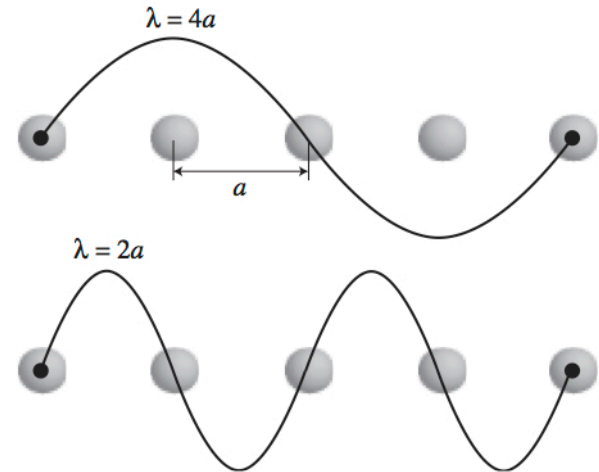# A random walk with Julia

Sam Huberman

PhD Mech. Eng.
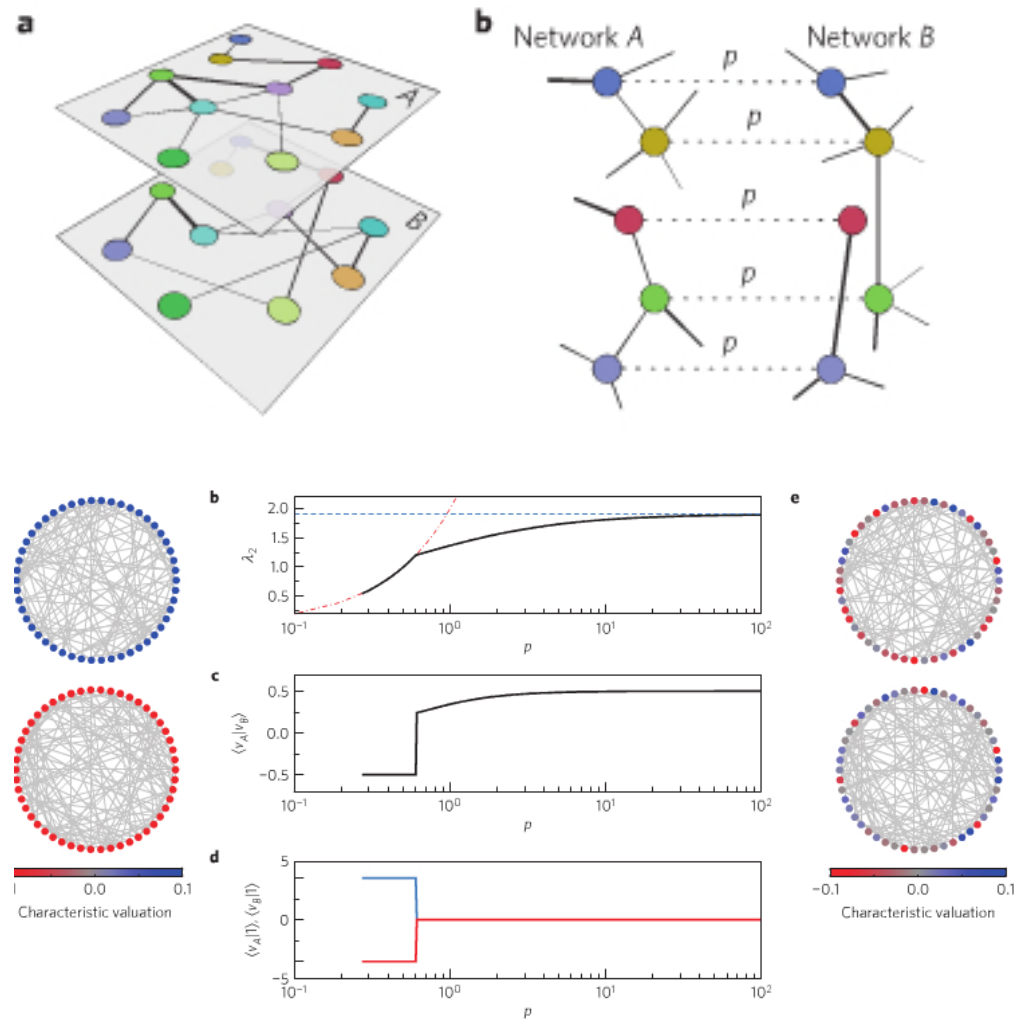
# Part 1: Disorder in solids

