

# CS784: Data Models and Languages

## Project Stage I Data Cleaning, Analysis and Visualization

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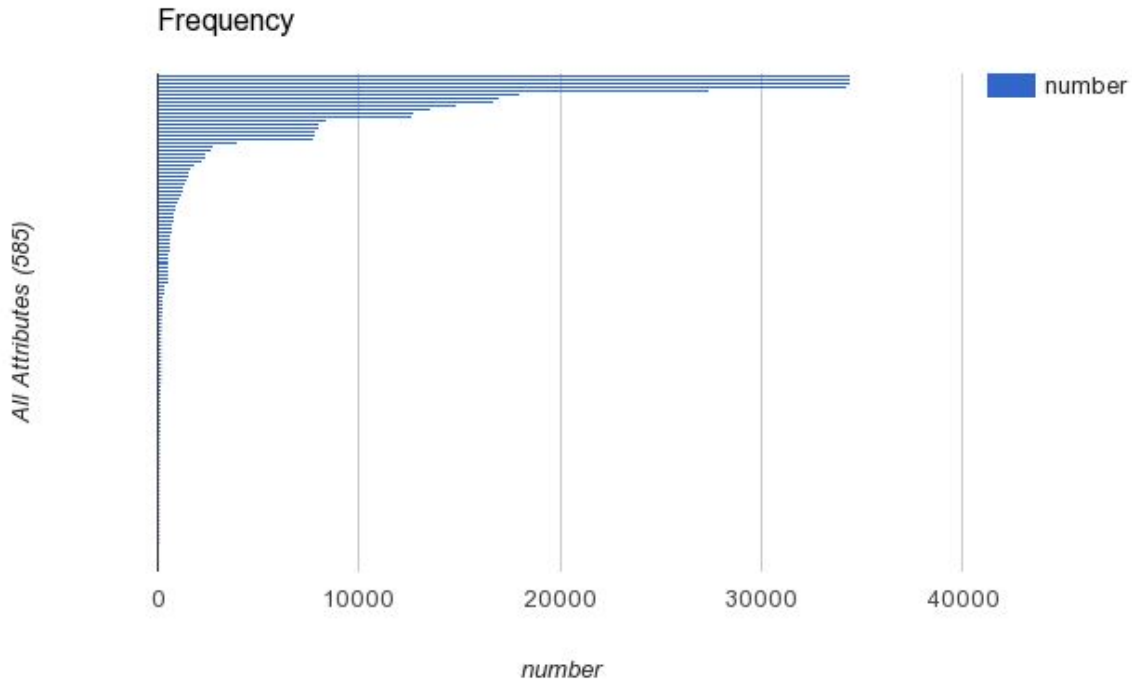
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## 1. List of attributes and product count

The list of attributes and their count is printed at the end of this report. We found a total of **585 attributes** and total product count of **34491**.

Below is the plot of number of product items each attribute appears in.



**Figure 1.1** The number of products that contain the given attributes (585 in total). We can observe that 20% of the attributes occupy 80% of the total occurrences in the data.

According to the list of attributes and their respective number in Figure 1.1, the **top 10 attributes** are listed in the order of descending frequency:

- product\_type
- product\_name
- product\_segment
- product\_long\_description
- brand
- product\_short\_description
- GTIN
- UPC
- country\_of\_origin: components
- category

## 2.1 Missing Attribute

Table 2.1 shows the top 10 attributes and their corresponding missing fraction/percentage. By missing percentage we mean if an attribute is present in 90 out of 100 products, its missing percentage is 10%.

Attributes	#products appears	Missing (Fraction)	Missing (Percentage)
Product Type	34491	0/34491	0.00%
Product Name	34491	0/34491	0.00%
Product Segment	34491	0/34491	0.00%
Product Long Description	34304	187/34491	0.54%
Brand	27461	7030/34491	20.38%
Product Short Description	17977	16514/34491	47.88%
GTIN	16994	17497/34491	50.73%
UPC	16684	17807/34491	51.63%
Country of Origin: Components	14886	19605/34491	56.84%
Category	13569	20922/34491	60.66%

**Table 2.1** Top 10 attributes and their missing portion in data

## 2.2 Ideas on filling missing attributes

In this section we discuss how to fill missing values. There are three approaches that we discussed about.

**Approach #1.** Discard attribute with high missing percentage

One naive approach would be simply to discard the attributes with missing value if they do not appear in significant amount of products. For example, if there are some attributes such as 'Category' which are missing in more than 60% of the products, we might choose to discard those from all of the products. One intuition behind this is that the given attribute might be redundant. For example, 'Product Type' might serve the same purpose as 'Category'. But this is not always true. As you can see from the above table, 'Brand', ranked as the 5th highest in the number of products that it appears in, is missing in about 20% of the total products and is not at all redundant. So we must try to fill in this attribute for the remaining 20% of the products as well.

**Approach #2.** Assign the most common value of the attribute to a missing attribute

In this approach we'd assign to the missing field the most common value among all possible values for this attribute. However, this approach does not take into account the 'similarity' of the product items while assigning attribute values. For example, if in our dataset we have 1000s of car models of 'Brand' Tesla, and we have 'Brand' attribute missing in few 'Laptop' category products, this approach would assign 'Brand' as Tesla to 'Laptop' products as well which is not correct. So we want to assign value based on '**similar**' product items (e.g., Brand of other products of type 'Electronics'). This brings us to our third solution.

**Approach #3** Similarity-based approach to find most likely attribute value

In this approach we will cluster similar products. For example, we would form clusters of 'Electronics', 'Car', 'Books' etc. products. Now, depending upon the cluster in which our product with missing attribute falls, we will assign the 'majority vote' attribute value within that cluster of products. For example, if we have a product description of type 'Electronics' we would assign it 'Brand' the most frequent value appearing in the 'Electronics' cluster of products. To form cluster and assign values, we first apply metrics (such as edit distance of two strings) to measure distance between different entity, and then use algorithms such as k-Nearest neighbor to cluster the attributes.

### 2.3 Classification of different types of attributes

Table 2.2 shows the statistics of top 10 frequent attributes. Note that length represents the number of characters in the string. The statistics of only those attributes that are classified as textual are shown.

