

Errata Sheet
Application-Specific Arithmetic
Computing Just Right
for the Reconfigurable Computer
and the Dark Silicon Era

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Unfortunately, mistakes remain even after several rounds of serious proof-readings by ourselves, colleagues and editors. This document collects and corrects those found so far.

If you find further errors, don't hesitate to tell us, please!

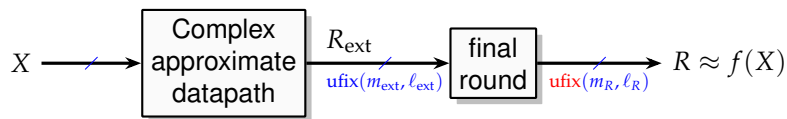
Chapter 2, Number Formats

Thanks to Élise Bachet for reporting the two following typos:

- Page 34, section 2.1.1, second and third sentences: two occurrence of $2^{w-1} - 1$ should be $2^w - 1$. These sentences should read:
It can therefore be used to encode distinctly all the integer in the interval $[0, 2^w - 1]$. The prevalent binary coding system relates the values of the bits x_i and an integer $X \in [0, 2^w - 1]$..."
- Page 41, section 2.2.2, just after (2.8), $2m$ should be 2^m . The correct sentence is: The sign bit now has weight 2^m , (...)

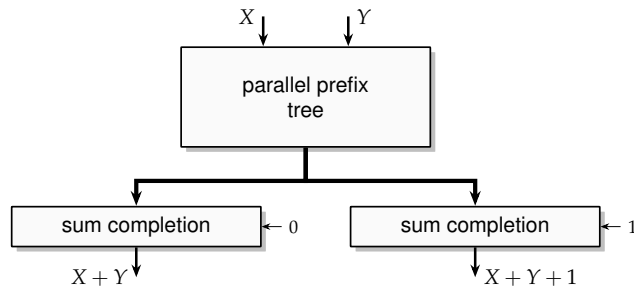
Chapter 3, Computing Just Right: Accuracy Specification and Error Analysis

- In Fig. 3.4, there is no reason for the unsigned format to become a signed one. Below is the correct figure. Thanks to Nachiket Kapre for spotting this.



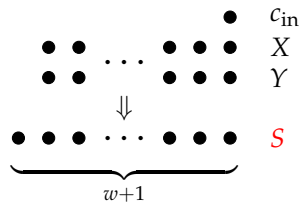
Chapter 5, Fixed-Point Addition

- Page 123, in Fig. 5.20, the label $(g_i, a_i)_{i=0\dots w-1}$ at the middle of the figure should be removed. The correct figure is given below. Thanks to Nachiket Kapre for spotting this.

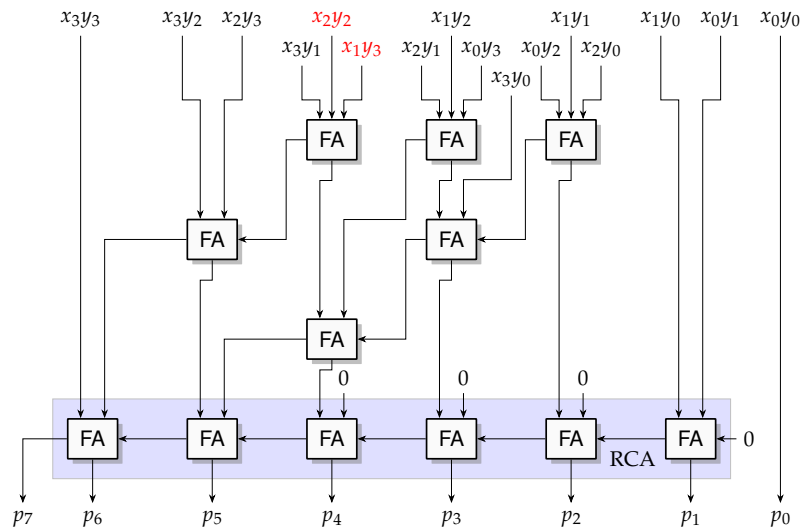


Chapter 7, Sums of Weighted Bits

- Page 155, Figure 7.5(b) has an S wrongly placed, the correct figure is given below.



- p. 156, Fig. 7.7, some of the inputs are wrong. Below is the correct figure. Thanks to Nachiket Kapre for spotting this.



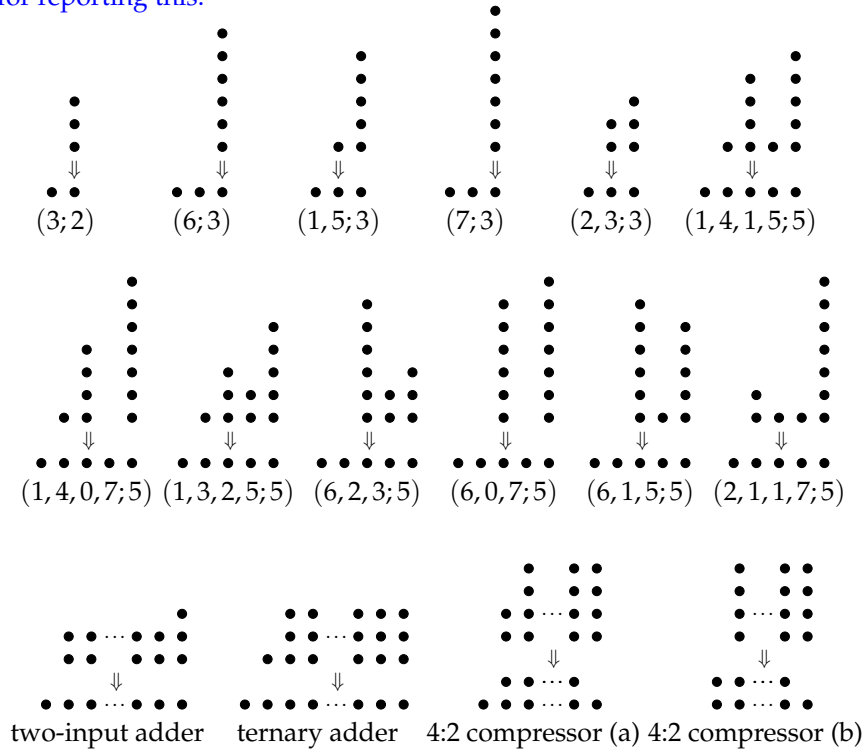
- p. 177, last sentence before 7.3.1.2 should be: As a result, 36 full adders and 6 half adders are necessary for this example.
- Page 180, Table 7.2 has wrong entries, the correct table is given below.