- Phonons…

- Perturbative approach is standard, but is it valid?

- Is there a metric that establishes the validity of this approach?
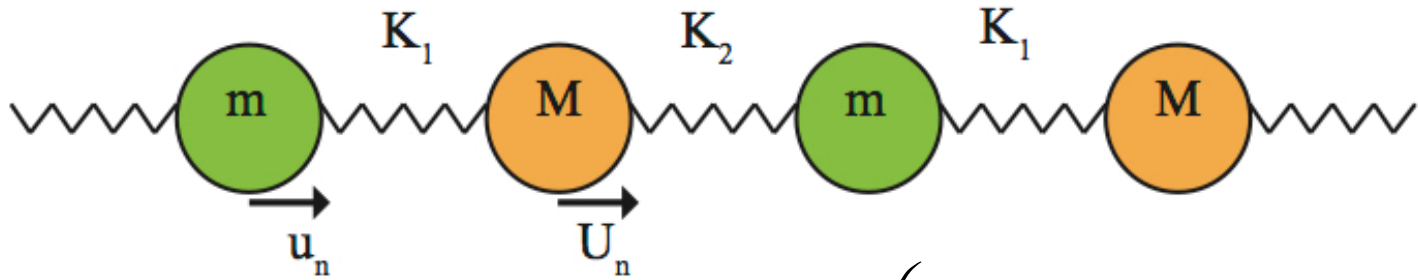
$\lambda = 4a$

