July 6 - July 12 Seminar Review

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1 IFDS 7.6

Title: A Representer Theorem for Single-Hidden Layer Neural Networks
Representer: Rahul Parhi

By representer theorems, the minimizer of an infinite regularized empirical risk minimization problem can be represented by finite formulas. Today, the presenter provides a representer theorem for the single-hidden neural network. Unlike classical theorems, the new theorem is defined on a non-Hilbertian Banach space. The new regularizer uses Laplace transformation and Radon transformation to reduce the dimension of the objective, leaving Dirac impulses. The presenter transfers the problem to a minimization problem for the regularizer subject to finite linear constrains. Therefore, the representation of the minimizer shares the same structure with the solution to the radon measure recovery problem, which is a superposition of Dirac impulses. Besides, the new regularizer also controls the generalizability of the representer.

Comments:
1. The solutions to the representer problem for neural network are not unique. However, there exists a solution that lies in the domain of our interests.
2. The presenter takes three steps to prove the theorem: (1) Figure out the structure of the solution domain; (2) Explore the existence of the solution; (3) Establish the form of solutions. We may apply these steps to other minimization problems.