Errata: The Complexity Theory Companion

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Introduction to the Errors This document contains the list of errors in


If you find other errors in the book, please let us know so that they can be added to this list.

Key “(n,m)” means page n, line m. If m is negative, that counts up from the bottom, e.g., line −2 is the next to last line of the page. If m is positive, the running header and figures/tables are not counted, e.g., line m is the first line after the running-header and any figures/tables (including their captions). Also, \"\hrule\"s, i.e., black horizontal lines, are not counted as lines. Ranges are shown using the natural notations, e.g., (1,5–10) and (3,−4)–(4,17).

List of Errors

(6,17) “an an” should be replaced by “an”; add a “]” after \(p_k(n)\).

(9,8) Eliminate the first occurrence of “then P=NP” in the statement of the theorem.
(9,4)  $y \in \maxw(x)$ at the end of the displayed formula should be replaced by $y \leq \maxw(x)$.

(10,4)  $u \in \Left[A, p]$ should be $u \in C$.

(16,2)  $\Delta_1$ should be replaced by $S_{i+1}$.

(19,3)  “sparse, for” should be replaced by “sparse.”

(20,4–5)  in both places, $p_{\ell}(p_{k}(|y|))$ should be replaced by $p_{k}(p_{\ell}(|y|))$.

(21,3)  “formula” should be replaced by “formula without.”

(21,6)  “ formula” should be replaced by “formula with.”

(24,1)  “binary of” should be replaced by “binary.”

(24,11–12)  $b \leq 2^{a}$ should be replaced by $b < 2^{a+1}$, and $(2^n)^c = 2^{cn}$ should be replaced by $(2^{n+1})^c = 2^{cn+c}$.

(28,6)  “encoding encoding” should be replaced by “encoding.”

(35,13)  “functions functions” should be replaced by “functions.”

(38,15)  $f(g(y, x_2), x_1) = y$ should be replaced by $f(g(y, x_2), x_2) = y$.

(50,16)  $R_{i-1,G} \cup$ should be replaced by $R_{i-1,G}(v) \cup$.

(52,11)  $L^n = n$ should be replaced by $\Sigma^n$.

(52,13)  Each of the three $f$’s should be a $g$.

(54,1)  “brute-force search” should be replaced by “brute force.”

(58,15 – 8)  Replace the statement of Theorem 3.22 with:

**Theorem 3.22 (Cook’s Theorem)**  Let $N_i$ be a standard enumeration of NPTMs that without loss of generality is such that $N_i$ runs in time $n^i + i$. There is a function $f_{COOK} \in FP$, mapping from strings to boolean formulas, such that

1. $(\forall i) (\forall x) [N_i(x) \text{ accepts} \iff f_{COOK}(N_i, x, 0^{\abs{x}+i}) \text{ is satisfiable}]$,
2. \((\exists g_{\text{COOK}} \in \text{FP}) \ (\forall i) \ (\forall x) \ [g_{\text{COOK}}(f_{\text{COOK}}(N_i, x, 0^{|x|^i + i})) = \langle N_i, x \rangle]\),

and

3. \((\exists h_{\text{COOK}} \in \text{FP}) \ (\forall i) \ (\forall x) \ [\text{if } a \text{ is a satisfying assignment of } f_{\text{COOK}}(N_i, x, 0^{|x|^i + i}), \text{ then } h_{\text{COOK}}(N_i, x, a, 0^{|x|^i + i}) \text{ outputs an accepting computation path of } N_i(x)].\)

(59, 6) “be such that” should be replaced by “be such that \(N_i\) runs in time \(n' + i\),”.

(59, 14–23) Each occurrence of \(f_{\text{COOK}}\) and \(h_{\text{COOK}}\) should have as an additional, final argument \(0^{|x|^i + i}\).

(68, 28) “unambiguous” should be replaced by “ambiguous.”

(69, 22–23) \(s\) should be replaced by \(x\).

(70, 6) \(\in\) should be replaced by \(\not\in\).

(70, -6) \(\langle x, y \rangle\) should be replaced by \(\langle x, u \rangle\).

(70, -1) \(p(n)\) should be replaced by \(\mu(n)\).

(71, 7) \(p(n)\) should be replaced by \(\mu(n)\) and \(\mu(|x|)\) should be replaced by \(\mu(n)\).

(72, 14) Add the following before the last sentence. The oracle access of the machine \(N\) is many-one in the sense that \(N\) accepts if and only if the oracle’s answer to its query is positive.

(72, 24) Add the following before the sentence starting with “This implies”: The oracle access of the machine \(\hat{N}\) is many-one in the sense that \(\hat{N}\) accepts if and only if the oracle’s answer to its query is positive.

(72, 25) \(A\) should be replaced by \(A'\).

(72, 28) Replace the two sentences, start from “Since” and ending with “\(< \frac{1}{2}\)” by the following: The function \((1 - 1/x)^x\) is strictly increasing for \(x > 0\). The function converges to \(\frac{1}{e} < \frac{1}{2}\). So, the probability that \(T^{B'}\) on input \(x\) rejects is at most \(\frac{1}{2}\).
(73,19) Replace the first sentence as follows: It is not hard to see that the proof of part 2 of Proposition 4.6 below relativizes, i.e., we have, for each $A$, $\text{BPP}^\text{BPP}_A = \text{BPP}_A$.

