REU 2013 Research Ideas

July 5, 2013

1. General Non-linear recovery. Recover non-circular planar graphs that we can recover with linear conductances. ex. $G(4,2)$. Jim

2. Annular Networks (Networks on general surfaces). Jim, Ian, David
   - Reconstruct using $\Lambda$ and $\Lambda'(z)|_{z=1}$
   - Medial graphs (cut-point lemma, propagation of information)
   - non-circular planar networks (nonlinear networks?)

3. Relations between discrete electrical networks and continuous networks, for instance, limiting through lattices. Jim, Justin

4. Radon transform Justin
   - Improve SciPy version and add more general transforms and weights
   - Classify different “scans” as invertible or partially invertible, c.f. Beylkin (on website).

5. Permutation Statistics. Elliot

6. SAGE (see William Stein’s website) Justin, William

7. Drawing the medial graph from the response matrix. Jim, Ian, John

8. Algebraic Number Theory Hao, Simon


10. Other PDEs Justin, Ian
    - Random walks
    - Heat Equation
    - Wave Equation
    - transport equation
    - Schrodinger networks

11. Spectral graph theory (what do the eigenvalues of $K$ or $\Lambda$ mean?) Justin, Jerry, David

12. Find “broken” resistors, sources and sinks. Jim

13. Partial recovery (recovering edges on a non-recoverable network). Peter, Jim John

14. $N - 1$ graphs. Jim, Courtney

15. Parametrizing the response matrix. Jim, John

16. Infinite Networks. Ian

17. Elliot’s stuff. ???

18. Pseudo-knots. ???