Attributes	Class	Min. Length	Max. Length	Ave. Length
Product Type	Categorical	-	-	-
Product Name	Textual	4	223	75
Product Segment	Categorical	-	-	-
Product Long Description	Textual	1	3998	1257
Brand	Categorical	-	-	-
Product Short Description	Textual	1	2888	223
GTIN	Textual	12	37	14
UPC	Textual	12	12	12
Country of Origin: Components	Categorical	-	-	-
Category	Categorical	-	-	-

**Table 2.2** Types and length statistics of different attributes

### **Logic/Algorithm behind the classification rule:**

```
/** attr means attribute to classify */  
// numeric case  
if all attr values are numeric:  
    class = 'Numeric'  
// boolean case  
else if all attr values are boolean:  
    class = 'Boolean'  
// categorical case  
else if fraction = (num_unique_vals / total_vals) < threshold (10%)  
    class = 'Categorical'  
else  
    class = 'Textual'
```

### **Interesting case of 'Categorical' versus 'Textual'**

To classify whether an attribute is categorical or textual, we use the fraction of unique values over total values. The idea behind this is that if an attribute is categorical, we will see less number of unique values relative to the total number of values. On the other hand a textual attribute will have the number of unique values close to total number of values. For example, thousands of products would have same value of the attribute 'Brand' e.g., 'Apple' or 'Lenovo' while 'product description' attribute would have probably different values for most of the products.

Specifically, in our case, an attribute is categorical if **num\_unique\_vals / total\_vals** < 10%. The threshold is determined by manually inspecting the data.

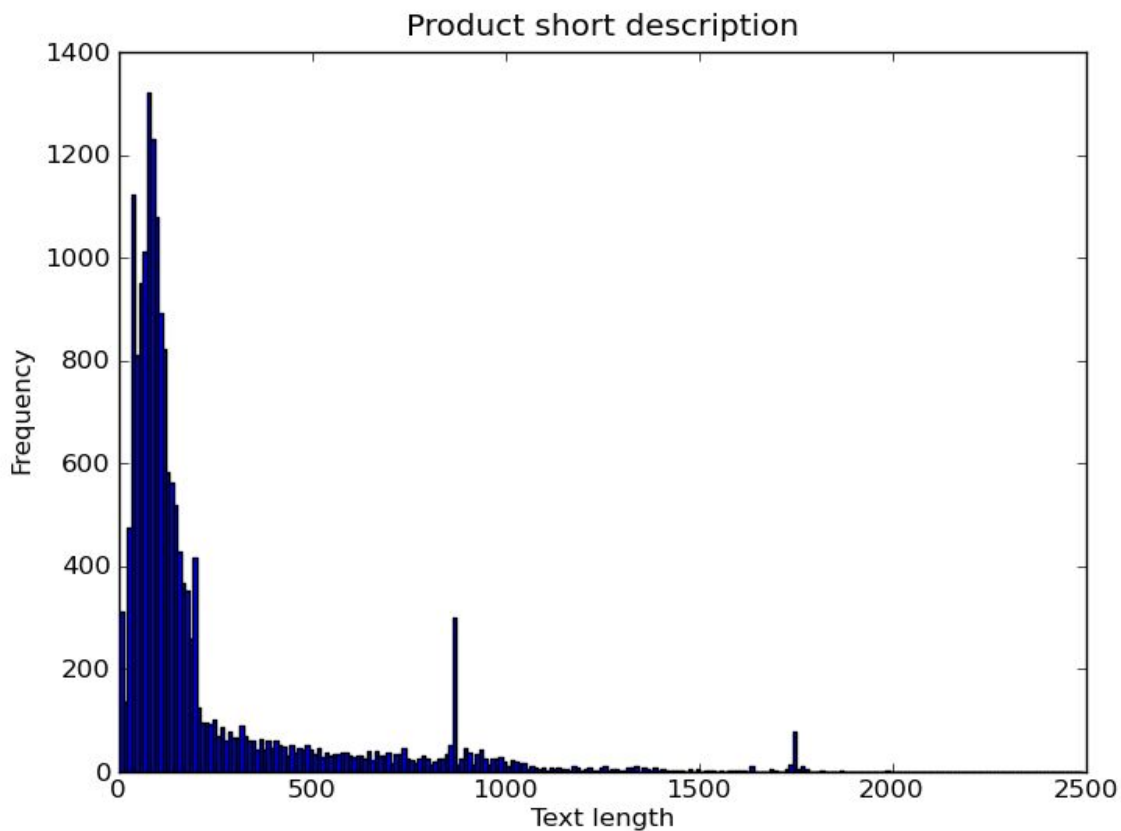
For 'Numeric' and 'Boolean', we used python built-in boolean and numerics parsers.

**Note:** It looks like GTIN and UPC attributes sort of follow a fixed format (fixed length, alphanumeric string). So we might want to create an additional class let's say 'ID' for such attributes.

## 2.4 Histograms and Anomaly detection in Frequent attributes

### Example #1 'Product Short Description'

Since there are no numerical attributes in the top-10 frequent attributes, we created histograms only for the textual ones. The 'product short description' histogram is shown below. As can be seen from the figure there are probably outliers around 1000 and 1800. Most of the descriptions are quite "short" (~300 chars). Only a few have many characters. We look at one of the short description with 1800+ characters. It is full of the html format character '&#x9' (tab).



**Figure 2.1** Histogram for the length of product short description (bin size = 10)

## Example #2 'Product Names'

Another example of anomalies can be shown by the histogram of product names. You can also observe the anomaly using the table (maximum length) above. There are outliers (anomalies) around 200 text length region. In the normal case you will not expect product name with 50-120 characters. But when we look into the record (shown below), we found it to be a valid one. So it should be considered just as outlier.

*Longest product name (Outlier):* The Business Objects Developer Job Description Handbook and Career Guide: The Complete Knowledge Guide You Need to Start or Advance Your Career As Application Developer. Practical Manual for Job-hunters and Career-changers.

