Appendix C

Errata (November, 2023)

With regret, I have to mention the following errors:

- p. 54: "...an exponential random variable with rate $\sum_{k=0}^{m}\alpha_k$" should be "...with rate $\sum_{k=1}^{m}\alpha_k$".
- p. 60: "...the Internet has an exponent around $\alpha = 2.4$" should be "...the Internet has an exponent around $\alpha = 1.4$".
- p. 140: "why λ is called the rate ... or the number of events per time unit" should be "why λ is called the rate ... or the average number of events per time unit".
- p. 143: the second "equality" should be an "inequality", thus

$$\sum_{j=2}^{n} P_{n-j}(t)\Pr[N(h)=j] \leq \sum_{j=2}^{n}\Pr[N(h)=j] \leq \Pr[N(h)>1] = o(h)$$

- p. 155: (vi) (c): "If there was one VoiP in the meantime" should be "If there was one VoiP packet in the meantime".
- p. 190: below (9.27): "the rectangular matrix R describes the transitions from the closed states to the transient states, while there are no transitions from the transient to the closed states" should be "the rectangular matrix R describes the transitions from the transient states to the closed states, while there are no transitions from the closed to the transient states".
- p. 201: exercise (ii) implicitly assumed an infinite N. For a finite N, it must hold that $P_{N,N} = 1 - \frac{1}{N}$ in order to obey the fundamental property $Pu = u$. In that case, the solution on p. 605 must contain a self-loop for state N with transition probability $1-\frac{1}{N}$. In addition, the steady state of node N then equals $\pi_N = N\frac{N-2}{N-1}\pi_{N-1}$ that only tends to 1 if $N \to \infty$. In that limit, there are two absorbing states, one at zero and one at $N \to \infty$.
- p. 202: exercise (ix): "... started in state j" should be "... started in state i".
- p. 209 : formula (10.19) should be $P(t) = u\pi + \sum_{k=2}^{N} e^{-|\mathrm{Re}\,\lambda_k|t + i\,\mathrm{Im}\,\lambda_k t} x_k y_k^T$.
- p. 216: last equation in display "$q_{ii} = 1-\beta T_{ii}(\beta)$" should be "$q_{ii} = \beta-\beta T_{ii}(\beta)$".
- p. 217: second last equation in display "$t_k(\beta)q_k = \sum_{k=1;k\neq j}^{N} t_k(\beta)q_{kj}$" should

be "$t_j(\beta)q_j = \sum_{k=1;k\neq j}^{N} t_k(\beta)q_{kj}$" and the line below "$t_k(\beta) = \pi_k$" is better replaced by "$t_j(\beta) = \pi_j$".

- p. 225, line 6: "p_2, or a link failure ..." should be "p_1, or a link failure ...".
- p. 354, xiii): In the figure, p and q need to be reversed: $p = 1/2$ and $q = 1/3$.
- p. 370: line 11: "Nodes with low closeness have short hopcounts ..." should be "Nodes with high closeness have ...".
- p. 372: the definition of $\widetilde{C}_G$ should be: six times the number $\blacktriangle_G$ of triangles divided by the number of connected triples,

$$\widetilde{C}_G = \frac{6\blacktriangle_G}{N_2 - W_2} = \frac{W_3}{d^T d - 2L} = \frac{\text{trace}\left(A^3\right)}{\sum_{j=1}^{N} d_j(d_j-1)}$$

where $N_k = u^T A^k u$ is the total number of walks with length k and $W_k = \text{trace}\left(A^k\right)$ is the number of closed walks with length k. Moreover, $W_3 = 6\blacktriangle_G$ and the number of connected triples equals the total number $N_2 = d^T d$ of walks of length 2 minus the number $W_2 = \text{trace}\left(A^2\right) = 2L$ of walks of length 2 between two nodes. The factor of 6 accounts for the fact that each triangle contributes to three connected triples of nodes, but six closed walks (three clockwise and three counterclockwise). For the complete graph K_N with $\text{trace}\left(A^3\right) = (N-2)(N-1)N$ and $\sum_{j=1}^{N} d_j(d_j-1) = N(N-1)(N-2)$, we find, indeed, that the clustering coefficient $\widetilde{C}_G = 1$.