(76,-9) $N_1$ should be replace by $N_0$.

(77,15–16) Replace each occurrence of $p$ by $q$.

(77,-12) Replace $C$ by $B$.

(77,-8) Replace each occurrence of $s(|x|)$ by $|x\#y|$.

(82,7) Replace $\text{PP}_A$ by $\text{PP}$.

(80,7) “leftmost” should be replaced by “rightmost.”

(101, 19) “multiplication multiplication” should be replaced by “multiplication.”

(112, 4) Lemma number should be 6.28 rather than 6.31.

(116, the figure) Replace the “Step 3” in line -2 by “Step 4.”

(117,-20) Insert $x$ after “input.”

(119,12–13) Replace “part 4” by “parts 1 and 2.”

(119,-3) Replace $|A|^2$ by $2|A|^2$.

(119,-2) Replace $s = 2 \lceil \log |A| \rceil + 1$ by $2|A|^2 + 1$.

(120,8) Remove “Set $A_n$ to the $n \times n$ matrix such that for.”

(120,14) In the displayed formula, replace $(i-j)^{-1}$ with $(k-j)^{-1}$.

(123,25) Delete “exists.”

(123,26) Add “steps” at the end of line, after “$p(|x|)$.”

(123,27) $V$ should be $V'$.

(123,-7) The second $V$ should be $V'$.
Replace “prover” with “provers.”

Add “has” after $V$.

$p(|x|) + 2$ should be $p(|x|) + 1$.

Replace “witnessing” with “witnessing that.”

Replace $w''$ by $w'$.

“grater” should be “greater.”

“$x = 0$” should be “$X = 0$.”

“The proof of Proposition 6.38 has some flaws. The hypothesis of the proposition requires the condition $2d + 1 \leq R$. The corrected statement and the proof can be found on p.270 of [RS96] (Lemma A.3).”

$M_5$ should be replaced by $M_k$.

Remove “define.”

Replace each occurrence of $\mu_{x_i}^s$ by $\mu_{x_i}^s$.

“$r > s$” should be replaced by “$r < s$.”

$e(e^{-1}(g_{s_2} \circ g_{s_1}))$ should be replaced by $e(e^{-1}(g_{s_2}) \circ e^{-1}(g_{s_1}))$.

$G_{s_2,s_2}^{(r)}$ should be replaced by $G_{s_1,s_2}^{(r)}$.

$\ell$ should be replaced by $\log \ell$.

$y$ should be replaced by $u$.

$y$ should be replaced by $u$.

$\theta_{3}^{-1}\gamma$ should be replaced by $\theta_{3}^{-1} \circ \gamma$.

$R_{\xi}$ should be $P(\hat{u})$. 
Replace “for all $u \in \Sigma^*$ and $v \in \Sigma^{p(|u|)}$, $q(|\langle u, v \rangle|) \leq r(|v|)” by “for all $u \in \Sigma^*$ and $v \in \Sigma^{t(|u|)}$, $p(|\langle u, v \rangle|) \leq r(|u|).”

Insert a space after “restriction.”

Replace $o$ by $O$.

The $r$ should be $rd$ and each occurrence of $b$ should be $bd$.

$G[\rho \neq 1$ should be replaced by $G_1[\rho \neq 1$.

The second occurrence of $G_1[\rho \neq 0$ should be replaced by $G_1[\rho \neq 0$.

Each occurrence of the variable $t$ should be replaced by an $r$.

“defined in the above” should be replaced by “defined above.”

“hen” should be replaced by “then.”

“is closed? under” should be replaced by “is closed under”

Replace “$\{x \mid z \in \Sigma^{p(|x|)} \land y \leq_{lex} z\}$” by “$\|\{z \mid z \in \Sigma^{p(|x|)} \land y \leq_{lex} z\}\|$.”

“if” is missing before “and only if.”

Replace “$S_{m,r} \leq 1$” by “$S_{m,r}(z) \leq 1$.”

“$Q_{m,r}$” should be “$Q_m$.”

Replace “$2^{-p(|x|)+2}$” by “$2^{-p(|x|)-2}$.”

Replace “with the located on” by “with the head located on.”

Insert “just ended” after “of queries.”

In the displayed formula, replace “$2s^*(x,i) - t(x)$” by “$2s^*(x,i) - t(x)2^q(p(|x|)) + t(x)$.”

NPNP should be replaced by NP.
Replace the statement of Cook’s Theorem by the one given in this errata listing under the page (58, -15–8) entry.

Replace “for some k” with “for some $k \geq 1$.”

Replace $|y| \leq$ by $|y| =$ in each of the four places it appears in the figure.

“PP$^{NP}$” should be replaced by “NP$^{PP}$.”

“SPP$^{SPP} = SPP^{FewP} = PP$” should be replaced by “SPP$^{SPP} = SPP^{FewP} = SPP.$”

“faction” should be replaced by “fraction” on line −2 of Figure A.22.

The quantity $\frac{3}{4}$ at the very end of the definition of IP should replaced by $\frac{1}{4}$.

The quantity $\frac{3}{4}$ at the very end of the definition of MIP should replaced by $\frac{1}{4}$.

The left “]” should be moved right to be beside the right “]”.

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$\leq_d$ should be $\leq^p_d$.

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