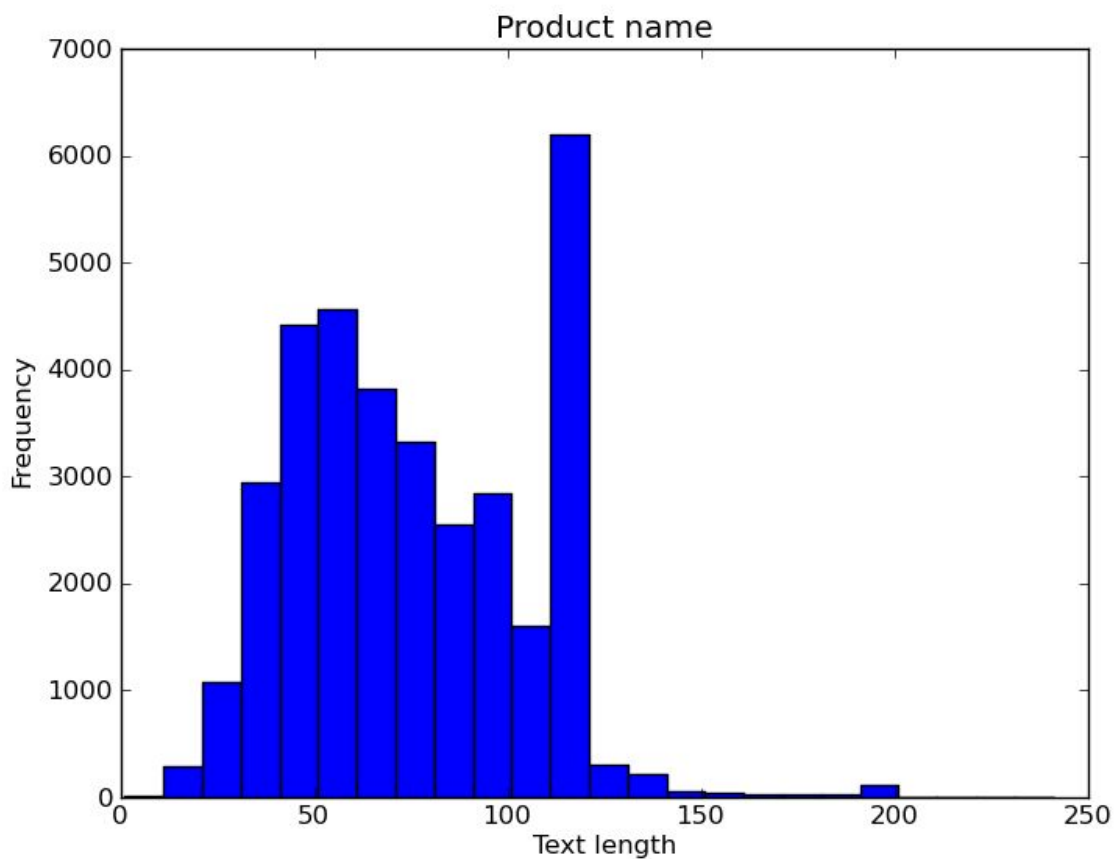


Figure 2.2 Histogram for the length of product name (bin size = 10)

### **Example #3 'GTIN'**

There is a GTIN with 37 characters, which is quite far away from the average length. When we look into the record, it looks something like this, which we believe to be an anomaly (reason described in the next section **2.5**):

*Longest GTIN (anomaly):* PITEMID\_255045\_DF1948\_1606091\_1829836

## **2.5 Format Issues in Attributes**

There are format issues in the **Global Trade Item Number (GTIN)**. Specifically, we noticed that the given data is actually using an GTIN-14 to identify the product number. We see two different types of data representation, which means they are probably merged from two different data sources:

- 1) GTIN\_number1\_number2
- 2) 14-characters alphanumeric number

*Example GTIN Values:* ['781878424846', '00609525004250', 'II58OMaI7u2782', 'II53NKdVgP0469', 'GTIN\_321146\_00025215623608', '09780812928082']

This inconsistency in the length of the value for this attribute is also reflected in above table. We should standardize the format before doing any analysis.

## **2.6 Synonym Attribute Values**

In this section we discuss synonyms. Specifically we found following synonyms in values of attributes 'Country of Origin: Category'. This attribute has three synonym values: **'US'**, **'United States'** and **'USA'**.

As another example, **'Laptop Bags|Laptop Sleeves|Wheeled Laptop Cases'** is one of the value in the Category attribute. However, there is also a value **'Laptop Bags|Wheeled Laptop Cases|Laptop Cases & Bags'**, which is very similar to the former, and they should probably be considered as synonyms. **'battery chargers'** and **'battery\_charger'** are the third example of synonymous values in attribute 'product type'.



## 2.7 Sprinkled Attribute Values

There are a couple of sprinkled phenomena appearing in the top-10 attributes. For example, there is one product (desktop) with product name “Refurbished HP Compaq 6005 Pro Desktop PC - AMD Athlon II X2 B24 3.0GHz, 4GB DDR2, 160GB HDD, DVDRW, Windows 7 Professional 64-bit”. Obviously, the latter part is just the configuration of the desktop, which should not be included in the product name. Instead, it should be described in the product description.

As another example, the UTC value is included in one of the product's short description. This also is a sprinkled phenomenon where the values of two different attributes are merged together. Also, in attribute Brand, the value ‘**ACP - Memory Upgrades Platinum Series**’ actually contains a part of the product name (Memory Upgrades Platinum Series), which is missing from the product name.

## 2.8 Data Quality Issues

The following data quality problems appear in our data:

**Example #1.** (Missing values) As you can see in Table 2.1, there are lots of missing values in different attributes, which is probably the biggest data quality problems in our data.

**Example #2.** (Misspellings) In the Categorical attributes, there is a value ‘**Secruity Sensors & Alarms**’ that appears in many different products. “**Secruity**” is a misspelling of security, which we found via Google docs spelling checks.

**Example #3.** (Embedded Values) Parts of the sprinkled attribute values actually belong to this category. A particular example is the value “Refurbished HP Compaq 6005 Pro Desktop PC - AMD Athlon II X2 B24 3.0GHz, 4GB DDR2, 160GB HDD, DVDRW, Windows 7 Professional 64-bit”, which actually embeds part of the product description into product name.

