Supplementary Materials: One-Stage Fair Multi-View Spectral Clustering

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Algorithm 1 Fair Multi-View Spectral Clustering

Input: Multi-view data $\mathcal{X} = \{\mathbf{X}^{(1)}, \mathbf{X}^{(2)}, \cdots, \mathbf{X}^{(v)}\}$, protected groups $\mathcal{G}_1, \cdots, \mathcal{G}_T$, fairness hyper-parameter λ.

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Construct the Laplacian matrix L^(i) for each view. Construct the one-hot protected group matrix P.
Initialize α_i = 1/v and Y by minimizing Tr( Y^T ( Σ_{i=1}^v α_i^2 L^(i) ) Y ( Y^T Y )^{-1} ).
repeat
    // Update Y
    repeat
        Compute Y_{.k}^T B Y_{.k} and Y_{.k}^T Y_{.k}, for k = 1, ..., c.
        for i = 1 to n do
            Let m be the location of 1 in the i-th row of current Y.
            Calculate L( Y^(s) ) by Eq.(16) or Eq.(17), for s = 1, ..., c.
            Obtain s* = argmin L( Y^(s) ).
            if s* ≠ m then
                Update Y_{.m}^T B Y_{.m}, Y_{.m}^T Y_{.m}, Y_{.s*}^T B Y_{.s*}, and Y_{.s*}^T Y_{.s*} by Eqs.(18) and (19).
                Set Y(i, m) = 0, Y(i, s*) = 1.
