Principles of Complex Systems, CSYS/MATH 300
University of Vermont, Spring 2013
Assignment 10 • code name: The End

Dispersed: Thursday, April 18, 2013.
Due: By start of lecture, 11:30 am, Thursday, April 25, 2013.
Some useful reminders:
Instructor: Peter Dodds
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Office hours: 1:00 pm to 4:00 pm, Wednesday
Course website: http://www.uvm.edu/~pdodds/teaching/courses/2013-01UVM-300

All parts are worth 3 points unless marked otherwise. Please show all your working clearly and list the names of others with whom you collaborated.

Graduate students are requested to use LaTeX (or related TeX variant).

1. Yes, even more on power law size distributions. It's good for you.

   For the probability distribution $P(x) = cx^{-\gamma}$, $0 < a \le x \le b$, compute the mean absolute displacement (MAD), which is given by $\langle |X - \langle X \rangle| \rangle$ where $\langle \cdot \rangle$ represents expected value. As always, simplify your expression as much as possible.

   MAD is a more reasonable estimate for the width of a distribution, but we like variance σ^2 because the calculations are much prettier. Really.

2. In the limit of $b \to \infty$, show that MAD asymptotically behave as:

$$\langle |X - \langle X \rangle| \rangle = \frac{2(\gamma - 2)^{(\gamma-3)}}{(\gamma - 1)^{(\gamma-2)}} a.$$

   How does this compare with the behavior of the variance? (See the last question of Assignment 1.)

3. *"Any good idea can be stated in fifty words or less."—Stanisław Ulam.*[1]

   Save the Cat! Logline

   Read through Anderson's seminal paper "More is different" [1] and generate three descriptions of complexification with exactly the following lengths:

   (a) Three words,

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[1] At the very least, Ulam's claim is self-consistent.

(b) Six words,

(c) and Twelve words.

Things have sped up since Ulam made his claim. All three may contain one or more sentences.

References

[1] P. W. Anderson. More is different. Science, 177(4047):393–396, 1972.