

Understanding Distance Measures Among Elections

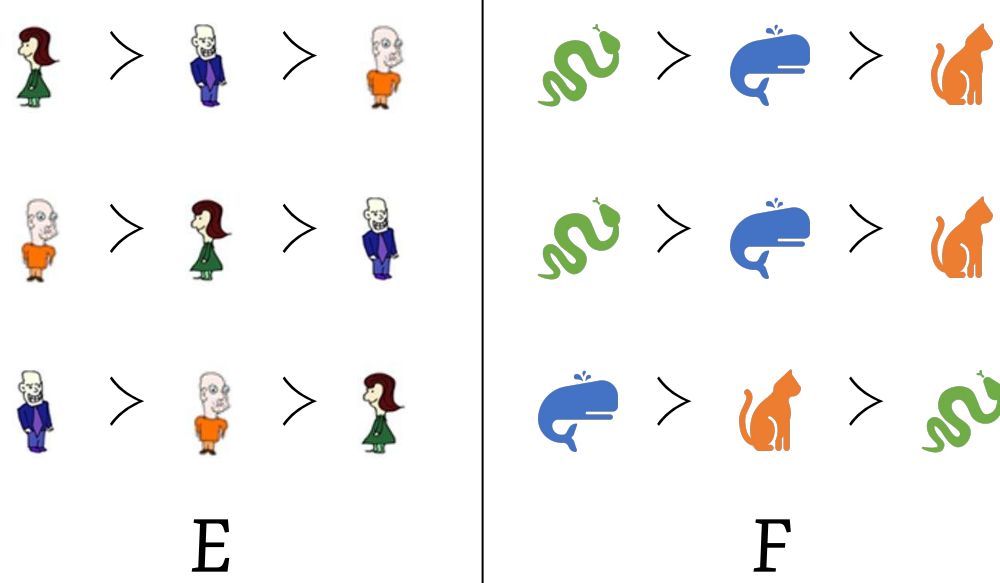
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We study six **metrics** that measure how different two election profiles are, i.e., their **distance**.

