

# Other applications of Hodge decomp.

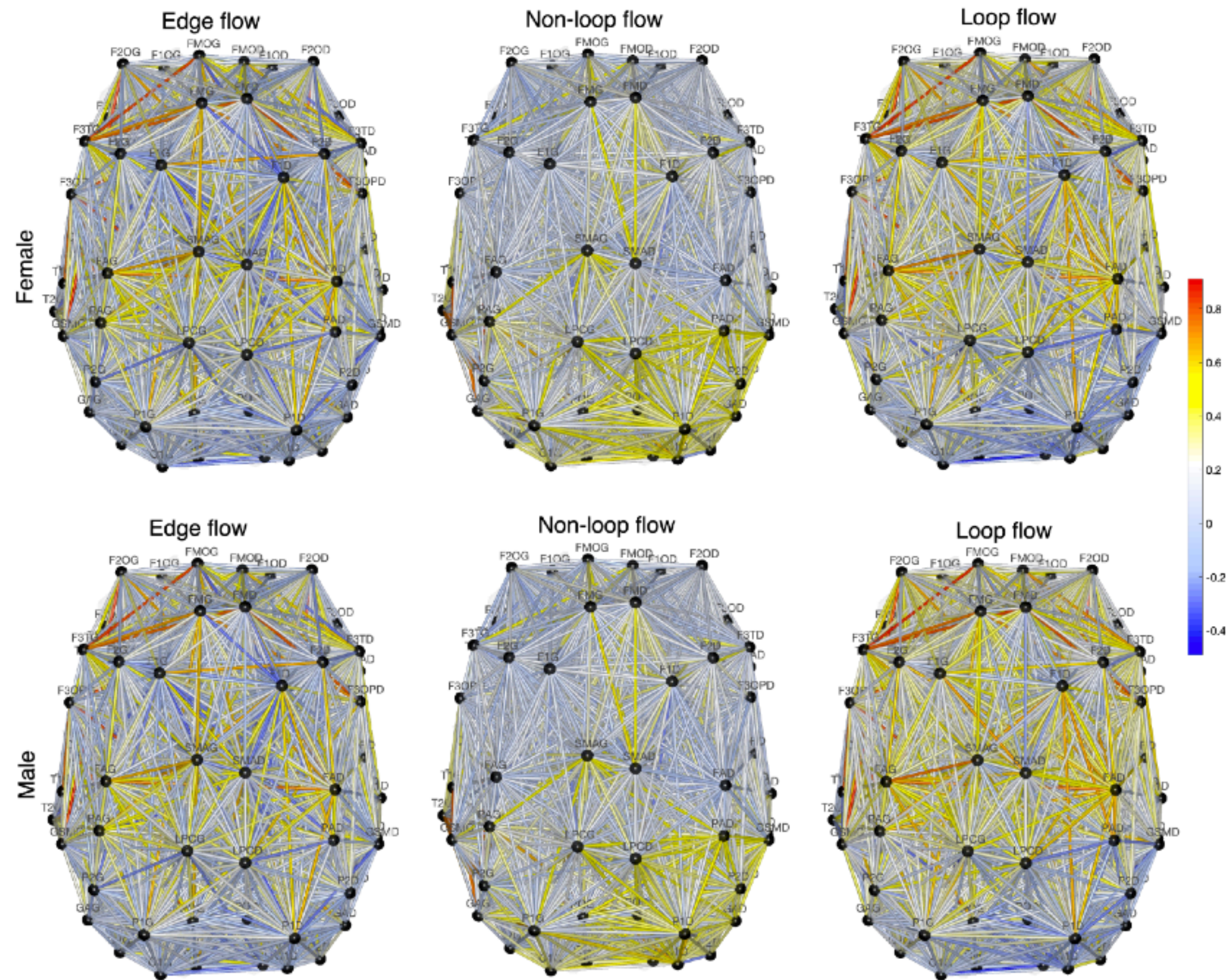
