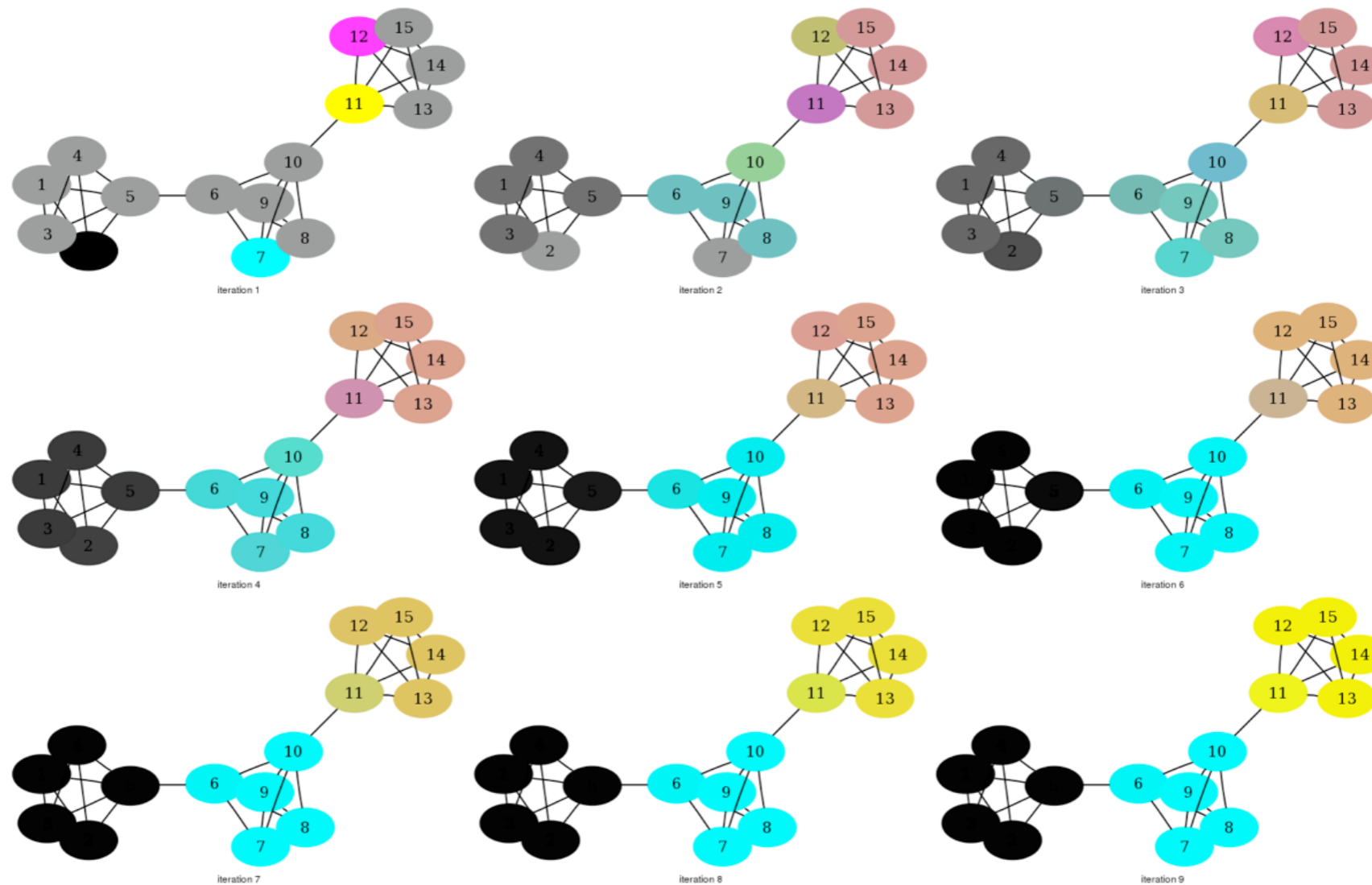
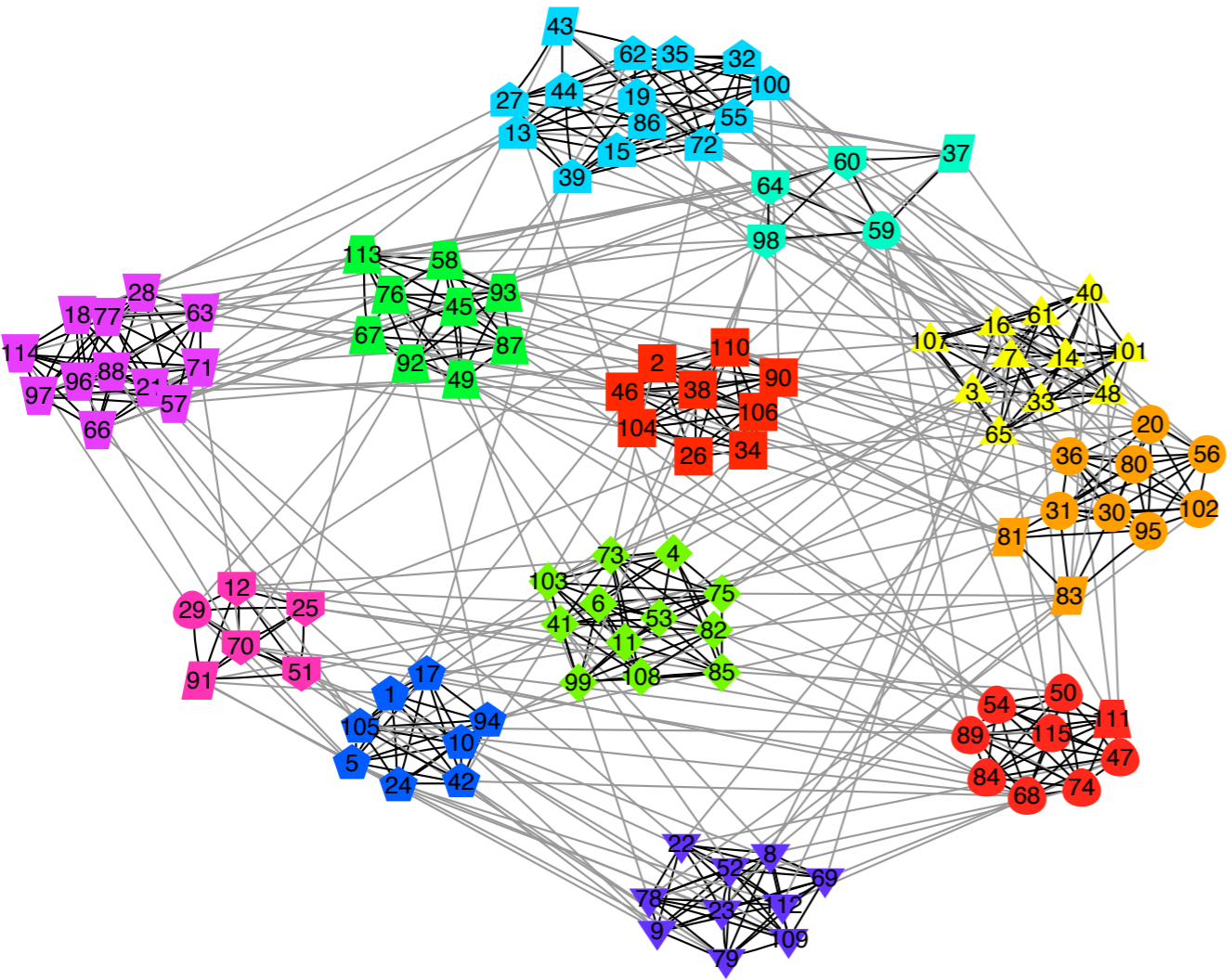