## 3. Software/Tools used

We used Python and its packages for this stage. Specifically, we used ‘json’ to parse the data from the input file; ‘operator’ to sort arrays; ‘matplotlib’ to plot histograms. Finally, to compute the difference between two strings for the bonus question we used ‘difflib’, namely its subpackage ‘Sequence Matcher

## 4. Bonus Question

We used following algorithm to detect pair of products which are incorrectly labeled.

Given two products prod1 and prod2, we look at the following features:

features\_array = [**'Product Type'**, **'Brand'**, **'Segment'**, **'Category'**, **'Product Name'**]

We then compute the product of the similarities in values of each of the above features for prod1 and prod2 using the function which is denoted by `MatchingSimilarity`. Specifically, it is computed by measuring the distance two strings using `EditDistance` as metrics. If the similarity is greater than the bound, label should be 'match' else expected label is 'mismatch'. In our implementation, we used bound = 0.9. Roughly, our algorithm looks as follows:

```
if (Matching Similarity (prod1['product_type'], prod2['product_type'])) *
    Matching Similarity (prod1['brand'], prod2['brand']) *
    Matching Similarity (prod1['segment'], prod2['segment']) *
    Matching Similarity (prod1['category'], prod2['category']) *
    Matching Similarity (prod1['product_name'], prod2['product_name'])
    > bound) {
    // label should be match
    if (label != 'Match')
        print "ERROR Found"
}
else { // label should be mismatch
    if (label != 'Mismatch')
        print "ERROR Found"
}
```

Following are our findings based on above algo:

match error counter: 6462 (As per our algo, these many pairs should be labeled 'mismatch' but they are labeled 'match')

mismatch error counter: 257 (As per our algo, these many pairs should be labeled 'match' but they are labeled 'mismatch')

total number: 20000 (total pairs)

Our algorithm looks into 'product name' for similarity which is very effective in detecting errors of mismatch types (see above 257 errors). However to better reduce match error, we need more advanced algorithm (e.g., machine learning based techniques) to look deeply into feature values.

For example the algorithm has found the following errors (we start counting with 0):

error at line 58 MATCH while the label must be MISMATCH

error at line 106 MISMATCH while the label must be MATCH

## **APPENDIX - List of attributes found in our data**

0. Product Type :: Product Count = 34491
1. Product Name :: Product Count = 34491
2. Product Segment :: Product Count = 34491
3. Product Long Description :: Product Count = 34304
4. Brand :: Product Count = 27461
5. Product Short Description :: Product Count = 17977
6. GTIN :: Product Count = 16994
7. UPC :: Product Count = 16684
8. Country of Origin: Components :: Product Count = 14886
9. Category :: Product Count = 13569
10. Manufacturer Part Number :: Product Count = 12725
11. Warranty Information :: Product Count = 12659
12. Manufacturer :: Product Count = 8440
13. Color :: Product Count = 8017
14. Actual Color :: Product Count = 8016
15. Assembled Product Length :: Product Count = 7893
16. Assembled Product Width :: Product Count = 7860
17. Assembled Product Height :: Product Count = 7743
18. Warranty Length :: Product Count = 3942
19. Condition :: Product Count = 2773
20. Composite Wood Code :: Product Count = 2669
21. E-Waste Recycling Compliance Required :: Product Count = 2425
22. Type :: Product Count = 2370
23. CPSC-Regulated Indicator :: Product Count = 2243
24. Has Mercury :: Product Count = 1863
25. Operating System :: Product Count = 1638
26. Multipack Indicator :: Product Count = 1539
27. Battery Type :: Product Count = 1535
28. Screen Size :: Product Count = 1466
29. Features :: Product Count = 1417
30. Number of Batteries :: Product Count = 1315
31. Hard Drive Capacity :: Product Count = 1274
32. Processor Type :: Product Count = 1235
33. Energy Star :: Product Count = 1112
34. RAM Memory :: Product Count = 1010
35. Memory Capacity :: Product Count = 917
36. Processor Speed :: Product Count = 887
37. Connector Type :: Product Count = 827
38. Processor Core Type :: Product Count = 816

39. California Residents Prop 65 Warning Required :: Product Count = 806
40. Electronics Certifications :: Product Count = 749
41. Release Date :: Product Count = 747
42. Material :: Product Count = 743
43. Digital Video Formats :: Product Count = 679
44. Operating System Required :: Product Count = 675
45. Warranty Provider :: Product Count = 675
46. Solid-State Drive :: Product Count = 652
47. RAM Memory Type :: Product Count = 652
48. Wireless :: Product Count = 590
49. Touchscreen :: Product Count = 563
50. Video Game Platform :: Product Count = 543
51. Monitor Type :: Product Count = 530
52. Computer Mouse Included :: Product Count = 527
53. Computer Mouse Type :: Product Count = 527
54. Keyboard Included :: Product Count = 527
55. Wireless Keyboard Included :: Product Count = 527
56. Desktop Computer Type :: Product Count = 520
57. Compatible Devices :: Product Count = 415
58. Publisher :: Product Count = 414
59. Size :: Product Count = 364
60. Interface Type :: Product Count = 285
61. ISBN-13 :: Product Count = 247
62. Number of Pages :: Product Count = 245
63. Battery Life :: Product Count = 241
64. Abridged :: Product Count = 238
65. Bluetooth :: Product Count = 204
66. Batteries Included :: Product Count = 194
67. Resolution :: Product Count = 187
68. Display Resolution :: Product Count = 183
69. Recommended Use :: Product Count = 174
70. Genre :: Product Count = 171
71. Online Multiplayer Available :: Product Count = 167
72. Downloadable Content Available :: Product Count = 167
73. Cooperative Gameplay Available :: Product Count = 167
74. Subgenre :: Product Count = 166
75. Graphic Card :: Product Count = 165
76. Assembly Required :: Product Count = 165
77. Compatible Brands :: Product Count = 164
78. Depth :: Product Count = 163
79. Display Technology :: Product Count = 162
80. Volts :: Product Count = 160
81. Peripherals Required :: Product Count = 155