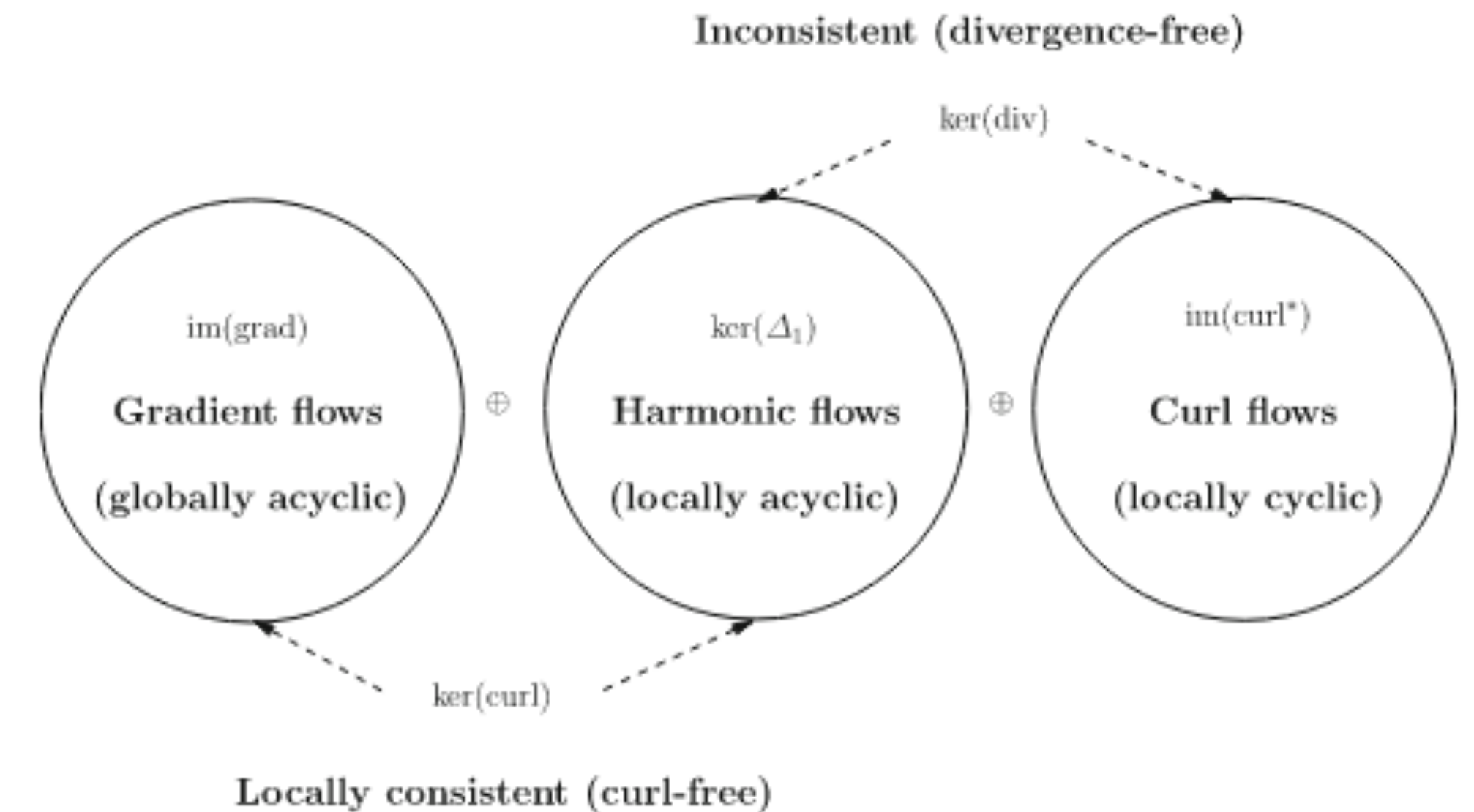


