Day 4 (Poster F)

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Title:Continuous black-box optimization with quantum annealing and random subspace coding

Abstract:
A black-box optimization algorithm such as Bayesian optimization searches extremum of an unknown function by alternating inference of the underlying function and optimization of an acquisition function. In a high-dimensional space，such algorithms perform poorly due to the difficulty of acquisition function optimization. In this talk，we apply quantum annealing (QA) to overcome the difficulty in continuous black-box optimization. As QA specializes in discrete optimization，a continuous state vector has to be encoded to binary，and the solution of QA has to be translated back. Our method has the following three parts: 1) Random subspace coding based on axis-parallel hyperrectangles that continuous vector can be encoded to binary. 2) A nonnegative-weighted linear regression model which is the acquisition function solved by QA. 3) A penalization scheme to ensure that the QA solution can be translated back. It is shown in experiments that its performance using D-Wave Advantage is competitive with a state-of-the-art method based on the Gaussian process in high-dimensional problems. Our method may open up a new possibility of QA and expand its range of application to continuous-valued problems.
This is collaboration work with Koki Kitai(U. Tokyo)，Shu Tanaka(Keio U.)，Ryo Tamura(NIMS/U. Tokyo)，and Koji Tsuda(U. Tokyo/RIKEN/NIMS).