82. Internal/External :: Product Count = 152
83. Aspect Ratio :: Product Count = 151
84. Average Customer Rating :: Product Count = 145
85. Product Accessories Included :: Product Count = 132
86. Rack Size :: Product Count = 131
87. Energy Guide: Appliance Labeling Rule Required :: Product Count = 127
88. Number of Audio Inputs :: Product Count = 126
89. Package Quantity :: Product Count = 125
90. Widescreen :: Product Count = 125
91. Is Wireless Microphone :: Product Count = 122
92. Finish :: Product Count = 112
93. System Requirements :: Product Count = 112
94. Supported Media Formats :: Product Count = 107
95. Lifestage :: Product Count = 104
96. Form :: Product Count = 104
97. Created By :: Product Count = 102
98. Modified By :: Product Count = 102
99. Created Date :: Product Count = 102
100. Modified Date :: Product Count = 102
101. Refresh Rate :: Product Count = 102
102. Packaging Instructions :: Product Count = 97
103. Dot ID :: Product Count = 94
104. Maximum Weight :: Product Count = 93
105. HDMI Connector :: Product Count = 88
106. Mount Type :: Product Count = 86
107. Batteries Required :: Product Count = 79
108. Wireless Technology :: Product Count = 79
109. Watts :: Product Count = 79
110. Digital Audio Formats :: Product Count = 78
111. Device Type :: Product Count = 78
112. Gender :: Product Count = 77
113. Maximum Number of Offline Players :: Product Count = 75
114. Series Title :: Product Count = 72
115. Technology :: Product Count = 70
116. Internet Protocol :: Product Count = 68
117. Total Units :: Product Count = 68
118. Audio/Video Cable Type :: Product Count = 64
119. Frequency Range :: Product Count = 63
120. Earpiece Type :: Product Count = 62
121. Number of Channels :: Product Count = 60
122. Output Power :: Product Count = 60
123. Amps :: Product Count = 59
124. Processor Brand :: Product Count = 59

125. Compatible Models :: Product Count = 58
126. Recommended Screen Size :: Product Count = 58
127. Capacity :: Product Count = 56
128. Base Unit of Measure :: Product Count = 54
129. Remote Control Included :: Product Count = 54
130. Maximum Number of Online Players :: Product Count = 53
131. Age Group :: Product Count = 52
132. Record Label :: Product Count = 52
133. Audio Decoder :: Product Count = 48
134. Enclosure Color :: Product Count = 48
135. Volume Unit :: Product Count = 47
136. Maximum Recommended Age :: Product Count = 45
137. Minimum Recommended Age :: Product Count = 45
138. Has Parental Controls :: Product Count = 44
139. Cord Length :: Product Count = 44
140. Languages :: Product Count = 42
141. Write Speed :: Product Count = 42
142. Number of Speakers :: Product Count = 41
143. Battery Size :: Product Count = 40
144. Frequency Response Range :: Product Count = 40
145. Maximum RAM Supported :: Product Count = 40
146. Electronics Carrying Case Type :: Product Count = 40
147. Number of Poles :: Product Count = 38
148. Adjustable Tilt :: Product Count = 38
149. Analog TV Tuner :: Product Count = 38
150. Style :: Product Count = 38
151. Impedance :: Product Count = 36
152. Save Big :: Product Count = 36
153. Output Mode :: Product Count = 36
154. Cable Length :: Product Count = 34
155. Read Speed :: Product Count = 34
156. Mounting Pattern :: Product Count = 34
157. Shielding Material :: Product Count = 33
158. Response Time :: Product Count = 33
159. Maximum Watts Per Channel :: Product Count = 33
160. Number of Outlets :: Product Count = 32
161. Available Instant Content Sources :: Product Count = 32
162. Automatic Document Feeder :: Product Count = 32
163. Power Type :: Product Count = 32
164. Duration :: Product Count = 32
165. Video Game Collection :: Product Count = 31
166. MPAA Rating :: Product Count = 31
167. Connector Gender :: Product Count = 31

168. Paper Size :: Product Count = 31
169. Maximum Energy Surge Rating :: Product Count = 30
170. Data Transfer Rate :: Product Count = 30
171. Surge Suppression :: Product Count = 30
172. Power Rating :: Product Count = 30
173. Musician :: Product Count = 30
174. Instruction Manual Included :: Product Count = 29
175. Studio & Production Company :: Product Count = 29
176. Operating Power Consumption :: Product Count = 29
177. Fastener Type :: Product Count = 29
178. Diameter :: Product Count = 28
179. In-Line Microphone :: Product Count = 28
180. Number of Ports :: Product Count = 27
181. Age Range :: Product Count = 26
182. Automatic Two-Sided Printing :: Product Count = 25
183. DIN Size :: Product Count = 25
184. Maximum Print Resolution :: Product Count = 25
185. Minimum Operating Temperature :: Product Count = 25
186. Maximum Operating Temperature :: Product Count = 25
187. Number of Sheets :: Product Count = 25
188. Items Included :: Product Count = 24
189. Number of Discs :: Product Count = 24
190. Printing Speed :: Product Count = 23
191. Version :: Product Count = 22
192. TV & Monitor Mounting Components :: Product Count = 22
193. Supported Networking Standards :: Product Count = 22
194. Instruction Manual Languages :: Product Count = 22
195. Department of Transportation Hazard Class :: Product Count = 21
196. Headphones Included :: Product Count = 20
197. Contrast Ratio Range :: Product Count = 20
198. Maximum Load Weight :: Product Count = 19
199. Refillable :: Product Count = 19
200. Hard Drive Type :: Product Count = 19
201. Recommended Location :: Product Count = 18
202. Maximum Monthly Volume :: Product Count = 18
203. Brightness :: Product Count = 18
204. Shipping Weight :: Product Count = 18
205. On-Screen Display :: Product Count = 18
206. Recording Time :: Product Count = 17
207. Actors :: Product Count = 17
208. Sports Team :: Product Count = 17
209. DVD Region Code :: Product Count = 17
210. Product Dimensions :: Product Count = 17