Fig. 14: Top: The average connectivity (edge flow), non-loop flow (middle) and the loop flow (right) of the female (top) and male networks (bottom).

- Brain networks (Anand et al. 2022)

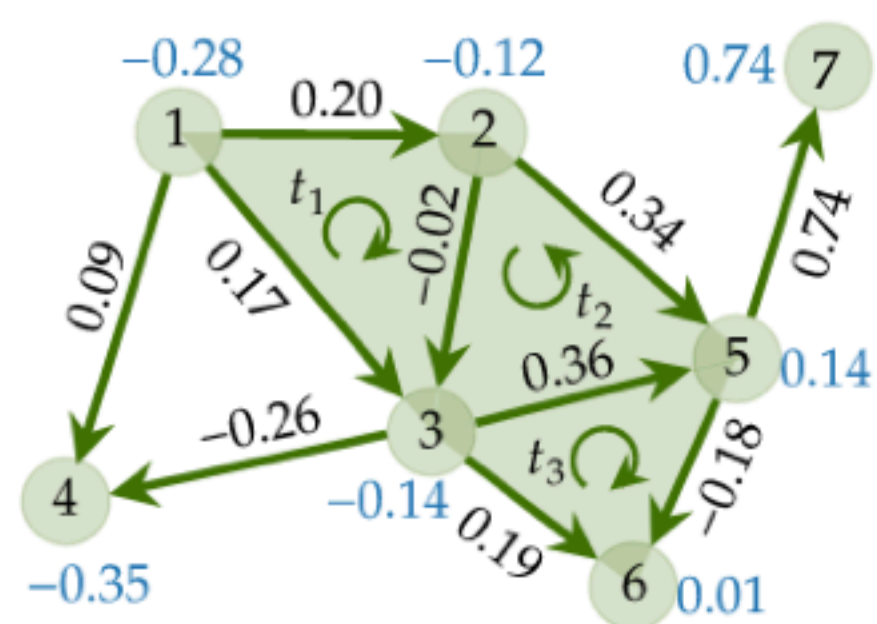


**Fig. 2** Hodge/Helmholtz decomposition of pairwise rankings

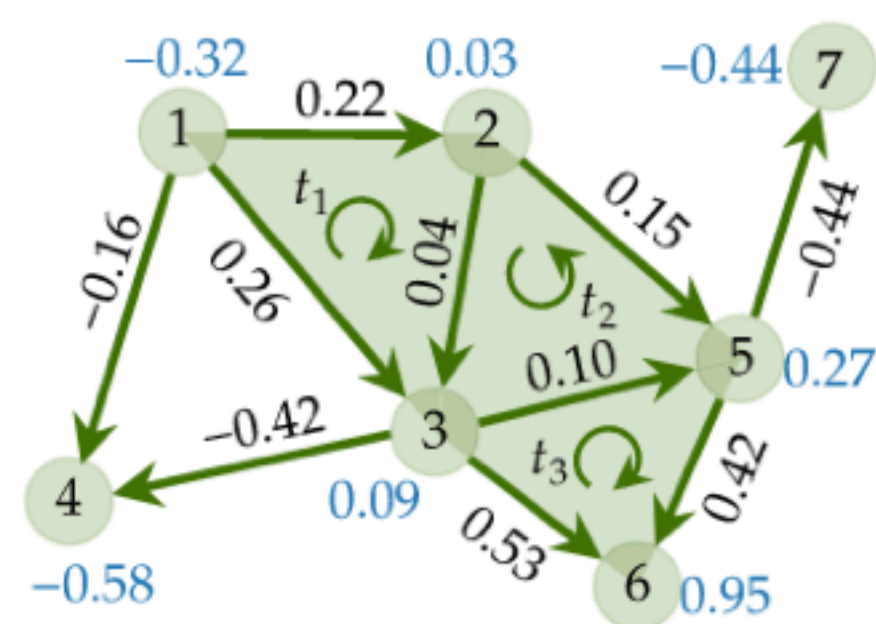
- Ranking problems (Jiang et al. 2011)
- Condorcet paradox: cyclic