SWAP

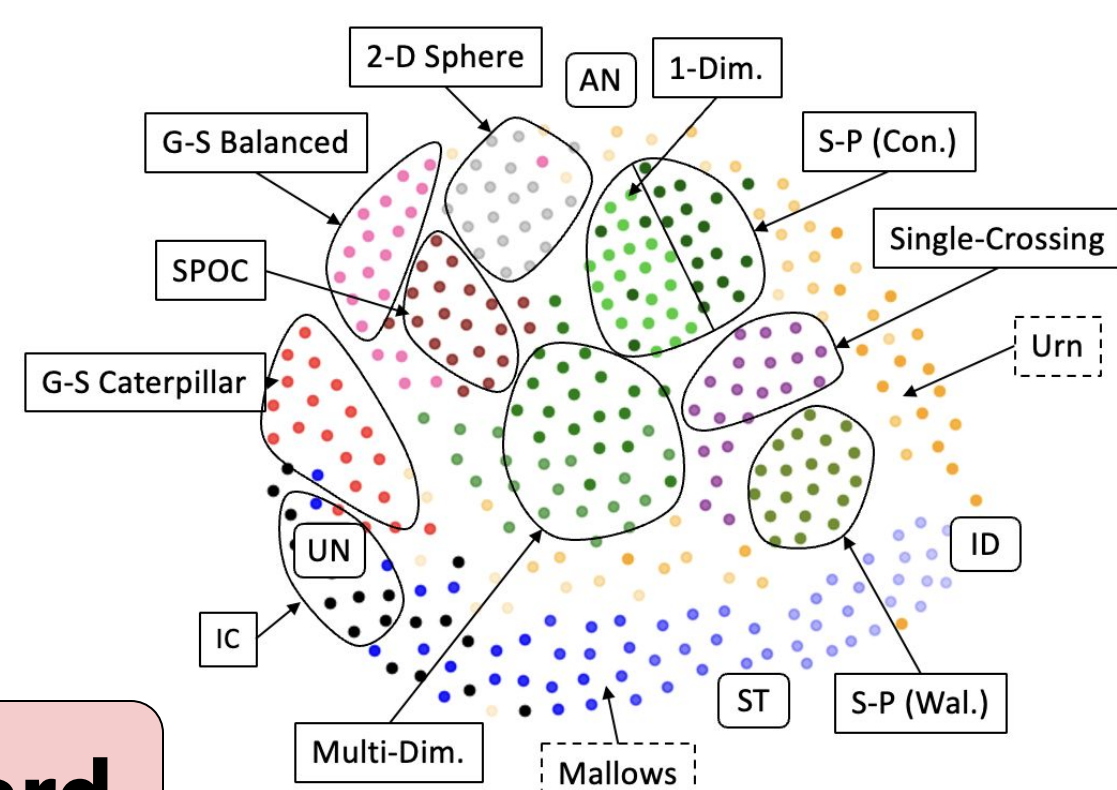
Example



$$d_{\text{swap}}(E, F) = 2$$

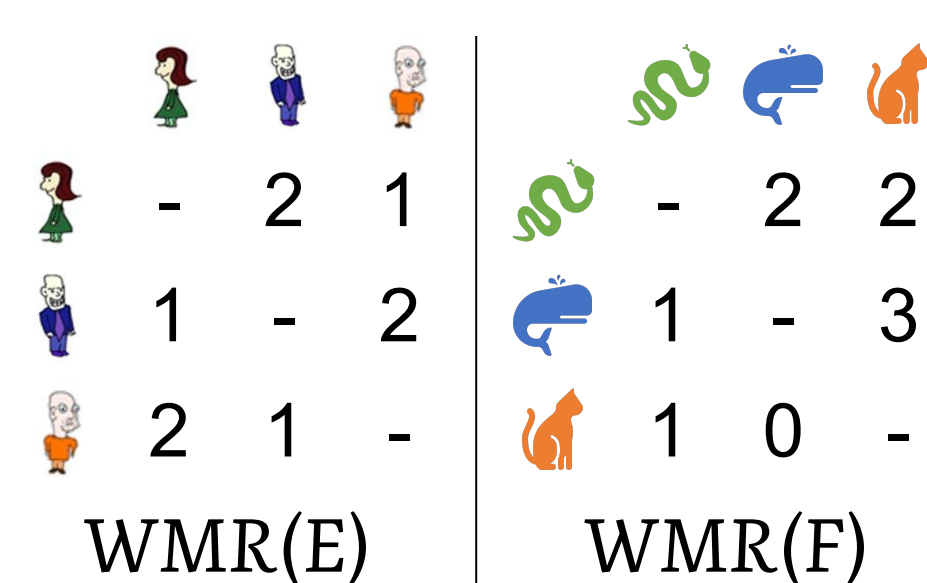
NP-hard

Map



ℓ_1 -PAIRWISE

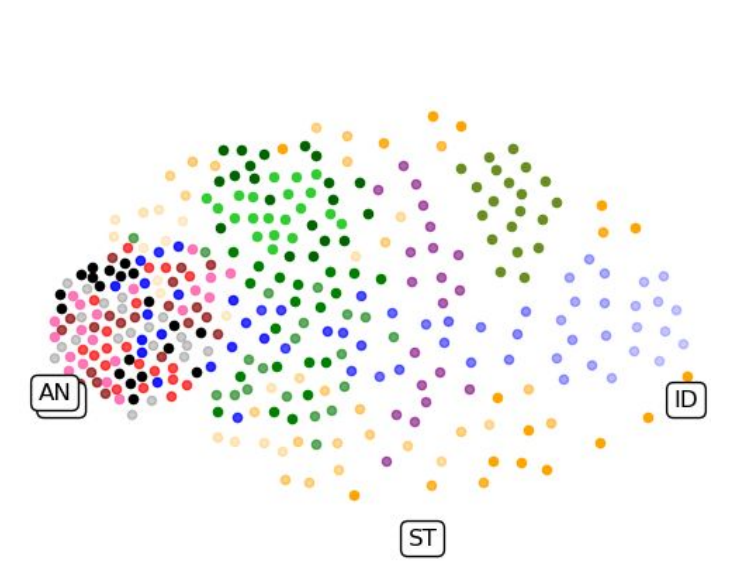
Example