A Bayesian approach to network modularity

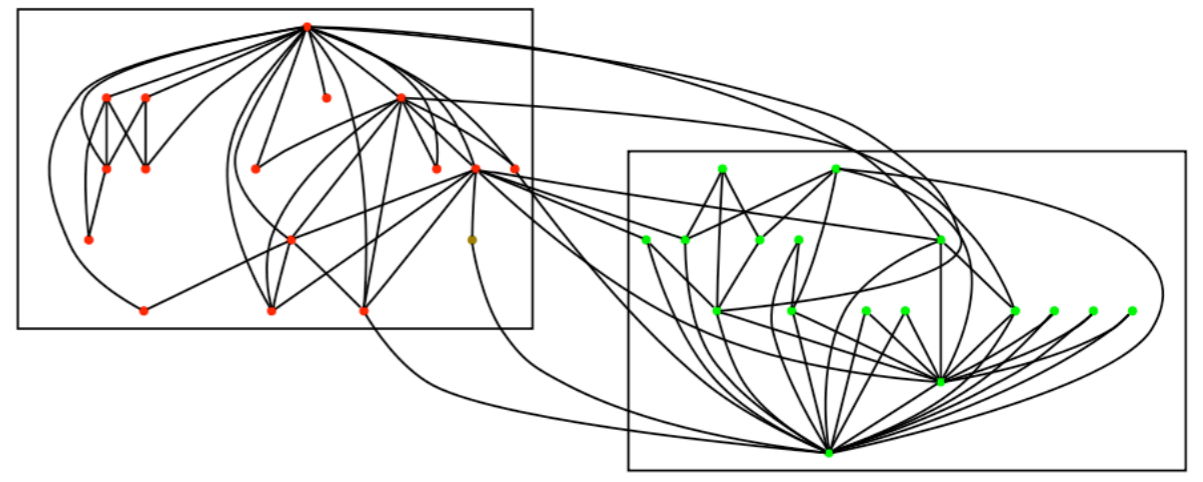
- Generative model: die rolling for module assignments, coin-flipping for edges
- Inference: variational Bayes for approximations to posteriors + complexity control



- Stochastic Block Model (Holland & Leinhardt 1975, Wasserman); Network inference (Reichardt, Hastings, Newman, Miele, Xing, Aukia); Variational Bayes (MacKay 1995, Jordan, Ghahramani, Beal)



2000 NCAA football schedule (Newman)
 nodes: teams, edges: games played
 shapes: conferences, colors: inferred modules



Karate network (Zachary)
 nodes: people, edges: alliance
 boxes: faction, colors: inferred modules

	$K_{\text{True}}/K_{\text{VB}}$					$K_{\text{True}}/K_{\text{ICL}}$				
	2	3	4	5	6	2	3	4	5	6
3	0	99	1	0	0	3	0	100	0	0
4	0	0	90	10	0	4	4	71	0	0
5	0	1	5	91	3	5	26	55	17	2

Comparison of VB to ICL (Miele) for synthetic N=60 node networks and $K_{\text{True}}=3,4,5$ modules