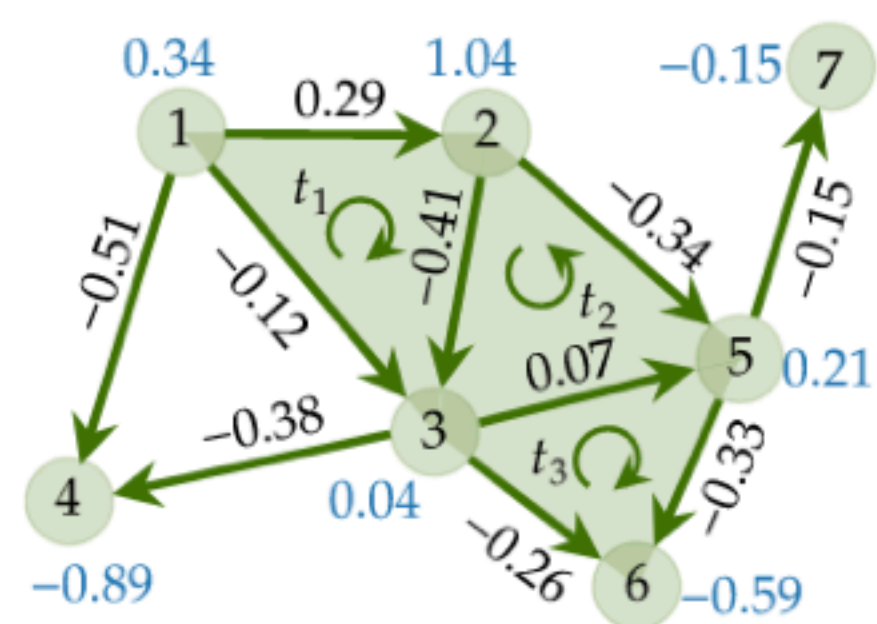
# Full Eigenbasis of example SC



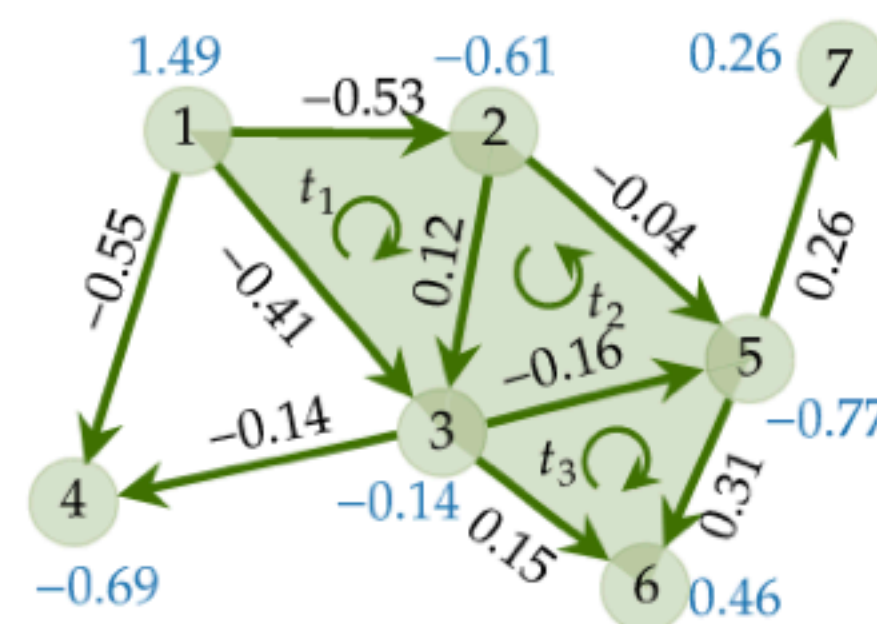
(a)  $\mathbf{u}_{G,1}, \lambda_{G,1} = 0.80$