$$d_{\text{pair}}(E, F) = 4$$

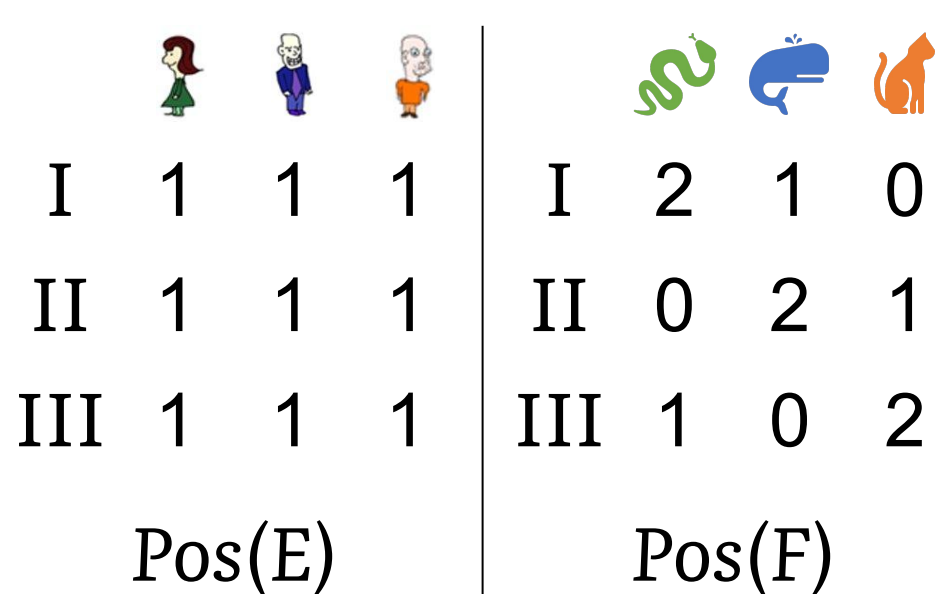
NP-hard

Map



ℓ_1 -POSITIONWISE

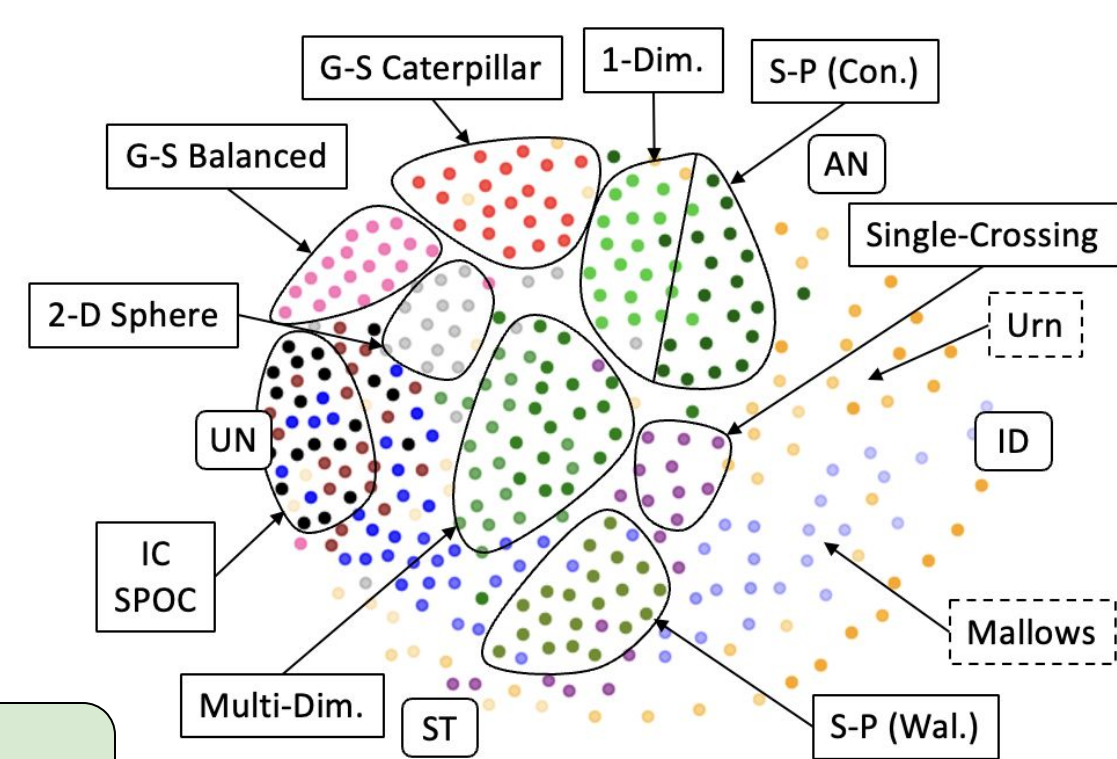
Example



$$d_{\text{pos}}^{\ell_1}(E, F) = 6$$

