

Theory of Computational Complexity

Final Assignment

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Solve the following two problems and submit your report by January 10th. The submission should be done by email: send a pdf file of the report to the address “legall@math.nagoya-u.ac.jp”. Do not forget to write your name and your student number on the report. I will send you an email of confirmation when I receive your email. In case you didn’t receive a confirmation email within two days, please send me another email.

Problem 1 (Classes in Computational Complexity)

Explain briefly what each of the following eight complexity classes represent: P, NP, EXP, PSPACE, L, NL, BPP, BQP. Describe the relationships (i.e., the known inclusions) between these classes.

Problem 2 (Fine-grained complexity)

A very good source of information about fine-grained complexity theory is the following recent survey:

On some fine-grained questions in algorithms and complexity by Virginia Vassilevska Williams, that appeared in the Proceedings of the 2018 International Congress of Mathematicians, available online at <http://people.csail.mit.edu/virgi/eccentri.pdf>.

This survey gives an overview of known hardness results in fine-grained complexity theory. Read this survey, choose one of the hardness results discussed in the survey and write a one-page report about it. (Do not choose one of the hardness results already discussed during the lectures.) Your report should include a description of the problem considered, a summary of the complexity of the best known algorithms solving it, and give a sketch about how the hardness result is proved.