**MASSACHUSETTS INSTITUTE OF TECHNOLOGY**

6.268 Spring 2018

Lecture 8: Power Laws and Preferential Attachment 3/6/2018

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The lecture will discuss some classic results, as well as some lively contemporary debates. Reading the primary sources is optional but encouraged.

### Mathematics of Power Laws

1. Newman []

The following is a list of readings on topics covered in Lecture 9. There are no textbook-style readings for some of these topics, and some (but not all) of the readings below can be terse. As long as you know what is covered in lectures, these readings can be viewed as optional. On the other hand, you are encouraged to do some extra reading to get a better perspective of the subject.

### Homophily models

1. For those mathematically inclined, threshold function for the existence of a complete matchings in random bipartite graphs is treated in Section VII.3 of [**?**].

2. Variants of the Chung-Lu model that include homophily effects are considered in [**?**], available here, and more recently in [**?**] (available here) and [**?**] (available here). In particular, you will find a definition and some properties of multi-type random networks (in Section 2.1 of [**?**]), which are generalizations of both the Erdös-Rényi and Chung-Lu models.

### Random geometric graphs

1. Random geometric graphs are studied very thoroughly in [**?**], but this is not easy reading. The connectivity threshold result is hidden in Chapter 13. As was the case for the Erdös-Rényi model, the threshold for disappearance of isolated points is the same as for connectivity (see Theorem 13.17 in [**?**]).

2. For those interested, results on the longest edge of the minimum spanning tree through random points on the unit square can be found in [**?**].

3. General techniques for analyzing the asymptotic behavior of classical combinatorial optimization problems (such as the TSP and MST) in various metric spaces are surveyed in [**?**].

[DGL+12]

## References

[DGL+12] Richard Durrett, James P. Gleeson, Alun L. Lloyd, Peter J. Mucha, Feng Shi, David Sivakoff, Joshua E. S. Socolar, and Chris Varghese. Graph fission in an evolving voter model. *Proceedings of the National Academy of Sciences of the United States of America*, 109(10):3682–7, 2012.