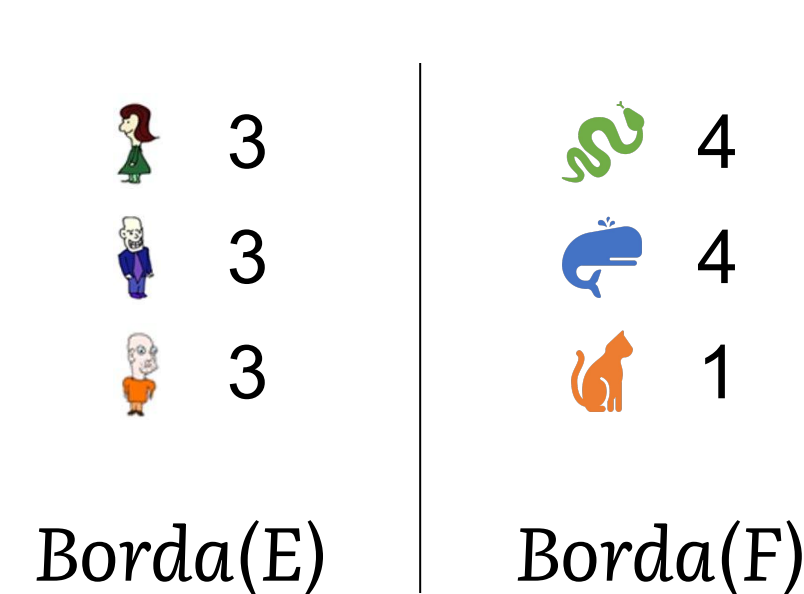
in P

Map



EMD-BORDAWISE

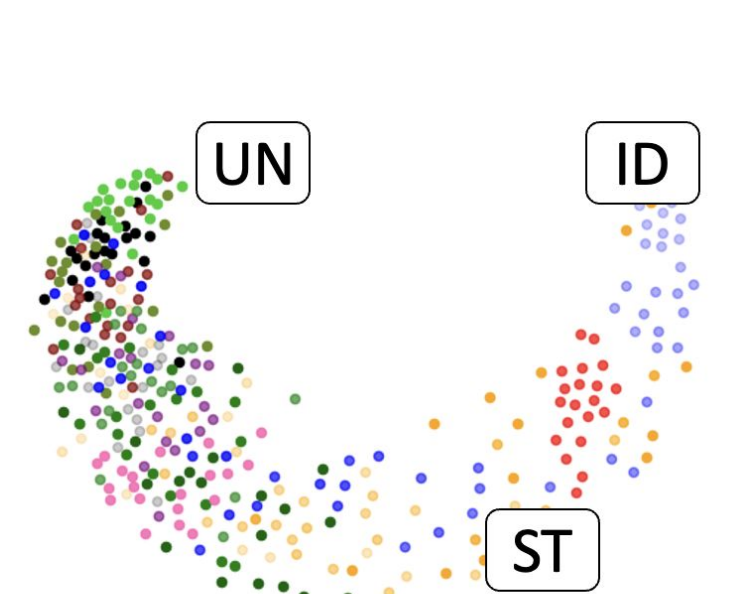
Example



$$d_{\text{Borda}}(E, F) = 3$$

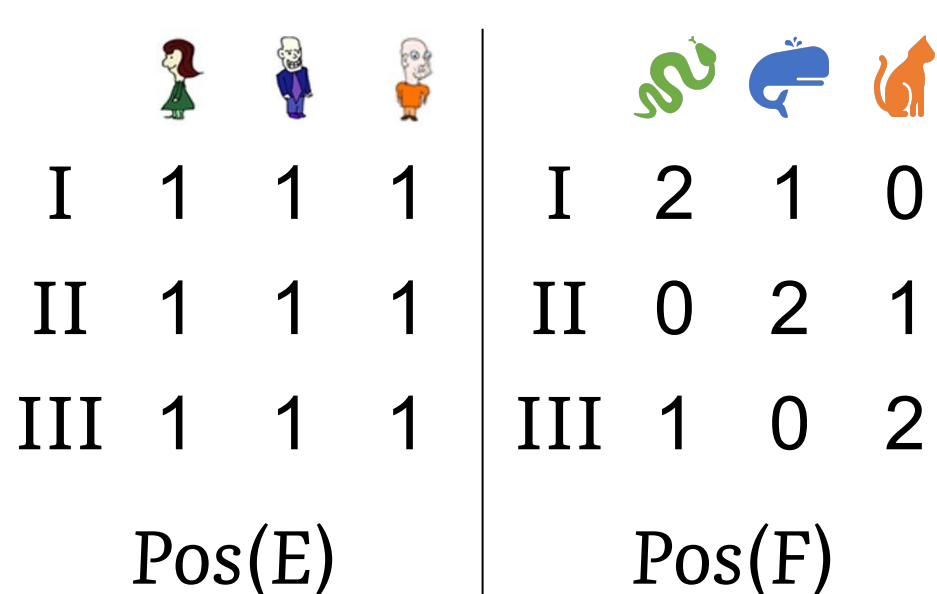
in P

Map



EMD-POSITIONWISE