211. Signal-to-Noise Ratio :: Product Count = 17  
212. Number of Megapixels :: Product Count = 17  
213. Has Circuit Breaker :: Product Count = 17  
214. Shipping Height :: Product Count = 16  
215. Sensitivity :: Product Count = 16  
216. Shipping Depth :: Product Count = 16  
217. Clamping Level :: Product Count = 16  
218. Humidity Range :: Product Count = 16  
219. Quality Tested for Walmart :: Product Count = 16  
220. Internal Memory :: Product Count = 16  
221. Shipping Width :: Product Count = 16  
222. Diagonal Size :: Product Count = 16  
223. Number of Drive Bays :: Product Count = 16  
224. Pattern :: Product Count = 16  
225. Compatible Cameras :: Product Count = 15  
226. Made in Country :: Product Count = 15  
227. Response Bandwidth :: Product Count = 15  
228. Total Harmonic Distortion :: Product Count = 15  
229. Headset Type :: Product Count = 15  
230. Vehicle Model :: Product Count = 15  
231. Color Pages Per Minute :: Product Count = 15  
232. Data Line Protection :: Product Count = 15  
233. Input Connector Type :: Product Count = 14  
234. Speaker Driver Types :: Product Count = 14  
235. Noise Filtration :: Product Count = 14  
236. Personalizable :: Product Count = 14  
237. Maximum Output :: Product Count = 14  
238. Number of Pieces :: Product Count = 14  
239. Apps Installed :: Product Count = 14  
240. Title :: Product Count = 13  
241. Talk Time :: Product Count = 13  
242. Cell Phone Service Provider :: Product Count = 13  
243. Enclosure Type :: Product Count = 13  
244. Theme :: Product Count = 12  
245. Age Restriction :: Product Count = 12  
246. Distance From Wall :: Product Count = 12  
247. Thermal Management Type :: Product Count = 12  
248. Director :: Product Count = 12  
249. Messaging Supported :: Product Count = 12  
250. Multifunctional :: Product Count = 12  
251. Low Pass Frequency Range :: Product Count = 12  
252. Maximum Page Yield :: Product Count = 12  
253. Gain Level :: Product Count = 12



254. HDTV :: Product Count = 12  
255. Bus Speed :: Product Count = 11  
256. Occasion :: Product Count = 11  
257. Software Included :: Product Count = 11  
258. Maximum Data Transfer Rate :: Product Count = 11  
259. Volume Capacity :: Product Count = 11  
260. USB Version :: Product Count = 10  
261. Backlight Type :: Product Count = 10  
262. Media Load Type :: Product Count = 10  
263. Frequency :: Product Count = 10  
264. Speed :: Product Count = 10  
265. Battery Watt Hour :: Product Count = 10  
266. Number of Presets :: Product Count = 10  
267. Viewing Angle :: Product Count = 10  
268. Microphone Included :: Product Count = 10  
269. Battery Weight :: Product Count = 10  
270. ESRB Rating :: Product Count = 9  
271. Video Modes :: Product Count = 9  
272. Hardware Included :: Product Count = 9  
273. Cold Crank Amp :: Product Count = 9  
274. Character :: Product Count = 9  
275. Number of Equalizers :: Product Count = 9  
276. Book Type :: Product Count = 9  
277. Wire Gauge :: Product Count = 9  
278. Has Expiration :: Product Count = 9  
279. Top Mount Depth :: Product Count = 9  
280. Has Cooling Fan :: Product Count = 9  
281. Video Streaming Quality :: Product Count = 8  
282. High Pass Frequency Range :: Product Count = 8  
283. Gifts by Recipient :: Product Count = 8  
284. Percentage of Preconsumer Content :: Product Count = 8  
285. Digital Camera Type :: Product Count = 8  
286. Shape :: Product Count = 8  
287. Attachment Style :: Product Count = 8  
288. Number of HDMI Connections :: Product Count = 8  
289. Number in Series :: Product Count = 8  
290. Printer Cartridge Type :: Product Count = 8  
291. Has Warranty :: Product Count = 8  
292. Surround Sound Mode :: Product Count = 8  
293. Percentage of Postconsumer Content :: Product Count = 8  
294. Cordless :: Product Count = 8  
295. Cord Material :: Product Count = 7  
296. Number of Line Sources :: Product Count = 7

297. Recordable Media Formats :: Product Count = 7  
298. Bass Boost Frequency :: Product Count = 7  
299. Bottom Mount Depth :: Product Count = 7  
300. Target Audience :: Product Count = 7  
301. SD Speed Class :: Product Count = 7  
302. Television Type :: Product Count = 7  
303. Battery Backup :: Product Count = 7  
304. Compatible Cars :: Product Count = 6  
305. Computer Software Type :: Product Count = 6  
306. Remote Control Type :: Product Count = 6  
307. Stereo Reception System :: Product Count = 6  
308. Portable :: Product Count = 6  
309. HDCP Compatible :: Product Count = 6  
310. Equalizer Type :: Product Count = 6  
311. Upscaling :: Product Count = 6  
312. Has Headphone Jack :: Product Count = 6  
313. USB Port :: Product Count = 6  
314. Crossover Slope :: Product Count = 6  
315. Music Media Format :: Product Count = 6  
316. Flash Modes :: Product Count = 6  
317. Number of Shelves :: Product Count = 6  
318. Total Pixels :: Product Count = 5  
319. Image Sensor :: Product Count = 5  
320. Maximum Video Bandwidth :: Product Count = 5  
321. Focal Length :: Product Count = 5  
322. Has Phase Shift Selector :: Product Count = 5  
323. Adjustable Height :: Product Count = 5  
324. Input Signal Voltage :: Product Count = 5  
325. Diaphragm Size :: Product Count = 5  
326. Screwdriver Tip Size :: Product Count = 5  
327. Roll Length :: Product Count = 5  
328. Standby Power Consumption :: Product Count = 5  
329. Number of Power Modules :: Product Count = 5  
330. Antenna Type :: Product Count = 5  
331. Optical Zoom :: Product Count = 5  
332. Video Output Standard :: Product Count = 5  
333. Sports League :: Product Count = 5  
334. Pet Type :: Product Count = 5  
335. ISO Range :: Product Count = 5  
336. Exposure Modes :: Product Count = 5  
337. Streaming Services :: Product Count = 4  
338. Offset Distance :: Product Count = 4  
339. Base Material :: Product Count = 4

