List of possible papers to read

80s

lec2 : (Physicssy papers : Hure-Henley, Krug-Spohn)

These are sort of "intuitive" and probably good to read to see how physicists make guesses.

Kingman 1968 (Subadditive ergodic theorem)

This is a challenging, fun and technical paper. Only worth reading if you enjoy analysis.

Lec3

v Berg - Kesten (strict inequality for time constant)

This is a lovely paper, and it talks about the types of weights you see on geodesics. It has two IMPORTANT arguments. The Peierl argument and a "resampling" argument. IS CHALLENGING.

Cox-Kesten (continuity of time constant) 1981. Also in Kesten's aspects.

I haven't read it. $F_n \Rightarrow F \Rightarrow \mu_{F_n} \to \mu_F$.

Burton-Keane (The ∞ cluster whenever it exists is unique. Density and uniqueness in percolation) Again very short paper, and was an idea called "finite energy" that has been very influential

Kesten (Aspects, $F(0) < p_c \Rightarrow \mu(e_1) > 0$)

Lovely short argument, uses the "vBK" inequality. Only need Prop 5.2.

Kesten ($p_c = \frac{1}{2}$ in Bernoulli bond percolation)

Challenging and fun. Uses duality of bond percolation. Great abstract. I haven't read it. Someone "explained" it to me, and I have long since forgotten.

lec 4a

1) Eden 1961 we will need in class. But there are a couple of combinatorial bounds that are quite interesting.

2) Turing 1952. This is a lovely 1D model. But he did not extend this to 2D sheets.

3) Wierman and Reh 1978. On conjectures in first passage percolation theory. Ann. Prob. This shows that $\frac{T(0, L_n)}{n} \to \mu = \lim \frac{T(0, ne_1)}{n}$

where L_n is the vertical line through ne_1

Simulation: Fix a box of size $[-N,N]^2$.

and pick maybe iid unif $[1,2]$ weights. Repeat these

weights by repeating the box $[-N,N]^2$ several times.

Then find $\frac{T(0,nx)}{n}$ for large n and many

different values of x. This should give you the

limit shape for periodic weights. Is it a polygon?

This is a stepping stone for a research project.

You can build on my python code at github.com

(username arjunkc) if you like.

Lec 5

Cox-Durrett's limit shape theorem. There are two missing ingredients:

1) The lemma that says that $\exists K$ st

$$P\left(\sup_x \frac{T(0,x)}{|x|_1} < K\right) > 0$$

if $\mathbb{E}[\min_i \tau_i^d] < \infty$.

I think its on pg 17 of their paper.

2) Why is $\mathbb{E}[\min_i \tau_i^d] < \infty$ an only if condition in their paper?

Lec 5

(1995 annals)
Haagstrom and Meester: Build a stationary ergodic system that can produce any convex symmetric limit shape

Kesten (Aspects, 1986, Corollary 8.4): If F has density f

$f(x) = a\left(1 + o\,\frac{1}{|\log x|}\right)$ as $x \downarrow 0$ and finite mean, $a > 0$

Then

$$C_1 \frac{\log d}{ad} \le \mu(F, d, e_1) \le 11 \frac{\log d}{ad}$$

But let $\mu^*(F, d) = \mu\left(F, d, \underbrace{\frac{(e_1, e_1, \dots, e_1)}{\sqrt{d}}}_{\text{diagonal}}\right)$

and its much faster here.

$$\frac{1}{6ea} \le \underline{\lim} \sqrt{d}\, \mu^* \le \overline{\lim} \sqrt{d}\, \mu^* \le \frac{1}{2a}$$

So the shape cannot be a ball.

D. Dhar (Exponential FPP in high dimensions) (1988, Phys Rev. Letters)

Auffinger-Tang (More FPP in higher dimensions) lec 7 and 8

1981

Durrett and Liggett (Flat spots theorem)

We covered everything in Durrett and Liggett except for a couple of bounds due to Harris, and the limit shape theorem for the branching random walk.

Marchand (2002, strict inequalities): Several improvements to Durrett and Liggett. Also $\mu(\beta e_1) < 1$ where β is defined in the notes.

Damron-Auffinger (2012, Differentiability): Showed that at the edge of the percolation cone, the shape is differentiable.

Durretts: Annals of probability paper on Directed Percolation. 1984. This is a long and detailed paper. Very well written and gives a broad overview of the subject.

lec 07: Durrett's 1980 paper on the contact process. (On the 1D Contact Process)

Harris 1978 set valued Markov Process (AoP)

Lemma 6.1 of Durrett 1980. Helps show

$$\mathbb{E}\left[r_n^{B \cup \{0\}} - r_n^{B}\right] \geq 1$$

Lec 9

Cramer's theorem: Any book on large deviation theory.

Dembo / Zeitouni, Klenke (Prob Theory), Ellis (Entropy large deviations and statistical mechanics)

Newman - Piza (1995) Annals of Prob. lovely, classic paper. Lots of information about fluctuation shape, etc.

Lec 10, 11, 12

Many inequalities in this lecture.

1) S. Chatterjee, "Superconcentration and other topics"

2) Kahn-Kalai-Lineal. Boolean Influence Inequalities. To understand some of the "CS" aspects of these inequalities.

3) Talagrand 1994. Russo's approximate 0-1 law. On the logarithmic improvement to Efron-Stein.

4) Prove the Gaussian-Poincare inequality. Is a 10 min, entertaining proof. You can find this in many places, including Chatterjee's book.

5) M. Ledoux. "Concentration of Meas." Another book to find some of these topics. You can probably find a proof of 4) here.

There are lots of lovely papers in this area.

The wax of the BRW is kind of amazing too.

lec 13 (separated occurrence inequalities)

1) The original BK paper 80s: 1985 Inequalities with application to reliability and percolation

2) Chayes-Chayes and Landall. 1999. Reimer's proof of the BK inequality

lec14 (Kesten's Lemma)

1) 1980 (On the time constant and path length of FPP)

Has a proof of $E[W] < \infty$

2) Grimmett Percolation Theorem 5.75. Proves that the expected size of the percolation cluster $< \infty$ for $p < p_c$

3) The text book also suggests Duminil-Copin and Tassion for this.