Errata in “Stochastic Thermodynamics: An Introduction”

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Chapter 2. Basics

2.7 Trajectories of master equations

- Page 25, line 8, eq. (2.90). Read:

\[ \prod_{\ell \in \text{dwell}} p_{x_{\ell} t_{\ell - 1} + dt|x_{\ell} t_{\ell - 1}} = \cdots \]

Correct to:

\[ \prod_{\ell \in \text{dwell}} p_{x_{\ell} t_{\ell - 1} + dt|x_{\ell} t_{\ell - 1}} = \cdots \]

- Page 25, line 6 from bottom, eq. (2.91). Read:

\[
\begin{align*}
\mathcal{P}_x &= e^{- \int_{t_n}^{t_{n+1}} dt' k_{n+1}^{\text{out}}(t') k_{n,x_{n+1}}(t_n) e^{- f_{n-1}^{t_n} dt' k_{n-1}^{\text{out}}(t')} \ldots} \\
&\quad \times e^{- \int_{t_{n-1}}^{t_n} dt' k_{n}^{\text{out}}(t') e^{- f_{n-2}^{t_{n-1}} dt' k_{n-2}^{\text{out}}(t')} \ldots} \\
&\quad \times e^{- \int_{t_0}^{t_{n-1}} dt' k_{0}^{\text{out}}(t') e^{- f_{0}^{t_0} dt' k_{0}^{\text{out}}(t')} p_{x_0}(t_0)}. 
\end{align*}
\]

Correct to:

\[
\begin{align*}
\mathcal{P}_x &= e^{- \int_{t_n}^{t_{n+1}} dt' k_{n+1}^{\text{out}}(t') k_{n,x_{n+1}}(t_n) e^{- f_{n-1}^{t_n} dt' k_{n-1}^{\text{out}}(t')} \ldots} \\
&\quad \times e^{- \int_{t_{n-1}}^{t_n} dt' k_{n}^{\text{out}}(t') e^{- f_{n-2}^{t_{n-1}} dt' k_{n-2}^{\text{out}}(t')} \ldots} \\
&\quad \times e^{- \int_{t_0}^{t_{n-1}} dt' k_{0}^{\text{out}}(t') e^{- f_{0}^{t_0} dt' k_{0}^{\text{out}}(t')} p_{x_0}(t_0)}. 
\end{align*}
\]

2.10 Information

- Page 34, line 3 from bottom, eq. (2.141). Read:

\[ + D_{\text{KL}}(p(S_1|S_2)\| q(S_2||S_1)), \]

Correct to:

\[ + D_{\text{KL}}(p(S_1|S_2)\| q(S_2||S_1)), \]
• Page 34, line last, eq. (2.142). Read:

\[ D_{KL}(p(S_1||S_2)||q(S_2||S_1)) = \]

correct to:

\[ D_{KL}(p(S_1||S_2)||q(S_2||S_1)) = \]

Chapter 3. Stochastic thermodynamics

3.7 Stochastic entropy and entropy production in a manipulated two-level system

• Page 49, caption to fig. 3.3, line 6. Read:
  probability of occupation \( p_1(1) \)

correct to:
  probability of occupation \( p_1(t) \)

3.8 Average entropy production rate

• Page 50, line 3rd from bottom, eq. (3.37). Read:

\[ \frac{ds_{sys}}{dt} = -kB \frac{d\lambda}{dt} \frac{\partial}{\partial \lambda} \ln p_x = \frac{k_B}{p_x} \frac{d\lambda}{dt} \frac{\partial p_x}{\partial \lambda}. \]

correct to:

\[ \frac{ds^x_{sys}}{dt} = -kB \frac{d\lambda}{dt} \frac{\partial}{\partial \lambda} \ln p_x = -kB \frac{d\lambda}{dt} \frac{\partial p_x}{p_x \frac{d\lambda}{dt} \frac{\partial \lambda}}. \]

• Page 50, line last, eq. (3.38). Read:

\[ \langle \frac{ds^x_{sys}}{dt} \rangle = kB \sum_x p_x \frac{ds^x_{sys}}{dt} = kB \frac{d\lambda}{dt} \sum_x \frac{dp_x}{d\lambda} = 0. \]

correct to:

\[ \langle \frac{ds^x_{sys}}{dt} \rangle = \sum_x p_x \frac{ds^x_{sys}}{dt} = -kB \frac{d\lambda}{dt} \sum_x \frac{dp_x}{d\lambda} = 0. \]

3.15 Exercises

• Page 65, line 5 from bottom. Read:
  \( \epsilon \) and different values of the

correct to:
  \( \epsilon_f \) and different values of the
3.13 Continuous systems (*)

- Page 64, line 7. Read:
  rule presented in eq. (2.127), obtaining
correct to:
  rule presented in eq. (2.128), obtaining

Chapter 4. Fluctuation relations

4.1 Irreversibility and entropy production

- Page 68, line 6, eq. (4.2). Read:

\[ P_{x|x_0}(\lambda) = e^{-\int_{t_n}^{t_m} k_{x_1} k_{n-1}(t_m) e^{-\int_{t_n}^{t_{m-1}} k_{n-1}(t)}} \ldots \]

  correct to:

\[ P_{x|x_0}(\lambda) = e^{-\int_{t_n}^{t_m} k_{x_1} k_{n-1}(t_n) e^{-\int_{t_n}^{t_{m-1}} k_{n-1}(t)}} \ldots \]

4.5 Detailed fluctuation relation

- Page 78. Fig. 4.4 should be replaced by the following:
4.9 Adiabatic and nonadiabatic entropy production and the Hatano-Sasa relation