$a$

$\lambda = 2a$

# Network approach

- Radicchi and Arenas looked at interconnected graphs

- Found an abrupt transition in the Fiedler eigenvalue.
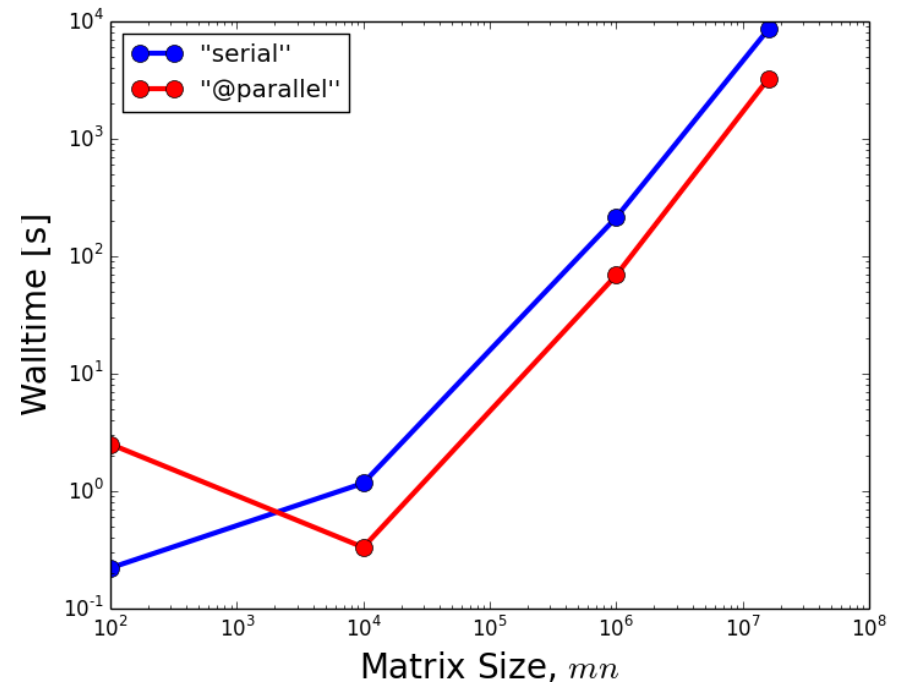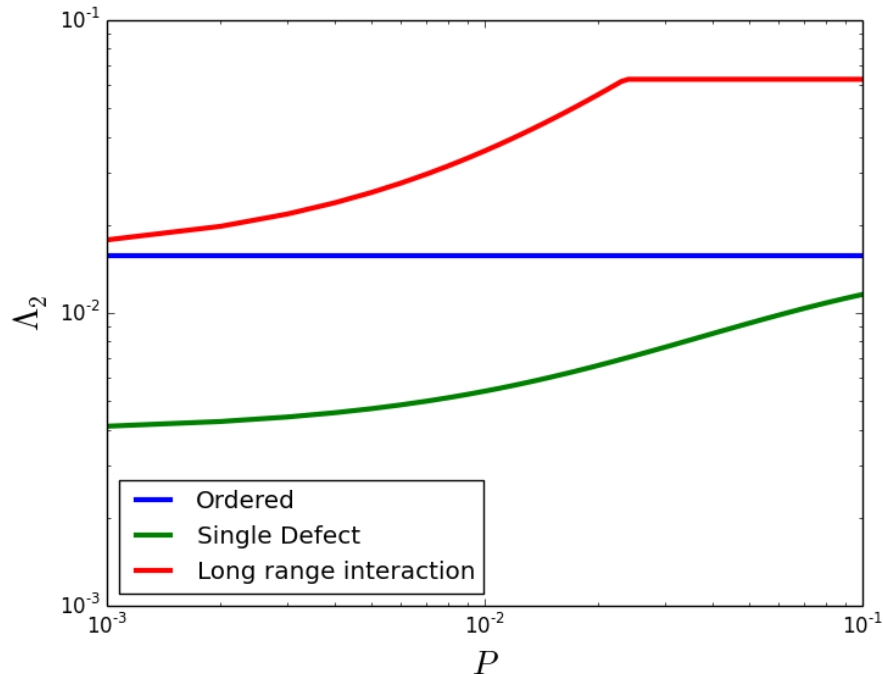
# 1D case



- Find Fiedler eigenvalues of $\begin{pmatrix} L_1 + pI & -pI \\ -pI & L_2 + pI \end{pmatrix}$

- Extend to real materials (more work to be done…)

# In terms of parallelism

- Parameter p is independent, allows for trivial parallelism

# Part 2: How far are you from a Nobel paper?

- Look at a citation network (American Physical Society)
- 500000 vertices
- 4.5 million edges
- Attempted to set up a parallelized BFS, but Graphs.jl was much faster (seconds versus minutes to hours)

# Hcat vs println

```
@parallel (hcat) for i=1:10; i; end
1x10 Array{Int64,2}:
 1  2  3  4  5  6  7  8  9  10
```

**But**

```
@parallel for i=1:10; println(i); end
      From worker 7:    1
      From worker 7:    2
      From worker 9:    4
      From worker 8:    3
      From worker 10:   5
      From worker 3:    7
      From worker 2:    6
      From worker 6:    10
      From worker 4:    8
      From worker 5:    9
```

**Why does hcat order the elements in array?**

# Along the way

- Debugged HTTP.jl package, but used HttpServer.jl

- Tested the Sublime-Ijulia package with Jacob Quinn

- Currently helping debug the homebrew.jl package with Eliot Saba

- Tried SharedArray functionality by Amit Murthy

# To sum up

- Looked at disorder in toy models
  - Need to recast the problem, look at real systems
- Looked at citation networks
  - Graphs.jl is a solid package