340. Digital Image Formats :: Product Count = 4  
341. Computer Cooling Type :: Product Count = 4  
342. Recommended Surface :: Product Count = 4  
343. Body Material :: Product Count = 4  
344. Fill Material :: Product Count = 4  
345. Maximum Storage Temperature :: Product Count = 4  
346. Compatible Tape Width :: Product Count = 4  
347. Display Modes :: Product Count = 4  
348. Lockable :: Product Count = 4  
349. Number of Drawers :: Product Count = 4  
350. Maximum Operating Range :: Product Count = 4  
351. Minimum Storage Temperature :: Product Count = 4  
352. Audio Power Amplifier Class :: Product Count = 4  
353. Headphone Technology :: Product Count = 4  
354. Ergonomic :: Product Count = 4  
355. Number of A/V Inputs :: Product Count = 3  
356. Number of Lines :: Product Count = 3  
357. Has Face Detection :: Product Count = 3  
358. Portable Radio Type :: Product Count = 3  
359. Image Stabilization Type :: Product Count = 3  
360. Remote Controlled :: Product Count = 3  
361. Sensor Resolution :: Product Count = 3  
362. Magnification :: Product Count = 3  
363. Primary Distributor ID :: Product Count = 3  
364. Motherboard Form Factor :: Product Count = 3  
365. Wireless Capabilities :: Product Count = 3  
366. Recommended Room :: Product Count = 3  
367. Musical Instrument Type :: Product Count = 3  
368. Pole Color :: Product Count = 3  
369. Image Processor Brand :: Product Count = 3  
370. Magnet Type :: Product Count = 3  
371. Manual White Balance :: Product Count = 3  
372. Maximum Shutter Speed :: Product Count = 3  
373. Self-Timer Delay :: Product Count = 3  
374. Maximum Travel Distance :: Product Count = 3  
375. Effective Sensor Resolution :: Product Count = 3  
376. Gauge :: Product Count = 3  
377. Zoom Adjustment :: Product Count = 3  
378. Lens Construction :: Product Count = 3  
379. Thickness :: Product Count = 3  
380. White Balance Presets :: Product Count = 3  
381. Minimum Shutter Speed :: Product Count = 3  
382. Dialer Type :: Product Count = 3

383. Wall Mountable :: Product Count = 3  
384. Dialing Modes :: Product Count = 3  
385. Faceplate Style :: Product Count = 3  
386. Maximum Image Resolution :: Product Count = 3  
387. Base Type :: Product Count = 3  
388. Focus Type :: Product Count = 3  
389. Mounting Hardware Included :: Product Count = 3  
390. Optical Sensor Size :: Product Count = 3  
391. Ink Color :: Product Count = 3  
392. Color Depth :: Product Count = 3  
393. Pump Included :: Product Count = 3  
394. Cover Material :: Product Count = 3  
395. Ringer Control :: Product Count = 3  
396. Dialer Location :: Product Count = 3  
397. Number of Audio Outputs :: Product Count = 3  
398. Number of Substations :: Product Count = 3  
399. Exposure Compensation :: Product Count = 3  
400. Coffee Filter Size :: Product Count = 2  
401. Orientation :: Product Count = 2  
402. Camera Accessory Bundle Type :: Product Count = 2  
403. LED Indicator :: Product Count = 2  
404. Is Signal Booster :: Product Count = 2  
405. Tuner Mode :: Product Count = 2  
406. Maximum DVDs Held :: Product Count = 2  
407. Voice-Activated :: Product Count = 2  
408. Pet Size :: Product Count = 2  
409. Web Technology Supported :: Product Count = 2  
410. Wireless Network Security Protocols :: Product Count = 2  
411. Reading Level :: Product Count = 2  
412. Nutritional Data Required :: Product Count = 2  
413. Environmental Certifications :: Product Count = 2  
414. Absorbency :: Product Count = 2  
415. Special Effects :: Product Count = 2  
416. Cable Connector Type :: Product Count = 2  
417. Number of Speeds :: Product Count = 2  
418. Educational Focus :: Product Count = 2  
419. Hardware Lock Type :: Product Count = 2  
420. Manual Operation :: Product Count = 2  
421. Number of Exposure Metering Zones :: Product Count = 2  
422. Base Color :: Product Count = 2  
423. Has Clock :: Product Count = 2  
424. Standby Time :: Product Count = 2  
425. Aperture Range :: Product Count = 2

426. Microphone Technology :: Product Count = 2  
427. Frame Material :: Product Count = 2  
428. Field of View Crop Factor :: Product Count = 2  
429. Adjustable Fan :: Product Count = 2  
430. Flash Sync Speed :: Product Count = 2  
431. Viewfinder Type :: Product Count = 2  
432. Edition :: Product Count = 2  
433. Has Magnetic Shield :: Product Count = 2  
434. Charger Included :: Product Count = 2  
435. Continuous Shooting Speed :: Product Count = 2  
436. J-Box Location :: Product Count = 2  
437. Maximum Shooting Speed :: Product Count = 2  
438. Caller ID :: Product Count = 2  
439. Shutter Speed Range :: Product Count = 2  
440. Voice Control :: Product Count = 2  
441. Printing Technology :: Product Count = 2  
442. Image Resolution Yield :: Product Count = 2  
443. Number of Controllable Devices :: Product Count = 2  
444. Data Storage :: Product Count = 2  
445. Image Stabilization :: Product Count = 2  
446. Stand Base Type :: Product Count = 2  
447. Maximum View Angle :: Product Count = 2  
448. Number of Autofocus Zones :: Product Count = 2  
449. Effective Flash Distance :: Product Count = 2  
450. Frame Finish :: Product Count = 2  
451. Vertical Viewing Angle :: Product Count = 2  
452. Laptop Bag & Case Style :: Product Count = 2  
453. Has Stand :: Product Count = 2  
454. Clothing Type :: Product Count = 2  
455. Ships in Multiple Boxes :: Product Count = 2  
456. Pest Type :: Product Count = 2  
457. Additional Compartments :: Product Count = 2  
458. Output Waveform :: Product Count = 2  
459. Shooting Programs :: Product Count = 2  
460. Minimum Focus Range :: Product Count = 2  
461. Microphone Output :: Product Count = 2  
462. Radio Antenna Frequency Band Type :: Product Count = 2  
463. Pages Per Minute :: Product Count = 2  
464. Has Shoulder Strap :: Product Count = 2  
465. Programmable :: Product Count = 2  
466. Sound Level :: Product Count = 2  
467. Top Material :: Product Count = 2  
468. Display Location :: Product Count = 2

