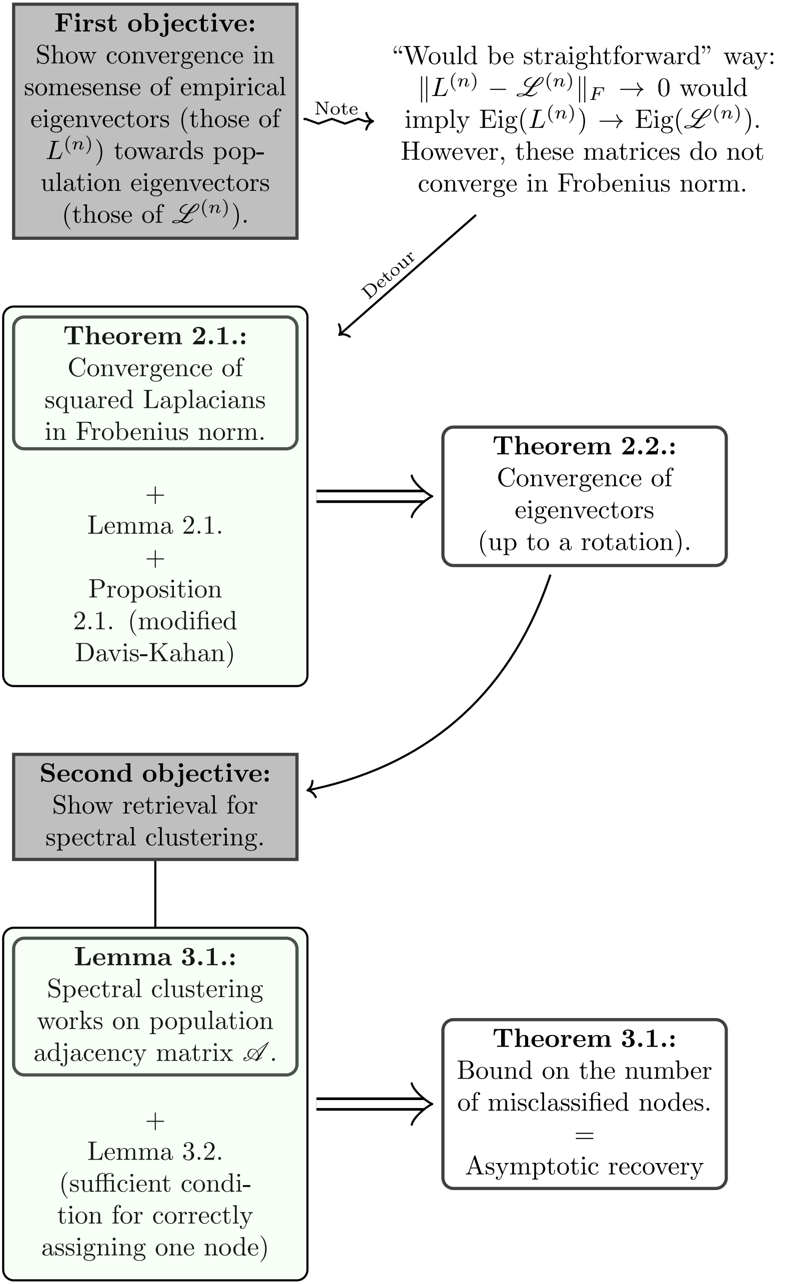
First objective: Show convergence in somesense of empirical eigenvectors (those of $L^{(n)}$) towards population eigenvectors (those of $\mathscr{L}^{(n)}$).
Note
"Would be straightforward" way: $\|L^{(n)} - \mathscr{L}^{(n)}\|_F \to 0$ would imply $\mathrm{Eig}(L^{(n)}) \to \mathrm{Eig}(\mathscr{L}^{(n)})$. However, these matrices do not converge in Frobenius norm.
Detour
Theorem 2.1.: Convergence of squared Laplacians in Frobenius norm.
+
Lemma 2.1.
+
Proposition 2.1. (modified Davis-Kahan)
Theorem 2.2.: Convergence of eigenvectors (up to a rotation).
Second objective: Show retrieval for spectral clustering.
Lemma 3.1.: Spectral clustering works on population adjacency matrix $\mathscr{A}$.
+
Lemma 3.2. (sufficient condition for correctly assigning one node)
Theorem 3.1.: Bound on the number of misclassified nodes.
=
Asymptotic recovery