- P. 83, line 7, eq. (4.69). Read:

\[-k_B \sum_{k=0}^{n} \ln \frac{p_{x_k}^{st}(t_{k+1})}{p_{x_k}(t_j)} = \]

correct to:

\[-k_B \sum_{k=0}^{n} \ln \frac{p_{x_k}^{st}(t_{k+1})}{p_{x_k}(t_k)} = \]

Chapter 5. Thermodynamics of Information

5.3 Information in stochastic thermodynamics

- Page 108, line 3 from bottom, eq. (5.8). Read:

\[\ln \frac{p_{x,y}(t_m)}{p_x(t_m)} \]

correct to:

\[\ln \frac{p_{x|y}(t_m)}{p_x(t_m)} \]

5.6 Copying information

- Page 114, line 20. Read:

\[\delta_{\text{stall}} = \epsilon_R + k_B T \ln(1 - \eta_{\text{eq}}). \]

correct to:

\[\delta_{\text{stall}} = \epsilon_r + k_B T \ln(1 - \eta_{\text{eq}}). \]
5.8 Information reservoirs

- Page 123, line 11f. Read:
  which is also the probability that the system is in state \( u \) immediately after an interaction,
  correct to:
  which is also the probability that the state swap takes place,

Chapter 6. Large Deviations: Theory and Practice

6.7 Fluctuation relations in a model of kinesin

- Page 148, 12th line from bottom, eq. (6.84). Read:
  \[
  A_1 = k_B T \ln \frac{k_0^\uparrow k_1^\rightarrow}{k_0^\leftarrow k_1^\uparrow} = -2f d + \Delta \mu;
  \]
  \[
  A_2 = k_B T \ln \frac{k_0^\uparrow k_1^\rightarrow}{k_0^\leftarrow k_1^\uparrow} = -2f d.
  \]
  correct to:
  \[
  A_1 = k_B T \ln \frac{k_0^\uparrow k_1^\rightarrow}{k_0^\leftarrow k_1^\uparrow} = 2f d + \Delta \mu;
  \]
  \[
  A_2 = k_B T \ln \frac{k_0^\uparrow k_1^\rightarrow}{k_0^\leftarrow k_1^\uparrow} = 2f d.
  \]

- Page 149. Caption to fig. 6.4, third line. Read:
  where \( J^{(r)} > 0 \) and \( J^{(n)} < 0 \),
  correct to:
  where \( J^{(r)} > 0 \) and \( J^{(n)} > 0 \),

- Page 149. 5th line of the text. Read:
  \( J^{(r)} < 0 \) and \( J^{(n)} > 0 \).
  correct to:
  \( J^{(r)} < 0 \) and \( J^{(n)} < 0 \).

- Page 149. 7th line from bottom. Read:
  \( \Delta \mu \cdot J^{(n)} < 0 \),
  correct to:
  \( \Delta \mu \cdot J^{(n)} > 0 \),
• Page 149, 4th line from bottom, eq. (6.86). Read:

$$T \dot{S} = A_0 J_0 + A_1 J_1 + A_2 J_2 = -2 f d J^{(r)} + \Delta \mu J^{(n)}.$$  

correct to:

$$T \dot{S} = A_0 J_0 + A_1 J_1 + A_2 J_2 = 2 f d J^{(r)} + \Delta \mu J^{(n)}.$$  

Chapter 8. Developments

8.2 Uncertainty relations

• Page 176, line 9 from bottom. Eq. (8.15), second line. Read:

$$\cdots \delta (\mathcal{J} - \mathcal{J}(x)) e^{\text{tot} / k_B} \mathcal{P}(\mathbf{x})$$  

correct to:

$$\cdots \delta (\mathcal{J} - \mathcal{J}(x)) e^{\text{tot} / k_B} \mathcal{P}(\mathbf{x})$$  

• Page 179, line 1. Read:

$$J_{\alpha}^* = \lim_{T \to 0^+} \langle \mathcal{J}_\alpha \rangle / T$$  

correct to:

$$J_{\alpha}^* = \langle \mathcal{J}_\alpha \rangle / T$$  

• Page 179, line 2. Read:

$$\hat{\sigma}^2 = \left( \hat{\sigma}^2_{\alpha \beta} \right) = \lim_{T \to 0^+} C_{\alpha \beta} / T$$  

correct to:

$$\hat{\sigma}^2 = \left( \hat{\sigma}^2_{\alpha \beta} \right) = \left( C_{\alpha \beta} \right) / T$$  

8.9 Population genetics

• Page 199. Add to last line:

For instance, in a Moran model with constant population size one has $\Lambda = 0$ and

$$r_x = h_x - \frac{1}{T} \ln \left( 1 - p^{\text{chr}}(\text{ext}, T) \right),$$  

where $p^{\text{chr}}(\text{ext}, t)$ is the chronological probability that a lineage becomes extinct before time $t$. This is given by

$$1 - p^{\text{chr}}(\text{ext}, T) = \langle 2^{-\rho} \rangle^{\text{rot}},$$  

where the average is taken over all lineages surviving to time $T$. An example is shown in fig. 8.6.

• Page 200. Fig. 8.6 should be replaced by the following:
• Page 200. Caption to fig. 8.6. Read:
The dotted line is a fit to \( h = r + \text{const.} \) The average number of divisions per lineage in this run is 5.64.
correct to:
The dotted line corresponds to \( h = r \). The average number of divisions per lineage in this run is 9.01.

Appendixes

A.8 Ito formula and Stratonovich-Ito mapping

• Page 223, line 6 from bottom. Read:
into the Ito convention, obtaining eq. (A.74).
correct to:
into the Ito convention, obtaining eq. (A.82).