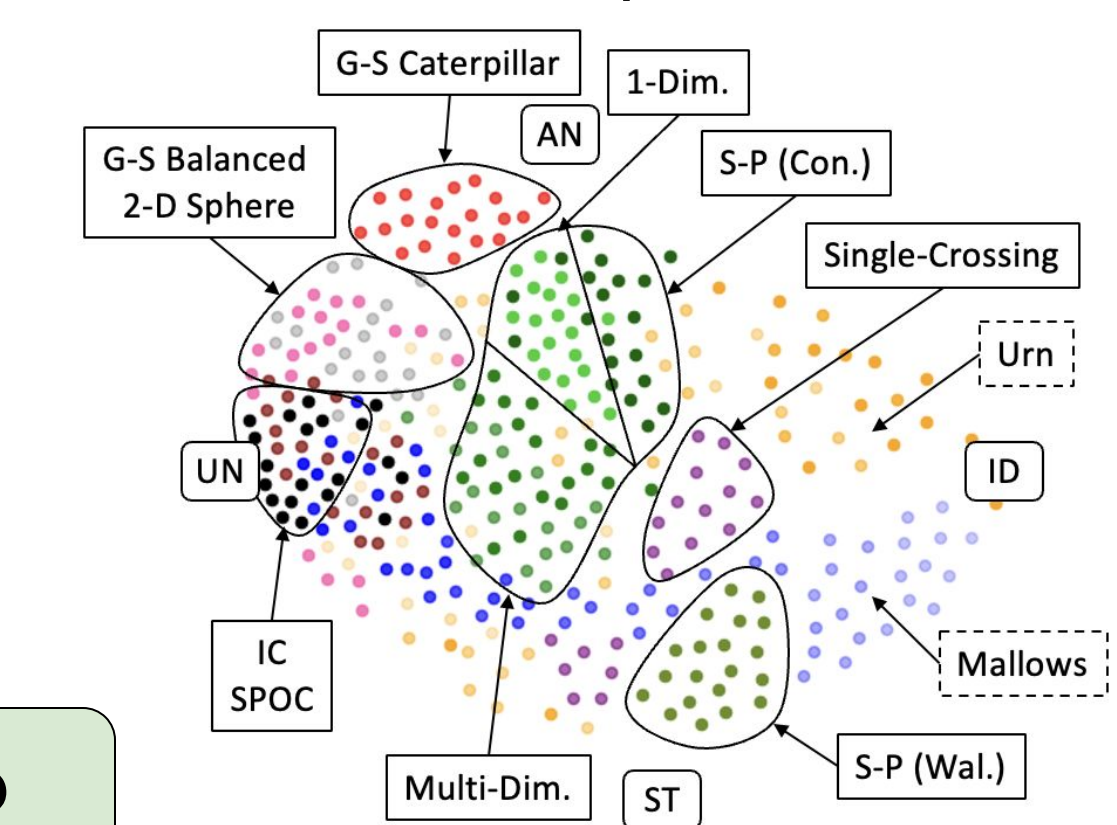
Example



$$d_{\text{pos}}^{\text{emd}}(E, F) = 4$$

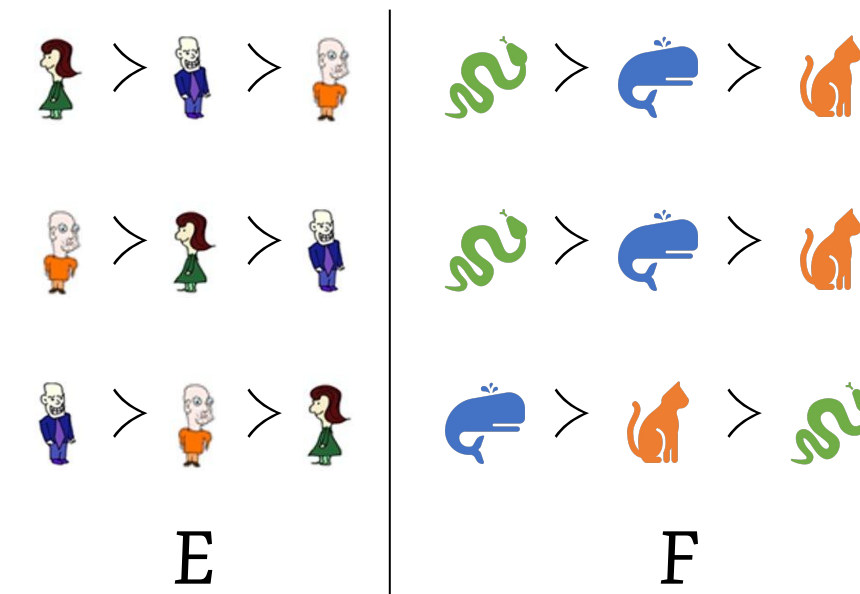
in P

Map



DISCRETE

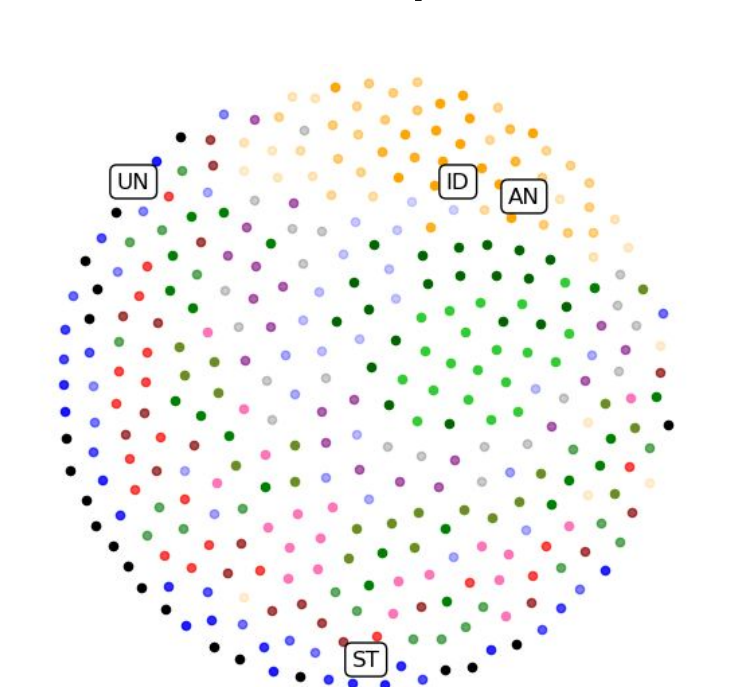
Example



