

# Molecular Machine Learning *in Vitro*

Ji-Hoon Lee<sup>a,b,c</sup>, Jin-Woo Kim<sup>b,c</sup>, Russell Deaton<sup>d</sup>, Seung Hwan Lee<sup>e</sup>, Tai Hyun Park<sup>e</sup>,  
Byoung-Tak Zhang<sup>a,f,g\*</sup>

<sup>a</sup>Graduate Program in Bioinformatics, <sup>e</sup>School of Chemical and Biological Engineering, <sup>f</sup>Graduate Program in Cognitive Science, <sup>g</sup>School of Computer Science and Engineering,  
Seoul National University, Republic of Korea

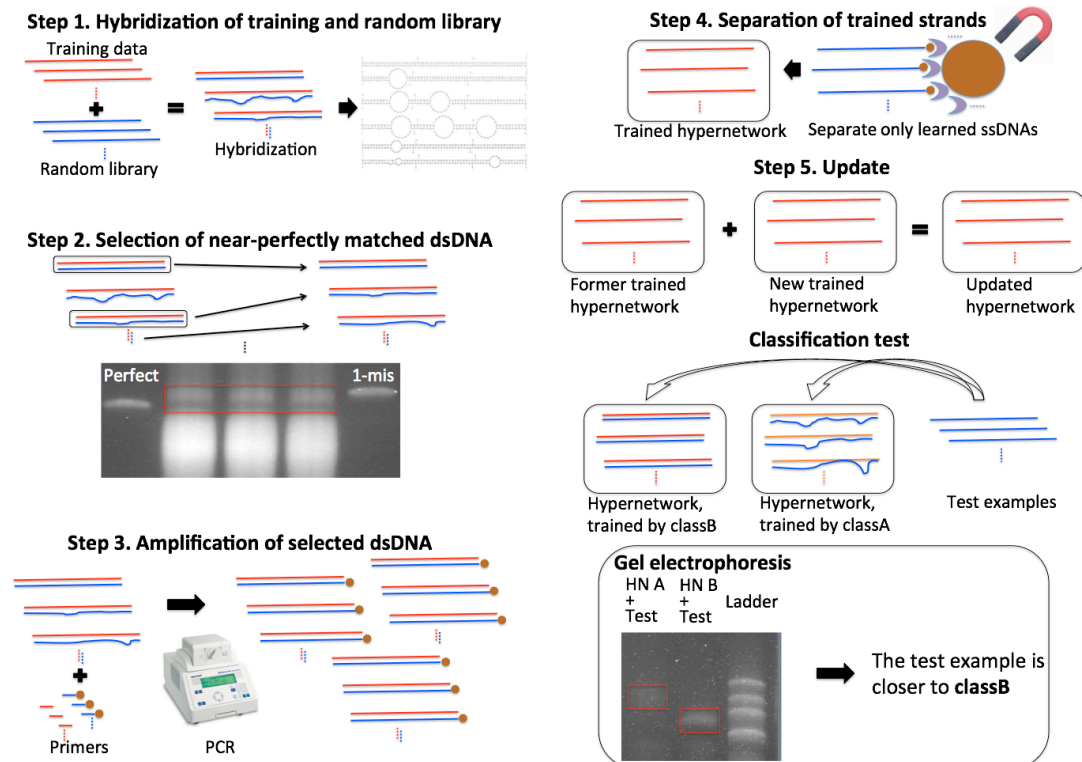
<sup>b</sup>Biological and Agricultural Engineering, <sup>c</sup>Bio/Nano Technology Laboratory, Institute for Nanoscience and Engineering, <sup>d</sup>Computer Science and Engineering,  
University of Arkansas, United States

[jhlee@bi.snu.ac.kr](mailto:jhlee@bi.snu.ac.kr), [jwkim@uark.edu](mailto:jwkim@uark.edu), [rdeaton@uark.edu](mailto:rdeaton@uark.edu), [skulsh78@snu.ac.kr](mailto:skulsh78@snu.ac.kr), [thpark@snu.ac.kr](mailto:thpark@snu.ac.kr),  
[btzhang@bi.snu.ac.kr](mailto:btzhang@bi.snu.ac.kr)\*

## Abstract

We present a molecular evolutionary method that implements machine learning *in vitro* using DNA hypernetworks. The specifically designed DNA molecules are trained via an *in vitro* evolutionary process to build molecular hypernetworks. The learned hypernetworks are used to perform pattern classification tasks and their properties of molecular learning are analyzed. A series of DNA hybridization, selection, PCR, and bead separation experiments are designed and implemented for molecular evolutionary learning *in vitro*. The results of simplified tests by DNA hybridization demonstrate effective pattern classification performance. The use of DNA molecules with their massively parallel assembly property enables natural simulation of human-like associative memory and learning.

## Overall Process



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