Clarifications, typos & corrections for Durstewitz, D. (2017), Advanced Data Analysis in Neuroscience, Springer

Last updated: 05/20/2018

Here is a list of clarifying notes and issues that surfaced after publication of the first edition:

Chapter 1

- Sect.1.1, Example 1.2: The interaction term "$\alpha\beta_{jk}$" is a separate term here and not meant to be the same as just the product $\alpha_j \times \beta_k$ (although it can be expressed as a product between a regression weight and properly specified 'design variables', see sect. 2.1).
- Sect. 1.3.2, below eq. 1.19: Of course we can also easily solve for the ML estimator of σ^2 by setting $\partial l_{\{\boldsymbol{y}|\boldsymbol{x}\}}(\boldsymbol{\theta})/\partial\sigma^2 = 0$ (after solving for β_0, β_1).
- Sect. 1.5.2, above eq. 1.27 (CLT): The mean has to be finite, i.e. $|\mu| := |E(X_i)| < \infty$ (in absolute value).

Chapter 7

- In eq. 7.4 (p. 123), strictly, one may want to take $T - \Delta t$ as the series length (but note that this is an asymptotic expression anyway).
- In eq. 7.11 (p. 132), one would usually fix $b_0 = 1$ to avoid redundancy with parameter σ^2.
- In eq. 7.16 (p. 134), the offset a_0 was ignored (i.e., $a_0 = 0$).
- In eq. 7.20 (p. 134), the variance σ^2 in the denominator denotes the variance of x_t which is *not* the same as the variance of the noise process ε_t in eq. 7.12 (rather, for the AR(1) process, $\sigma_x^2 = \sigma_\varepsilon^2/(1-a_1^2)$).
- The *augmented* matrix $\mathbf{X}_p$ in eq. 7.23 (p. 136) has dimensions $(T-p)\times(p+1)$, which might have been unclear from the lines directly above.
- Paragraph below eq. 7.27 on p. 138; the first sentence here is misleading: The stated condition $\left|\sum_{i=1}^{p} a_i\right| < 1$ (see also eq. 7.25 and below) assures convergence of the geometric series in eq. 7.25 and thus a finite mean, but it is by itself *not* a sufficient condition for establishing stationarity of an AR(p) process with p>1 more generally! To determine whether an AR(p) process is stationary, all eigenvalues of the transition matrix of the equivalent VAR(1) representation (as indicated in eq. 7.27) have to be considered, i.e. condition eq. 7.28 has to be satisfied.
- Eq. 7.90 (p. 171): Because this update rule performs a perfect integration and hence does not converge to a useful quantity like $E[r|s,a]$ (as eq. 7.94 would with $\gamma = 0$), it is actually never used like this. It should also be r_t instead of r_{t+1} on the right-hand side.

Chapter 8

- In eq. 8.6 (p. 189), as in eq. 7.11, one would usually fix $b_0 = 1$ to avoid redundancy with parameter σ^2.

Chapter 9

- In eq. 9.13 (p. 209), it should be $I\{\varepsilon_t^{(k)} \neq 0\}$ with index k, not i.
- Note that for linearization of eq. 9.41 (p. 240) only the linearization of $\phi(\boldsymbol{x}_t)$ in eq. 9.44 is needed (since the other terms in eq. 9.41 are already linear).