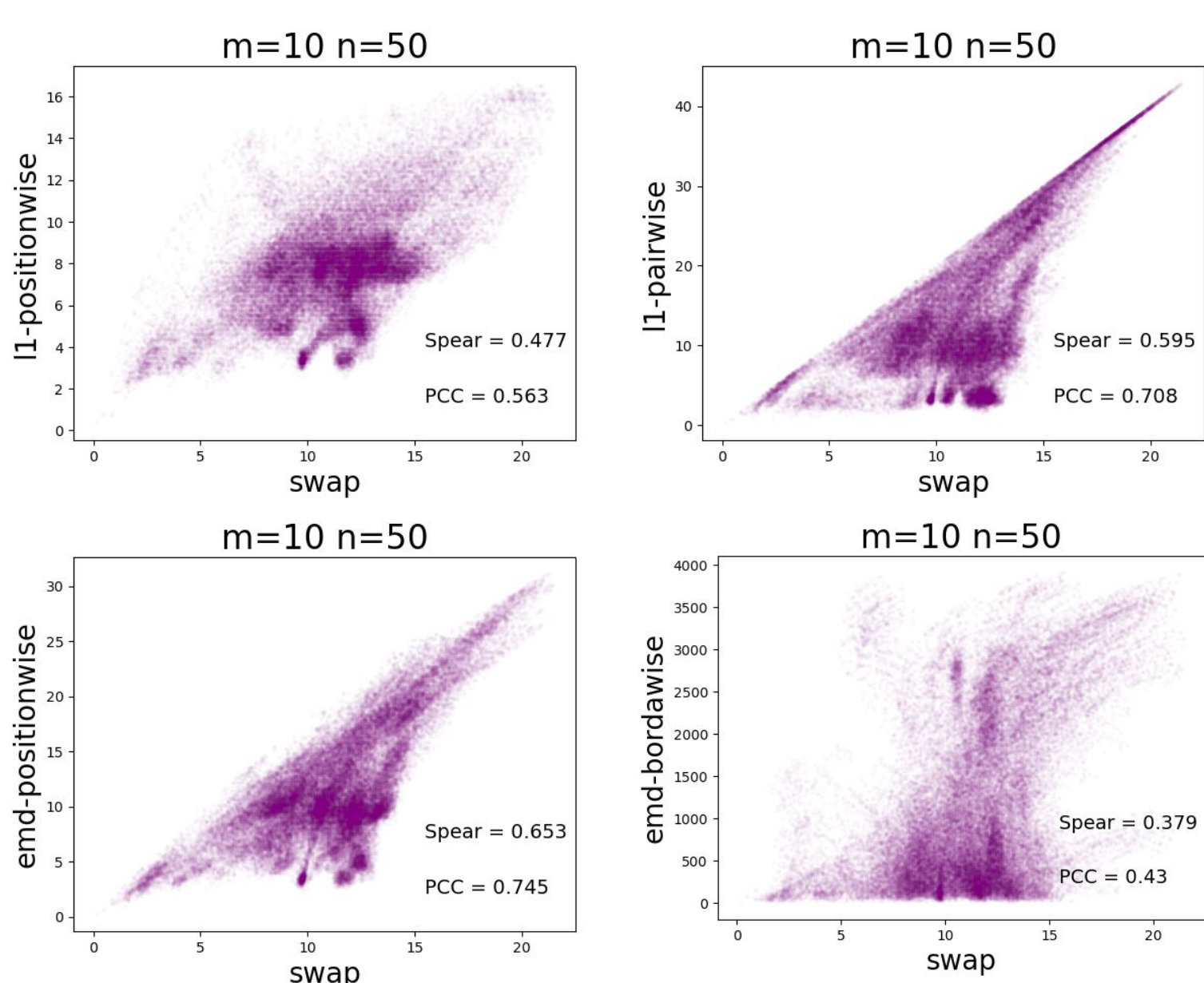
$$d_{\text{disc}}(E, F) = 1$$

in P

Map



Correlation



Read the paper:



Number of Equivalence Classes

$ C \times V $	ANECs	Positionwise	Pairwise	Bordawise
3×3	10	10	8	8
3×4	24	23	17	13
3×5	42	40	25	18
4×3	111	93	50	37
4×4	762	465	200	76
4×5	4095	1746	513	131

Conclusion

EMD-POSITIONWISE strikes the best balance between its computational complexity and expressiveness.