Table B3. Performance (%) evaluation of different datasets based on the NMI metric. We have highlighted the values of the best-performing method in **bold**, and the second-best method is marked with an underline. • indicates whether proposed method is statistically superior to the compared methods according to the pairwise t-test at 0.05 significance level.

Method	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Average
CEAM (TKDE'24)	•5.6$_{\pm 10}$	•36.2$_{\pm 26}$	•16.7$_{\pm 4}$	•27.4$_{\pm 1}$	•60.1$_{\pm 10}$	•4.3$_{\pm 3}$	•18.0$_{\pm 2}$	•19.0$_{\pm 5}$	•14.3$_{\pm 4}$	•8.8$_{\pm 5}$	21.0$_{\pm 8}$
CEs^{2}L (AIJ'19)	•3.4$_{\pm 5}$	•9.3$_{\pm 10}$	•19.0$_{\pm 4}$	•27.9$_{\pm 2}$	•45.1$_{\pm 14}$	•12.3$_{\pm 5}$	•12.0$_{\pm 2}$	•15.2$_{\pm 7}$	15.7$_{\pm 3}$	•10.2$_{\pm 6}$	17.0$_{\pm 6}$
CEs^{2}Q (AIJ'19)	•2.5$_{\pm 4}$	•11.5$_{\pm 8}$	•17.6$_{\pm 5}$	•28.1$_{\pm 3}$	•43.9$_{\pm 15}$	•12.1$_{\pm 5}$	•12.2$_{\pm 2}$	•17.9$_{\pm 4}$	•15.4$_{\pm 3}$	•7.5$_{\pm 4}$	16.9$_{\pm 6}$
LWEA (TCYB'18)	•0.4$_{\pm 0}$	•53.3$_{\pm 3}$	•15.9$_{\pm 3}$	•28.1$_{\pm 1}$	•63.3$_{\pm 3}$	•12.1$_{\pm 5}$	•13.7$_{\pm 3}$	•21.0$_{\pm 4}$	•14.7$_{\pm 1}$	•7.9$_{\pm 4}$	23.0$_{\pm 3}$
NWCA (arXiv'24)	•0.4$_{\pm 0}$	•52.5$_{\pm 3}$	•16.0$_{\pm 3}$	•28.4$_{\pm 1}$	•63.7$_{\pm 3}$	•12.5$_{\pm 4}$	•13.6$_{\pm 3}$	•21.7$_{\pm 1}$	•14.8$_{\pm 1}$	•9.7$_{\pm 4}$	23.3$_{\pm 2}$
ECCMS (TNNLS'24)	•0.4$_{\pm 0}$	•50.7$_{\pm 19}$	•18.4$_{\pm 5}$	•28.2$_{\pm 0}$	•64.7$_{\pm 3}$	•12.3$_{\pm 5}$	•12.9$_{\pm 3}$	•22.8$_{\pm 4}$	•15.5$_{\pm 2}$	•9.1$_{\pm 4}$	23.5$_{\pm 5}$
MKKM (arXiv'18)	•8.1$_{\pm 12}$	•40.8$_{\pm 20}$	•12.8$_{\pm 3}$	•20.6$_{\pm 6}$	•55.4$_{\pm 9}$	•12.0$_{\pm 5}$	•19.7$_{\pm 4}$	•14.3$_{\pm 4}$	•12.0$_{\pm 7}$	•9.1$_{\pm 6}$	20.5$_{\pm 8}$