Method	FA	HA	final adder length	FF (fully pipelined)
Dadda	36	6	14	179
RA	39	7	10	140

- Page 184, Table 7.3 has two wrong entries. Below is the correct table:

GPC/ row adder	Ref.	#LUT6 (k)	Efficiency ($E = \delta/k$)	Delay
(3;2)	[Bru+13]	1	1	$\tau_L \approx \tau$
(6;3)	[Bru+13]	3	1	$\tau_L \approx \tau$
(1,5;3)	[Bru+13]	3	1	$\tau_L \approx \tau$
(7;3)	[Yua+19]	2	2	$\tau_L + 2\tau_{CC} \approx \tau$
(2,3;3)	[KZ14a]	2	1	$\tau_L + 2\tau_{CC} \approx \tau$
(1,4,1,5;5)	[KZ14a]	4	1.5	$\tau_L + 4\tau_{CC} \approx \tau$
(1,4,0,7;5)	[Yua+19]	4	1.75	$\tau_L + 4\tau_{CC} \approx \tau$
(1,3,2,5;5)	[KZ14b]	4	1.5	$\tau_L + 4\tau_{CC} \approx \tau$
(6,2,3;5)	[Pre17]	4	1.5	$\tau_L + 4\tau_{CC} \approx \tau$
(6,0,7;5)	[Yua+19]	4	2	$\tau_L + 4\tau_{CC} \approx \tau$
(6,1,5;5)	[Pre17]	4	1.75	$\tau_L + 4\tau_{CC} \approx \tau$
(2,1,1,7;5)	[Yua+19]	4	1.5	$\tau_L + 4\tau_{CC} \approx \tau$
2-input add.		k	1	$\tau_L + k\tau_{CC}$
ternary add.		k	$2 - \frac{2}{k}$	$2\tau_L + \tau_R + k\tau_{CC} \approx 3\tau + k\tau_{CC}$
4:2 compressor	[KZ14a]	k	$2 - \frac{1}{k}$	$\tau_L + k\tau_{CC}$

- Page 185, Fig. 7.23, the figure was not updated with Table 7.3 and partly shows different GPCs. The correct figure is below. Thanks to Robin Green for reporting this.



- Page 190, there is an index error in the ILP formulation. $M_{e,c+c'}$ and $K_{e,c+c'}$ has to be replaced by $M_{e,c'}$ and $K_{e,c'}$, respectively, and $k_{s-1,e,c+c'}$ has to be replaced by $k_{s-1,e,c-c'}$. This affects C1 and C2 and the correct constraints are:

$$C1: N_{s-1,c} \leq \sum_{e=0}^{E-1} \sum_{c'=0}^{C_e-1} M_{e,c'} k_{s-1,e,c-c'} \quad \text{for } s = 1 \dots S, c = 0 \dots C-1$$

$$C2: N_{s,c} = \sum_{e=0}^{E-1} \sum_{c'=0}^{C_e-1} K_{e,c'} k_{s-1,e,c-c'} \quad \text{for } s = 1 \dots S, c = 0 \dots C-1$$

Thanks to Robin Green for reporting this.

Chapter 10, Shifters and Leading Bit Counters

- p. 312, in the legend of Fig. 10.4, the words “left” and “right” should be exchanged. The correct legend reads:
Architecture of a full **left** shifter for $w_X = 10$ and $S_{\max} = 15$. The s_i are the bits of S . For a **right** shifter, just exchange the two inputs to each multiplexer, or (equivalently) complement all the s_i .
Thanks to Orégane Desrentes for reporting this.
- p. 313, first item, the second sentence should be:
For instance, in the figure ($w_X = 10$ and $w_S = 4$) the number (...)
Thanks to Nachiket Kapre for spotting this.

Chapter 16, Generalities on Fixed-Point Function Approximation

- p. 483, the legend of Fig. 16.6(d) gives a wrong interval. The correct legend should be $\frac{15}{16} \sin(\frac{\pi}{2}x)$ on $[0, 1)$.
- Same for Fig. 16.8 p. 485. Thanks to Nachiket Kapre for reporting these.

Chapter 17, Function Evaluation Using Tables and Additions

- p. 499, two instances of 2^w_A should be 2^{w_A} . Thanks to Nachiket Kapre for reporting this typo.

Chapter 18, Polynomial-Based Architectures for Function Evaluation

- p. 548, 18.2.3, third paragraph: a minus sign is missing, the correct sentence should read: In the case depicted in Fig. 18.15, the change of variable defining the function to evaluate is $X = 2^{-A-1}(1 + Y)$ with (...)
Thanks to Nachiket Kapre for reporting this typo.

Chapter 24, Arithmetic for Deep Learning

- Page 737, last line: “A one-dimensional 2 by 2 convolution” should be: A one-dimensional **3** by 2 convolution (...)