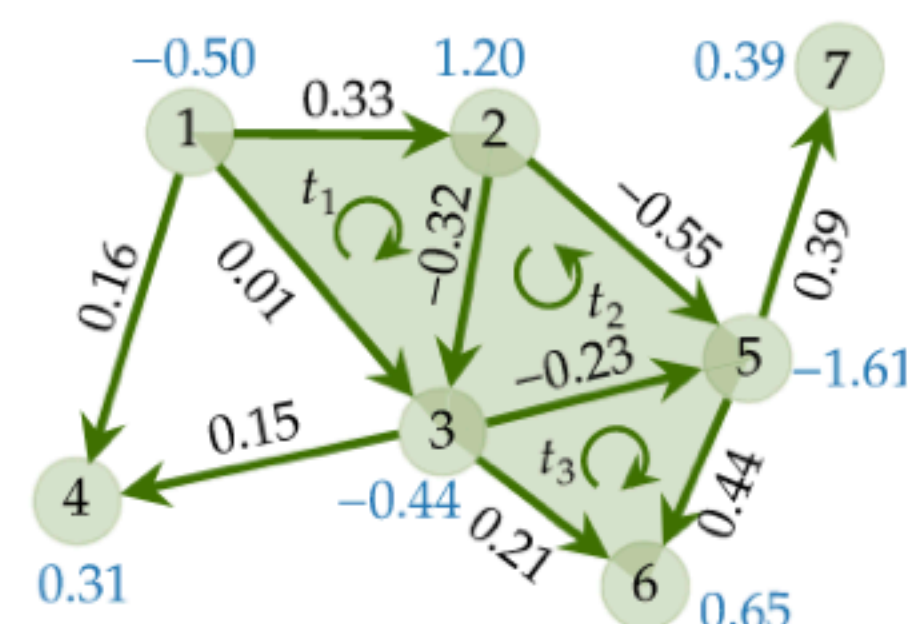
(b)  $\mathbf{u}_{G,2}, \lambda_{G,2} = 1.61$



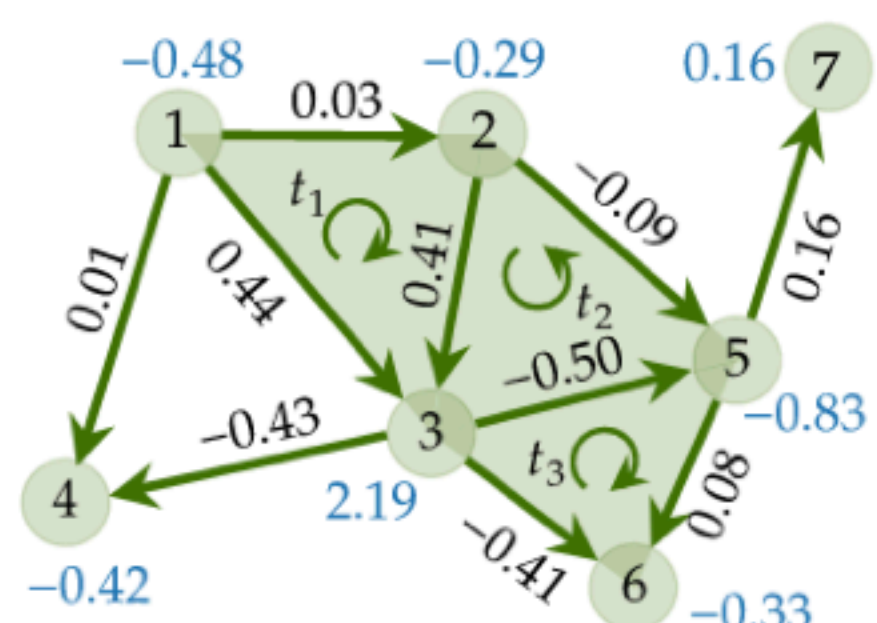
(c)  $\mathbf{u}_{G,3}, \lambda_{G,3} = 2.43$



