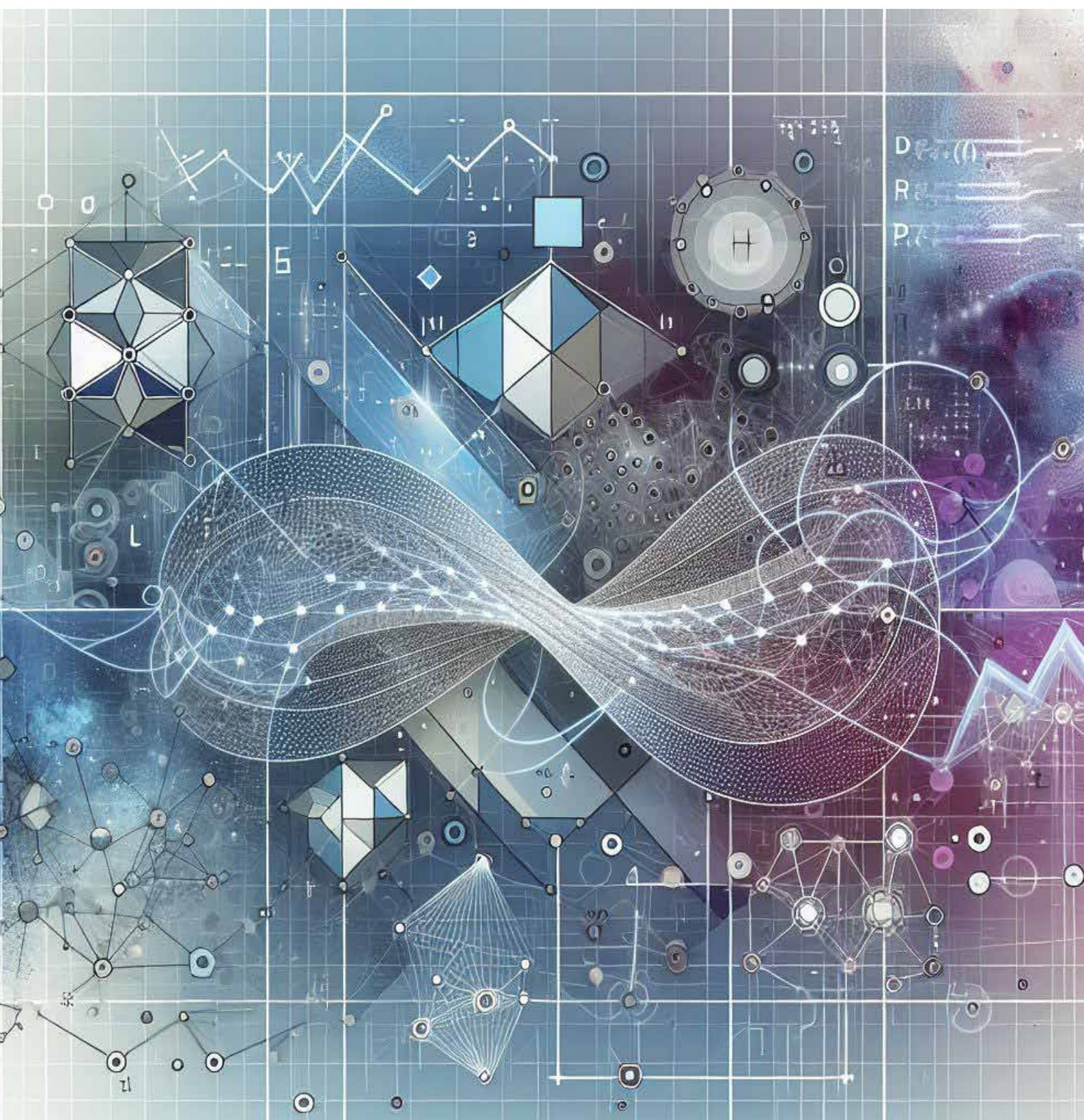
機械学習と純粋数学：結び目理論予想

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1 abstract

For a long time, pure maths researches seemed to be a little isolated, it is said that one can just conduct research with a pen and a piece of paper without other tools. In the recent years, there seems to be more and more computer-aided researches in the field and pure mathematicians are encouraged to collaborate with data scientists, people in machine learning and many more other fields. Terence Tao has proved a conjecture with the help of AI fairly recently which further stimulated this collaboration between pure mathematicians and those of the applied ones.

In this talk, I would like to introduce the application of machine learning in predicting conjectures in knot theory (a branch in topology, but also seemed to have applications in many other fields) and how they might relate to some of my own research projects.

2 Short bio

I am currently a postdoc at Mathematical and Theoretical Physics Unit at OIST. I graduated with a MMATH degree from University of Saint Andrews in Scotland in 2013 and then took the International graduate program in Tokyo Institute of Technology under the supervision of Professor Sadayosi Kojima and followed by a Doctoral degree at the University of Tokyo under the supervision of Professor Takuya Sakasai.

My research interests mainly lie in geometric group theory and low dimensional topology. In the past few years, my research focused particularly on topics related to the so called Thompson's groups and their generalisations.

PUBLICATIONS AND PREPRINTS

1. X. Sheng, Quasi-isometric embedding from the generalised Thompson's group T_n , TOKYO J. MATH. Vol. 45, No. 2, 2022.
2. X. Sheng, Divergence Property of the Brown-Thompson Groups and Braided Thompson Groups, Transformation Groups (2024).
3. X. Sheng, Some obstructions on the subgroups of the Brin-Thompson groups and a selection of twisted Brin-Thompson groups, arXiv preprint 2209.11982, revise.
4. X. Sheng, Some experimental results on knots and links constructed from Thompson's group F a la Jones, submitted.
5. P. Marra, V. Proietti, X. Sheng, Hofstadter-Toda spectral duality and quantum groups, J. Math. Phys. 65, 071903 (2024).
6. Geometric and combinatorial properties of some generalisations of Thompson's groups, Doctoral Thesis (2022).
7. Generalised Thompson's group T_n in T , Master Thesis (2016).
8. Word problem, Groups and automata, MMath dissertation (2013).