SMKKM (TPAMI'23)	•8.7$_{\pm 4}$	•38.5$_{\pm 11}$	•19.3$_{\pm 4}$	•27.0$_{\pm 2}$	•59.4$_{\pm 9}$	•10.5$_{\pm 5}$	•20.0$_{\pm 2}$	•18.2$_{\pm 3}$	•15.5$_{\pm 2}$	•10.5$_{\pm 4}$	22.8$_{\pm 5}$
SEC (TKDE'17)	•9.2$_{\pm 12}$	•24.9$_{\pm 18}$	•17.3$_{\pm 4}$	•21.9$_{\pm 5}$	•36.0$_{\pm 17}$	•12.8$_{\pm 4}$	•15.5$_{\pm 3}$	•13.6$_{\pm 7}$	•9.9$_{\pm 6}$	•7.1$_{\pm 4}$	16.8$_{\pm 9}$
Proposed ($\alpha = 0.1$)	25.0$_{\pm 12}$	58.3$_{\pm 1}$	20.0$_{\pm 4}$	29.4$_{\pm 2}$	67.5$_{\pm 3}$	14.4$_{\pm 4}$	18.8$_{\pm 2}$	19.6$_{\pm 6}$	15.0$_{\pm 4}$	12.4$_{\pm 4}$	28.0$_{\pm 4}$
Proposed	**25.0**$_{\pm 12}$	**59.0**$_{\pm 1}$	**21.1**$_{\pm 3}$	**29.4**$_{\pm 2}$	**67.5**$_{\pm 3}$	**15.0**$_{\pm 4}$	**22.9**$_{\pm 2}$	**27.4**$_{\pm 2}$	**15.8**$_{\pm 3}$	**12.4**$_{\pm 4}$	**29.6**$_{\pm 4}$

Table B4. Performance (%) evaluation of different datasets based on the ARI metric. We have highlighted the values of the best-performing method in **bold**, and the second-best method is marked with an underline. • indicates whether proposed method is statistically superior to the compared methods according to the pairwise t-test at 0.05 significance level.

Method	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Average
CEAM (TKDE'24)	•6.6$_{\pm 12}$	•42.8$_{\pm 31}$	•12.9$_{\pm 4}$	•20.4$_{\pm 1}$	•59.0$_{\pm 13}$	•2.7$_{\pm 5}$	•2.5$_{\pm 1}$	•10.8$_{\pm 4}$	•12.8$_{\pm 5}$	•10.1$_{\pm 7}$	18.1$_{\pm 8}$
CEs^{2}L (AIJ'19)	•2.4$_{\pm 4}$	•3.0$_{\pm 10}$	•14.0$_{\pm 3}$	•20.3$_{\pm 2}$	•33.3$_{\pm 19}$	•18.3$_{\pm 6}$	•0.2$_{\pm 2}$	•6.8$_{\pm 7}$	•15.4$_{\pm 4}$	•9.6$_{\pm 9}$	12.3$_{\pm 7}$
CEs^{2}Q (AIJ'19)	•1.7$_{\pm 3}$	•3.5$_{\pm 7}$	•12.4$_{\pm 3}$	•20.0$_{\pm 2}$	•31.2$_{\pm 17}$	•18.5$_{\pm 6}$	•0.3$_{\pm 2}$	•9.0$_{\pm 4}$	•15.2$_{\pm 5}$	•6.7$_{\pm 5}$	11.8$_{\pm 6}$