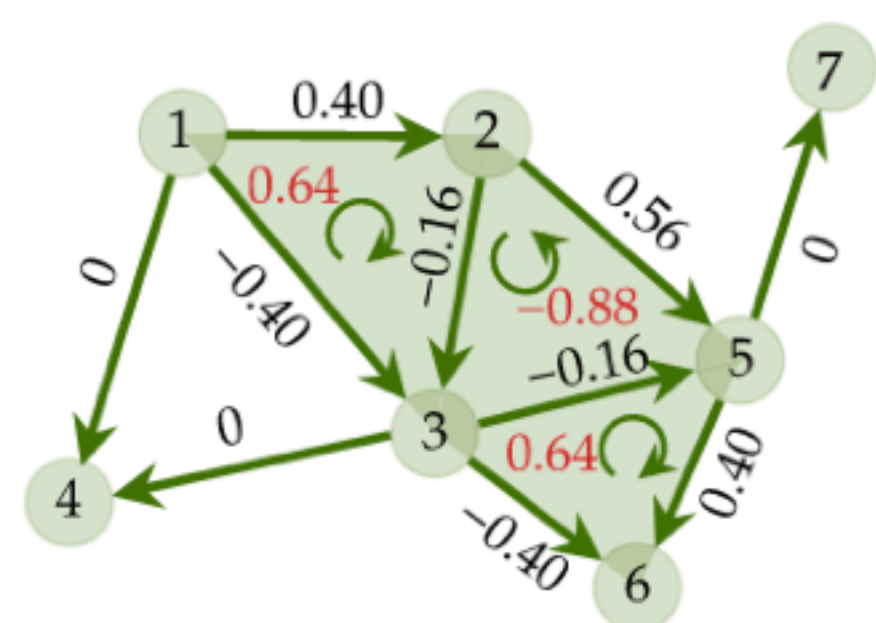
(d)  $\mathbf{u}_{G,4}, \lambda_{G,4} = 3.96$



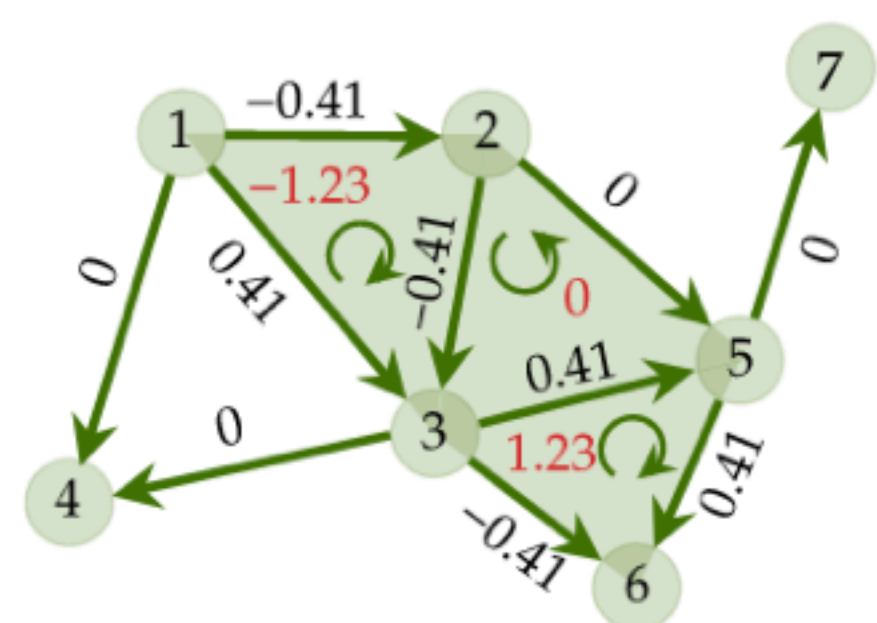
(e)  $\mathbf{u}_{G,5}, \lambda_{G,5} = 5.12$



