**SUPPLEMENTARY MATERIAL**

 All analyses were performed using Matlab (Mathworks Inc., version 8.7) and existing software packages, such as SPM8 (v8.7), VBM8 (r435), and *libsvm* ([55], version 3.18). See Supplementary Figure 1 for an overview of the processing steps. Further below, the custom implementation details of the adjustment of the data kernel using Gaussian process regression are listed.

 Effects of age, gender, and total intracranial volume were removed with kernel-based Gaussian process regression as in previous work [44]. The image pre-processing and the process of adjustment for covariates are depicted in Supplementary Figure 1. Denoting the data matrix of gray matter (GM) probability maps ( the number of data points, the number of voxels per image) and denoting the design matrix of a constant column, age, gender, and volumes of GM, white matter, and cerebrospinal fluid as , effects of these variables were regressed out of the gram matrix **.** Regression parameters were estimated using controls from the ADNI data set as where **R** = , where the elements of the covariance matrix were defined as a sum of a constant, a linear, a squared exponential, and a noise term , where if and zero otherwise. The subscript \* denotes the covariance matrix of the test examples. The optimal hyperparameters were estimated by maximizing following Gaussian log-likelihood:

Gradient and Hessian with respect to the hyperparameters of above equation were analytically computed to iteratively solve the non-convex unconstrained optimization problem using the trust-region algorithm[67] implemented in Matlabs *fminunc* function .