LWEA (TCYB'18)	•-0.5$_{\pm 0}$	•62.9$_{\pm 4}$	•13.1$_{\pm 3}$	•21.2$_{\pm 1}$	•57.5$_{\pm 5}$	•18.5$_{\pm 6}$	•0.0$_{\pm 2}$	•10.0$_{\pm 4}$	•13.5$_{\pm 3}$	•8.8$_{\pm 6}$	20.5$_{\pm 4}$
NWCA (arXiv'24)	•-0.5$_{\pm 0}$	•62.3$_{\pm 4}$	•12.9$_{\pm 2}$	21.6$_{\pm 1}$	•56.3$_{\pm 6}$	•19.8$_{\pm 5}$	•-0.1$_{\pm 2}$	•10.4$_{\pm 1}$	•13.3$_{\pm 3}$	•11.7$_{\pm 6}$	20.8$_{\pm 3}$
ECCMS (TNNLS'24)	•-0.5$_{\pm 0}$	•56.1$_{\pm 24}$	•13.5$_{\pm 3}$	•21.3$_{\pm 1}$	•60.8$_{\pm 7}$	•19.0$_{\pm 6}$	•-0.3$_{\pm 1}$	•12.2$_{\pm 4}$	•14.0$_{\pm 3}$	•10.5$_{\pm 6}$	20.7$_{\pm 6}$
MKKM (arXiv'18)	•8.8$_{\pm 14}$	•47.1$_{\pm 25}$	•9.5$_{\pm 2}$	•14.2$_{\pm 5}$	•53.8$_{\pm 10}$	•13.6$_{\pm 12}$	•2.1$_{\pm 2}$	•7.2$_{\pm 3}$	•10.9$_{\pm 6}$	•10.1$_{\pm 7}$	17.7$_{\pm 8}$
SMKKM (TPAMI'23)	•8.8$_{\pm 5}$	•41.9$_{\pm 10}$	•14.6$_{\pm 3}$	•17.0$_{\pm 3}$	•55.5$_{\pm 11}$	•13.2$_{\pm 9}$	•3.5$_{\pm 1}$	•7.2$_{\pm 4}$	15.7$_{\pm 2}$	•12.2$_{\pm 5}$	19.0$_{\pm 5}$
SEC (TKDE'17)	•8.9$_{\pm 15}$	•23.8$_{\pm 25}$	•12.8$_{\pm 4}$	•13.5$_{\pm 5}$	•26.9$_{\pm 19}$	•13.5$_{\pm 12}$	•1.1$_{\pm 2}$	•5.6$_{\pm 7}$	•7.2$_{\pm 6}$	•5.2$_{\pm 5}$	11.9$_{\pm 9}$
Fix $\alpha = 0.1$	30.8$_{\pm 15}$	69.2$_{\pm 1}$	15.8$_{\pm 4}$	22.1$_{\pm 2}$	67.5$_{\pm 5}$	20.6$_{\pm 5}$	2.6$_{\pm 1}$	12.0$_{\pm 5}$	14.8$_{\pm 5}$	14.5$_{\pm 6}$	27.0$_{\pm 4}$
Proposed	**30.8**$_{\pm 15}$	**69.5**$_{\pm 2}$	**16.7**$_{\pm 3}$	**22.1**$_{\pm 2}$	**67.5**$_{\pm 5}$	**21.5**$_{\pm 5}$	**4.1**$_{\pm 1}$	**18.4**$_{\pm 2}$	**16.0**$_{\pm 3}$	**14.5**$_{\pm 6}$	**28.1**$_{\pm 3}$

Table B5. Performance (%) evaluation of different datasets based on the F-score metric. We have highlighted the values of the best-performing method in **bold**, and the second-best method is marked with an underline. • indicates whether proposed method is statistically superior to the compared methods according to the pairwise t-test at 0.05 significance level.

