List of symbols

Only when explicitly mentioned, we deviate from the standard notation and symbols outlined here.

Random variables and matrices are written with capital letters, while complex, real, integer, etc. variables in small. For example, X refers to a random variable, A to a matrix, whereas x is a real number and z is complex number. Operations on random variables are denoted by [.], whereas (.) for real or complex variable. A set of elements is embraced by {.}.

$\Pr[A]$: probability of the event A
$E[X] = \mu$: expectation of the random variable X
$\mathrm{Var}[X] = \sigma_X^2$: variance of the random variable X
$f_X(x) = \frac{dF_X(x)}{dx}$: probability density function of X
$F_X(x)$: probability distribution function of X
$\varphi_X(z)$: probability generating function of X;
$\varphi_X(z) = E\left[z^X\right]$ when X is a discrete r.v.
$\varphi_X(z) = E\left[e^{-zX}\right]$ when X is a continuous r.v.
$\{X_k\}_{1 \le k \le m} = \{X_1, X_2, \ldots, X_m\}$
$X_{(k)}$: k-th order statistics, k-th smallest value in the set $\{X_k\}_{1 \le k \le m}$
$\gamma = 0.57721\ldots$: Euler's constant
Ω: sample space
ω: sample point
P: transition probability matrix (Markov process)

Queuing Theory

t_n: arrival time of the n-th packet
r_n: departure time of the n-th packet
$\tau_n = t_n - t_{n-1}$: n-th interarrival time

x_n: service time of n-th packet
w_n: waiting time of the n-th packet
$T_n = x_n + w_n$: system time of n-th packet
$v\,(t)$: virtual waiting time or unfinished work at time t
$\lambda = (E\,[\tau])^{-1}$: average arrival rate
$\mu = (E\,[x])^{-1}$: averal service rate
$\rho = \frac{\lambda}{\mu}$: traffic intensity
$N_A\,(t)$: number of arrivals at time t
$N_S\,(t)$: number of packets in the system (queue plus server) at time t
$N_Q\,(t)$: number of packets in the queue at time t

Graph Theory

$\mathcal{L}$: set of links in a graph
$\mathcal{N}$: set of nodes in a graph
$L = |\mathcal{L}|$: number of links in a graph
$N = |\mathcal{N}|$: number of nodes in a graph
K_N: the complete graph with N nodes
d_j: degree of node j
D : degree in a graph (random variable)
$\kappa\,(G)$: vertex (node) connectivity of graph G
$\lambda\,(G)$: edge (link) connectivity of graph G
H: hopcount in a graph (random variable)
A : adjacency matrix of graph G
B : incidence matrix of graph G
$Q = BB^T$: Laplacian matrix of graph G
$\Delta = \mathrm{diag}(d_1, d_2, \ldots, d_N)$: diagonal matrix of the nodal degrees
$\{\lambda_k\}_{1 \le k \le N}$: set of eigenvalues of A ordered as $\lambda_1 \ge \lambda_2 \ge \cdots \ge \lambda_N$
$\{\mu_k\}_{1 \le k \le N}$: set of eigenvalues of Q ordered as $\mu_1 \ge \mu_2 \ge \cdots \ge \mu_N$
$\mu_Q = \mu_{N-1}$: second smallest eigenvalue of Q.