A Statistician Worries About Random Network Modeling

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Where I'm Coming From

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And as a statistician, many aspects of the current state of random network models worry me.

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Let’s look at some issues with these points in mind.

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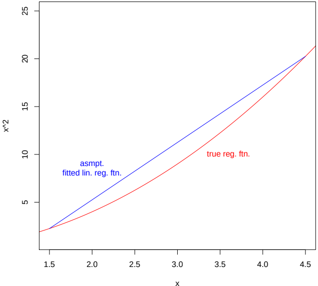

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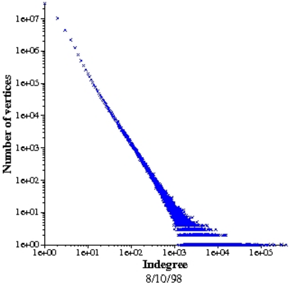

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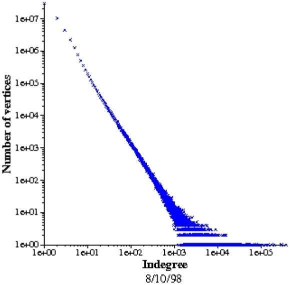

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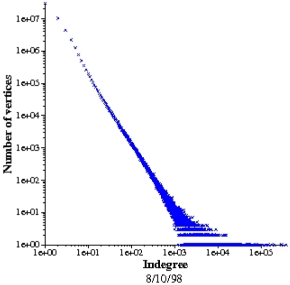

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- Model problems in tail raises concern about both Prediction and Understanding.
- Seemingly small change in assumptions can greatly change qualitative behavior [D'Souza *et al*, 2009].

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- Informal graphical assessment (residuals, nonparametric estimation) is simple and easily interpretable.
- Cross-validation (splitting data into training, assessment sets) is easy.

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Random networks:

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- N often huge, so tests are meaningless anyway.
- Graph subsets often behave differently from the full set [Stumpf *et al*, 2005], so cross-validation doesn't work.

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  - The bootstrap, “the statistician’s Swiss army knife,” inoperable (subgraph, nonindependence problems).
- Bias issues [Achlioptas, 2005] more common here than in classical statistics.

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- Model fragility, GOF assessment issues are troubling.
- Potential for misunderstanding, and thus misuse, is signficant.