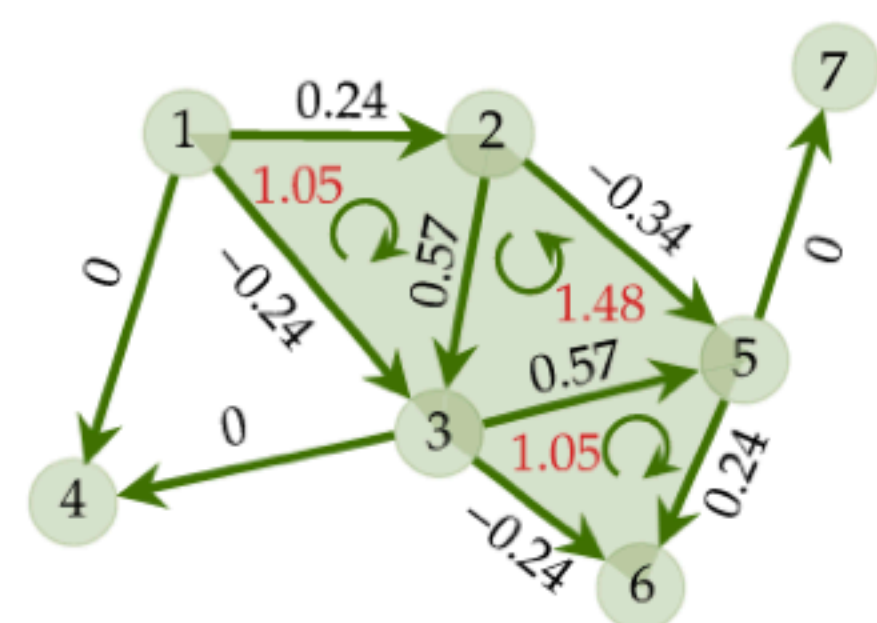
(f)  $\mathbf{u}_{G,6}, \lambda_{G,6} = 6.08$



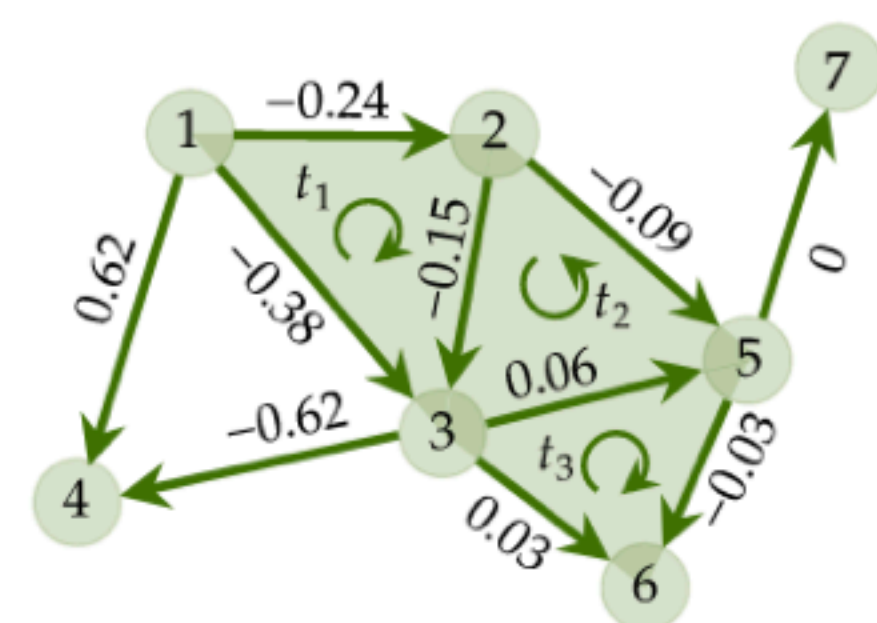
(g)  $\mathbf{u}_{C,1}, \lambda_{C,1} = 1.59$



(h)  $\mathbf{u}_{C,2}, \lambda_{C,2} = 3.00$



(i)  $\mathbf{u}_{C,3}, \lambda_{C,3} = 4.41$



(j)  $\mathbf{u}_H, \lambda_H = 0$