469. Nominal Voltage :: Product Count = 2  
470. Animal Type :: Product Count = 2  
471. Fabric Material :: Product Count = 2  
472. Sport Type :: Product Count = 2  
473. Detachable Faceplate :: Product Count = 1  
474. Antenna Connector Type :: Product Count = 1  
475. Warnings :: Product Count = 1  
476. Number of Ringtones :: Product Count = 1  
477. Number of Cartridges :: Product Count = 1  
478. HD Radio :: Product Count = 1  
479. Anti-Aging :: Product Count = 1  
480. Drive System :: Product Count = 1  
481. Barcode Type :: Product Count = 1  
482. Retractable :: Product Count = 1  
483. Number of Rack Units :: Product Count = 1  
484. Skin Type :: Product Count = 1  
485. Number of Pins :: Product Count = 1  
486. Alphanumeric Character :: Product Count = 1  
487. Designer :: Product Count = 1  
488. Fitness Goal :: Product Count = 1  
489. Manufacturer City :: Product Count = 1  
490. Partner Originated Base UPC :: Product Count = 1  
491. Message Recorder :: Product Count = 1  
492. Map Datum :: Product Count = 1  
493. Grip Type :: Product Count = 1  
494. Computer Replacement Part Type :: Product Count = 1  
495. Has Installed Keylock :: Product Count = 1  
496. Coupler Type :: Product Count = 1  
497. Optical Disk Drive Type :: Product Count = 1  
498. Circuit Breaker Type :: Product Count = 1  
499. Read Format :: Product Count = 1  
500. Media Included :: Product Count = 1  
501. Resistance :: Product Count = 1  
502. Flavor :: Product Count = 1  
503. Maximum Frequency Response :: Product Count = 1  
504. Has Lid :: Product Count = 1  
505. Manufacturer Phone Number :: Product Count = 1  
506. DLNA-Certified :: Product Count = 1  
507. Chuck Size :: Product Count = 1  
508. Network Cable Type :: Product Count = 1  
509. Energy Consumption Per Year :: Product Count = 1  
510. Audio Turntable Speed :: Product Count = 1  
511. Number of Recording Layers :: Product Count = 1

512. Decibels :: Product Count = 1  
513. Mini-Jack Adapter :: Product Count = 1  
514. Made From Recycled Materials :: Product Count = 1  
515. Number of Tabs :: Product Count = 1  
516. Automatic Voltage Regulation :: Product Count = 1  
517. Adjustable Depth :: Product Count = 1  
518. Caliber :: Product Count = 1  
519. Waterproof :: Product Count = 1  
520. Error Correcting :: Product Count = 1  
521. Manufacturer Street :: Product Count = 1  
522. Video Recorder :: Product Count = 1  
523. Instructions :: Product Count = 1  
524. Transmission Range :: Product Count = 1  
525. Compact Stereo Features :: Product Count = 1  
526. Maximum Expandable Memory :: Product Count = 1  
527. Flash Guide Number :: Product Count = 1  
528. LCD Screen Resolution :: Product Count = 1  
529. GPS Device Type :: Product Count = 1  
530. Data Integrity Check Types :: Product Count = 1  
531. Copy Speed :: Product Count = 1  
532. Number of Recording Modes :: Product Count = 1  
533. Number of Utilized RAM Slots :: Product Count = 1  
534. Antenna Direction :: Product Count = 1  
535. Number of Handsets :: Product Count = 1  
536. Assembled Product Weight :: Product Count = 1  
537. Animal Health Concern :: Product Count = 1  
538. Satellite-Ready :: Product Count = 1  
539. Cell Phone Case Type :: Product Count = 1  
540. Handle Style :: Product Count = 1  
541. Bed Size :: Product Count = 1  
542. Horsepower :: Product Count = 1  
543. Shop by Personality :: Product Count = 1  
544. Recording Mode :: Product Count = 1  
545. Recharge Time :: Product Count = 1  
546. Storage Media Type :: Product Count = 1  
547. Manufacturer State :: Product Count = 1  
548. Depth Without Door & Handles :: Product Count = 1  
549. Woofer Size :: Product Count = 1  
550. RAM Memory Speed :: Product Count = 1  
551. BD Profiles :: Product Count = 1  
552. Remote Control Model :: Product Count = 1  
553. Rating Reason :: Product Count = 1  
554. Data Usage :: Product Count = 1

555. Computer Monitor Type :: Product Count = 1  
556. Reverse Mode :: Product Count = 1  
557. Has Disc Changer :: Product Count = 1  
558. Cordless Phone Standard :: Product Count = 1  
559. Line Coding Format :: Product Count = 1  
560. Speakerphone Capability :: Product Count = 1  
561. Interface Speed :: Product Count = 1  
562. Flash Type :: Product Count = 1  
563. Framed :: Product Count = 1  
564. Holding Capacity :: Product Count = 1  
565. Manufacturer Web Site :: Product Count = 1  
566. Cellular Network Technology :: Product Count = 1  
567. Dialed Calls Memory :: Product Count = 1  
568. Light Bulb Type :: Product Count = 1  
569. Charging Time :: Product Count = 1  
570. Automatic Shutoff :: Product Count = 1  
571. Audio Studio Rack Type :: Product Count = 1  
572. Bicycle Frame Size :: Product Count = 1  
573. Clothing Size :: Product Count = 1  
574. Manufacturer Zip Code :: Product Count = 1  
575. Recording Speed :: Product Count = 1  
576. Number of Antennas :: Product Count = 1  
577. Number of Cameras :: Product Count = 1  
578. Health Concern :: Product Count = 1  
579. Industrial :: Product Count = 1  
580. Has Casters :: Product Count = 1  
581. Latency Timing :: Product Count = 1  
582. Maximum RPM :: Product Count = 1  
583. Scent :: Product Count = 1  
584. Energy Star Version :: Product Count = 1