            end if
        end for
    until Converges
    // Update α
    Update α by Eq.(21).
until Converges
```

Output: The final partition matrix $\mathbf{Y}$.

1 APPENDIX A: DETAILED PSEUDO-CODE OF FMSC

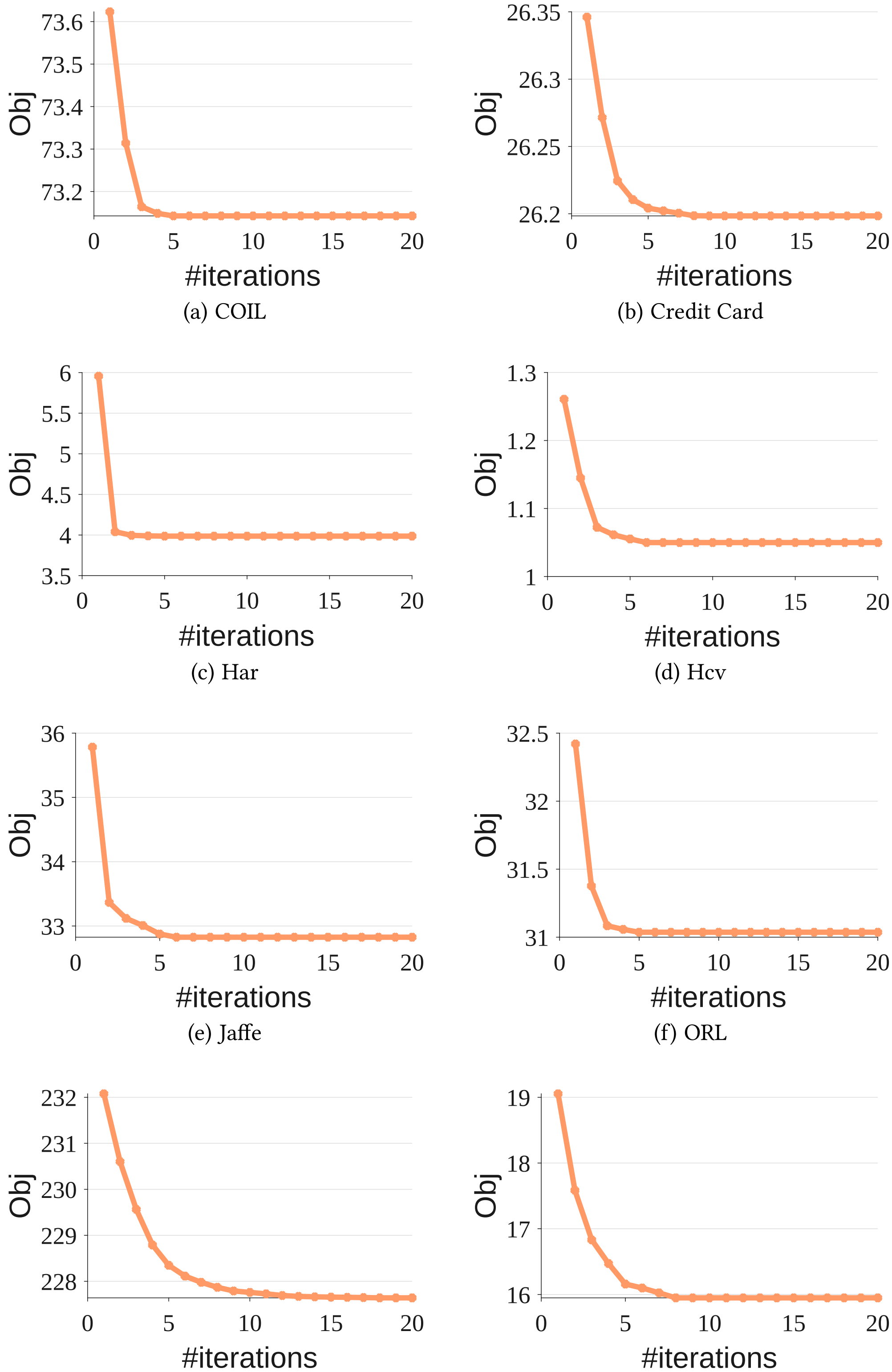
Algorithm 1 shows the detailed algorithm of our proposed FMSC.

2 APPENDIX B: CONVERGENCE CURVES

Figure 1 shows the convergence curves of our method on all data sets. The results show that our method converges very fast, which often converges within 10 iterations.

3 APPENDIX C: RUNNING TIME COMPARISON

Figure 2 shows the running time of all multi-view clustering methods on all data sets. We report the logarithm of the time (in seconds) for better comparison. From Figure 2, we can see that our method is faster than many state-of-the-art methods, which well demonstrates the efficiency of our proposed method.



(a) COIL (b) Credit Card
(c) Har (d) Hcv
(e) Jaffe (f) ORL
(g) Scene (h) Yale

Figure 1: Convergence curves on all data sets

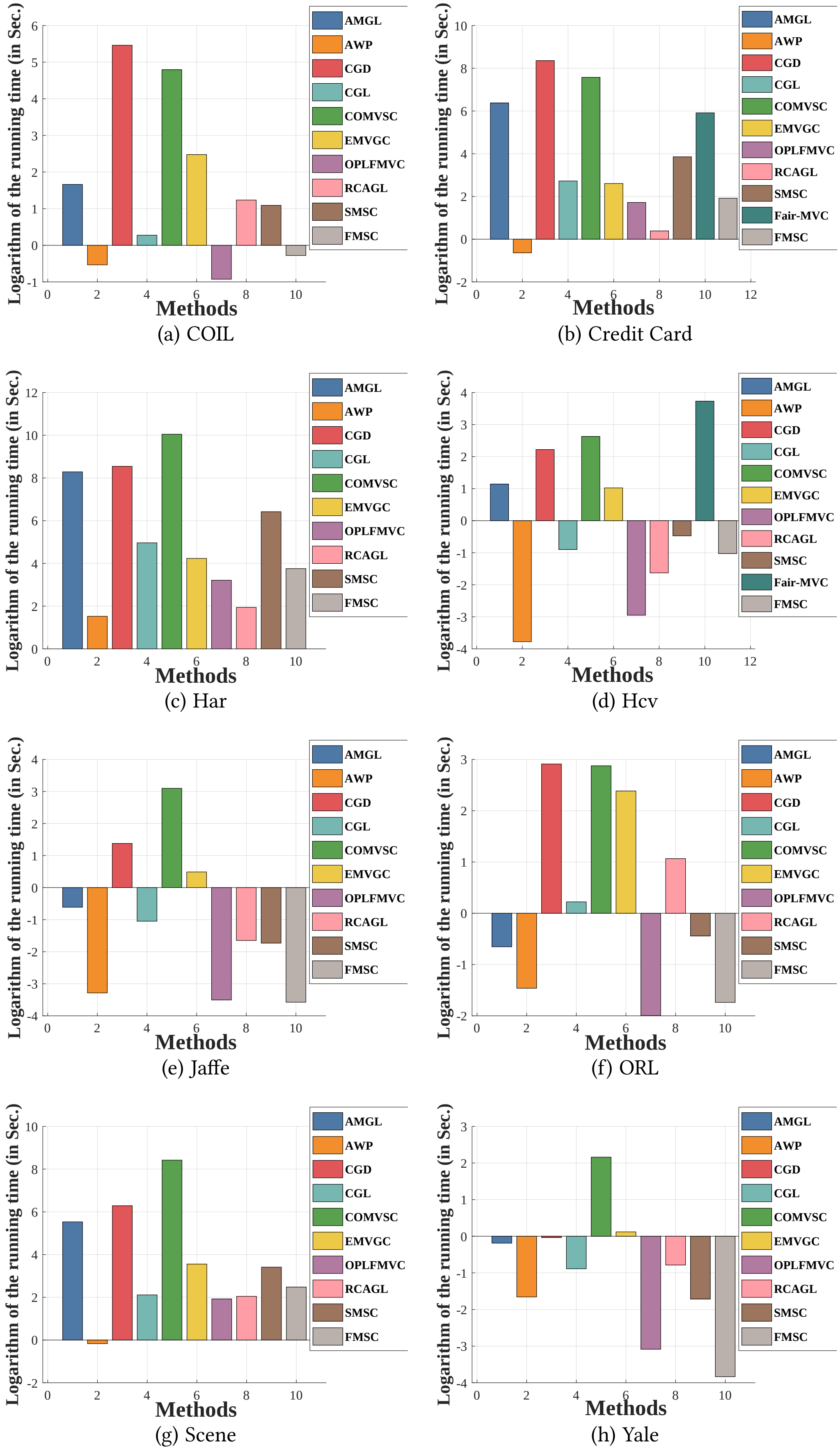


Figure 2: Running time of all multi-view clustering methods on all data sets