- p. 417: line 3 from bottom: "Gummel" should be "Gumbel".
- p. 440 (xi): there is a misprint in $E[h]$: it should be $E[h] = \frac{1}{m}\sum_{i=1}^{m} h_i$.
- p. 449: equation (17.7) should be (in particular, third line sum)

$$q_{ij} = \begin{cases} \delta & \text{if } \begin{cases} j = i - 2^{m-1}; m = 1,2...N \\ \text{and } x_m(i) = 1 \end{cases} \\ \varepsilon + \beta\sum_{k=1}^{N} a_{mk}x_k(i) & \text{if } \begin{cases} j = i + 2^{m-1}; m = 1,2...N \\ \text{and } x_m(i) = 0 \end{cases} \\ -\sum_{k=0;k\neq j}^{2^N-1} q_{jk} & \text{if } i = j \\ 0 & \text{otherwise} \end{cases}$$

- p. 451: line -8: "(a) if the node i is infected (X_i), then $\frac{dE[X_i]}{dt}$ decreases ..." should be "then $E[X_i(t)]$ decreases over time t with rate equal to the curing rate δ".
- p. 457: The integral of after eq. (17.23) should have the opposite sign. Hence, (17.24) should be

$$W(t) \leq e^{(\tau A - (1+\varepsilon^*)I)t^*} W(0) - \varepsilon^* \frac{I - e^{(\tau A-(1+\varepsilon^*)I)t^*}}{\tau A - (1+\varepsilon^*)I}\, u$$

and on p. 458, the tendency towards "$\varepsilon^*\left\{(\tau A - (1+\varepsilon^*)I)^{-1}u\right\}_i$, ..." should be "$\varepsilon^*\left\{-(\tau A - (1+\varepsilon^*)I)^{-1}u\right\}_i$, which is positive for $\varepsilon^* > 0$".

- p. 458: "decreases exponentially fast" should be "decreases exponentially fast for sufficiently large time". This is a rather important observation, because in the star graph the prevalence can initially still increase with time, even if the effective infection rate τ is below the epidemic threshold (see Van Mieghem, P., 2016, "Approximate formula and bounds for the time-varying SIS prevalence in networks", Physical Review E, Vol. 93, No. 5, p. 052312.)
- p. 458: Theorem 17.3.2 is wrong. The reason is that in the proof the argument "In any graph G, the conditional probability

  $$\varepsilon_G = \lim_{y_\infty \downarrow 0} \max_{(k,l)\in\mathcal{L}} \Pr\left[X_k = 1 | X_l = 1\right]$$

  can be upper bounded by $\varepsilon_G \leq \varepsilon_{K_N}$, because the infection probability ε_G on a link (k, l) in the graph G is largest in the complete graph." is not correct. For more information, I refer to my article "Approximate formula and bounds for the time-varying SIS prevalence in networks", Physical Review E, Vol. 93, No. 5, p. 052312, 2016.
- p. 463 (bottom): the index j should be i: the last equation is written for node i (and for node j).
- p. 465: in the proof: $\sum_{j=1}^{N} a_{ij} h_i\left(k-1\right)$ should be replaced by $\sum_{j=1}^{N} a_{ij} h_j\left(k-1\right)$ and, in the final line of the proof, "partial fraction" must be replaced by "continued fraction".
- p. 594: B.5 (i): the first formula in display, $\Pr\left[D_{\max} \leq x\right] = \left(\left(\frac{x}{\tau}\right)^{-\alpha}\right)^N$, should be $\Pr\left[D_{\max} \leq x\right] = \left(1 - \left(\frac{x}{\tau}\right)^{-\alpha}\right)^N$.
- p. 621, solution of problem (iv): "Solving this equation ... yields $\rho = \frac{P_B + \sqrt{2P_B - P_B^2}}{1-P_B}$" should be "Solving this equation ... yields $r = \frac{P_B + \sqrt{2P_B - P_B^2}}{1-P_B}$"
- p. 623: In Fig. B.9, the first three states 1,2,3 should be 0,1,2. The last state m is correct.
- p. 626, solution of problem xvi (a). Arrival rate $\lambda = \frac{90\times 7}{60\times 8} = 1.3125$ calls/minute, or, change the number of employees in the company from 90 to 120.
- p. 627, solution of problem xvi (c). The value of 5! should be 120, not 150.
- p. 656 in (xi): The size of the URT is $m + 1$, the root A and the m nearest neighbors, that are different from the root A. The correct average hopcount (from (16.17)) should be

  $$E[h] = E[H_{N=m+1}] = \frac{m+1}{m} \sum_{l=2}^{m+1} \frac{1}{l}$$

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