Method	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	Average
CEAM (TKDE'24)	•60.5$_{\pm 9}$	•79.4$_{\pm 15}$	•46.4$_{\pm 3}$	•42.7$_{\pm 1}$	•83.1$_{\pm 7}$	•66.0$_{\pm 2}$	•22.8$_{\pm 2}$	•51.4$_{\pm 3}$	•49.9$_{\pm 3}$	•61.8$_{\pm 6}$	56.4$_{\pm 5}$
CEs^{2}L (AIJ'19)	•58.0$_{\pm 4}$	•59.5$_{\pm 7}$	•46.3$_{\pm 2}$	•42.0$_{\pm 2}$	•65.0$_{\pm 12}$	•72.2$_{\pm 3}$	•19.3$_{\pm 2}$	•49.1$_{\pm 5}$	51.7$_{\pm 3}$	•62.7$_{\pm 6}$	52.6$_{\pm 4}$
CEs^{2}Q (AIJ'19)	•57.4$_{\pm 3}$	•60.3$_{\pm 5}$	•44.7$_{\pm 3}$	•41.9$_{\pm 2}$	•62.9$_{\pm 12}$	•72.4$_{\pm 3}$	•19.2$_{\pm 1}$	•50.5$_{\pm 5}$	•51.6$_{\pm 3}$	•60.3$_{\pm 4}$	52.1$_{\pm 4}$
LWEA (TCYB'18)	•55.5$_{\pm 0}$	•89.6$_{\pm 1}$	•46.0$_{\pm 3}$	43.2$_{\pm 1}$	•81.7$_{\pm 4}$	•72.4$_{\pm 3}$	•18.6$_{\pm 2}$	•49.5$_{\pm 1}$	•51.3$_{\pm 2}$	•61.2$_{\pm 4}$	56.9$_{\pm 2}$
NWCA (arXiv'24)	•55.5$_{\pm 0}$	•89.4$_{\pm 1}$	•45.9$_{\pm 2}$	•43.6$_{\pm 1}$	•80.7$_{\pm 5}$	73.2$_{\pm 2}$	•18.8$_{\pm 2}$	•49.2$_{\pm 1}$	•51.2$_{\pm 2}$	•63.5$_{\pm 4}$	57.1$_{\pm 2}$
ECCMS (TNNLS'24)	•55.5$_{\pm 0}$	•85.6$_{\pm 12}$	•46.1$_{\pm 3}$	•43.3$_{\pm 1}$	•84.0$_{\pm 3}$	72.6$_{\pm 3}$	•18.5$_{\pm 2}$	•51.0$_{\pm 3}$	•51.6$_{\pm 3}$	•62.5$_{\pm 4}$	57.1$_{\pm 3}$
MKKM (arXiv'18)	•62.1$_{\pm 10}$	•82.6$_{\pm 11}$	•42.9$_{\pm 3}$	•37.4$_{\pm 5}$	•79.8$_{\pm 7}$	•70.8$_{\pm 5}$	•25.2$_{\pm 3}$	•50.2$_{\pm 2}$	•49.7$_{\pm 6}$	•62.5$_{\pm 6}$	56.3$_{\pm 6}$
SMKKM (TPAMI'23)	•62.9$_{\pm 4}$	•73.7$_{\pm 7}$	•47.7$_{\pm 3}$	•39.8$_{\pm 2}$	•80.6$_{\pm 8}$	•69.9$_{\pm 4}$	•23.4$_{\pm 3}$	•53.2$_{\pm 1}$	52.2$_{\pm 1}$	•63.3$_{\pm 4}$	56.7$_{\pm 4}$
SEC (TKDE'17)	•62.2$_{\pm 10}$	•71.9$_{\pm 12}$	•46.0$_{\pm 3}$	•37.2$_{\pm 4}$	•59.9$_{\pm 13}$	•71.0$_{\pm 4}$	•20.5$_{\pm 2}$	•48.2$_{\pm 5}$	•45.7$_{\pm 5}$	•58.8$_{\pm 5}$	52.1$_{\pm 6}$
Fix $\alpha = 0.1$	76.5$_{\pm 9}$	91.6$_{\pm 0}$	48.9$_{\pm 3}$	43.7$_{\pm 1}$	87.6$_{\pm 2}$	73.3$_{\pm 3}$	21.4$_{\pm 2}$	55.4$_{\pm 5}$	51.5$_{\pm 4}$	65.1$_{\pm 5}$	61.5$_{\pm 3}$
Proposed	**76.5**$_{\pm 9}$	**91.7**$_{\pm 1}$	**49.8**$_{\pm 2}$	**43.7**$_{\pm 1}$	**87.6**$_{\pm 2}$	**73.8**$_{\pm 2}$	**27.3**$_{\pm 3}$	**63.3**$_{\pm 1}$	**52.3**$_{\pm 2}$	**65.1**$_{\pm 5}$	**63.1**$_{\pm 3}$