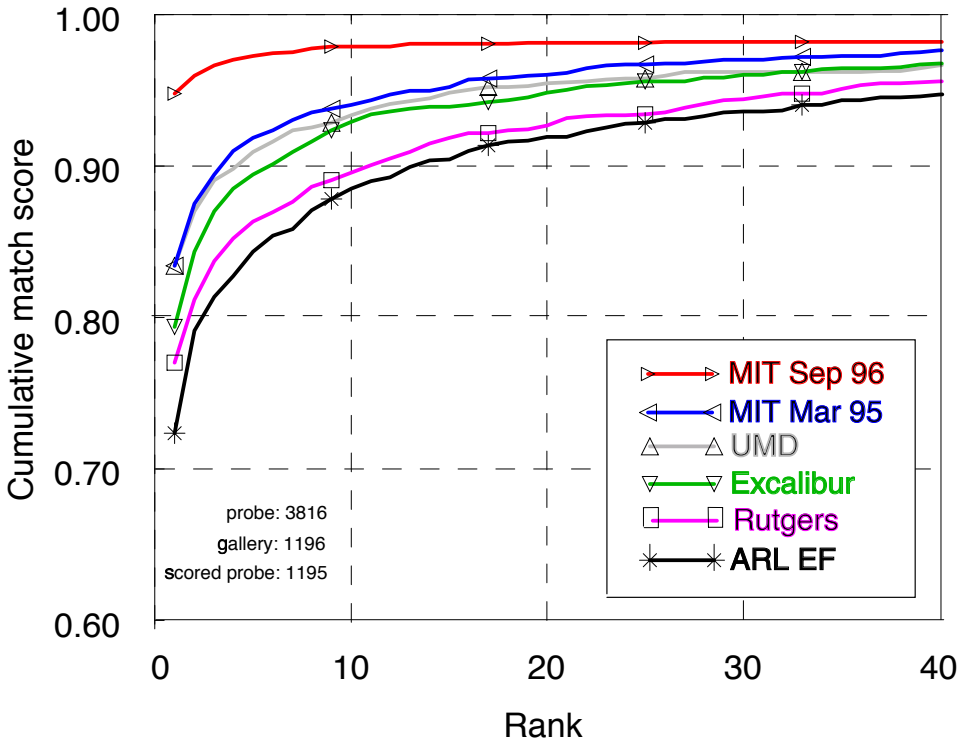


Figure 7: Cumulative recognition rates for frontal FA/FB views for the competing algorithms in the FERET 1996 test. The top curve (labeled "MIT Sep 96") corresponds to our Bayesian matching technique. Note that second placed is standard eigenface matching (labeled "MIT Mar 95").

FERET tested, our experiments with a database of approximately 2000 faces have shown that using $S'$ instead of $S$ results in only a minor (2-3%) deficit in the recognition rate while cutting the computational cost by a factor of 2.

### 4.5 Eigenface vs. Bayesian Matching

It is interesting to compare the computational protocol of standard Euclidean eigenfaces with the new probabilistic similarity. This is shown in Figure 9 which illustrates the signal flow graphs for the two methods. With eigenface matching, both the probe and gallery images are pre-projected onto a single "universal" set of eigenfaces, after which their respective principal components are differenced and normed to compute a Euclidean distance metric as the basis of a similarity score. With probabilistic matching on the other hand, the probe and gallery images are **first** differenced and then projected onto **two** sets of eigenfaces which are used to compute the likelihoods $P(\Delta|\Omega_I)$ and $P(\Delta|\Omega_E)$, from which the *a posteriori* probability $P(\Omega_I|\Delta)$ is computed by application of Bayes rule as in Eq. 2. Alternatively, the likelihood $P(\Delta|\Omega_I)$ alone can be computed to form the simplified similarity in Eq. 3. As noted in the previous section, use of $S'$ instead of $S$ reduces the computational requirements by a factor of two, while only compromising the overall recognition rate by a few percentage points.[2]

Finally, we note that the computation of either MAP/ML similarity measures can be greatly simplified using the derivations shown in Section 3.2. This reformulation yields an exact remapping of the probabilistic similarity score without requiring repeated image-differencing and eigenspace projections. The most desirable

[2]Note that Figure 9(b) shows the *conceptual* architecture of Bayesian matching and not the actual implementation used as detailed in Section 3.2.