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 Λ 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**
9. Numerical recovery algorithms, non-layer stripping algorithm. **Jim, Jerry**
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 Λ 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. **???**