Human nose and The Graphical Law

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Abstract

Nasal index is breadth divided by height of a nose multiplied by hundred. We look into the nasal indices of noses of human beings as gathered by Thomson and Buxton as early as 1923. We draw the natural logarithm of the nasal indices, normalised, vs the natural logarithm of the rank, normalised(unnormalised). We conclude that the human nose, can be characterised by a magnetisation curve of a Spin-Glass in the presence of a little external magnetic field.

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I. INTRODUCTION

Whether it is of Sultan of Arabia or Mrs Gandhi or Ronald Regan or Leonard Euler, we get mesmerised by the exceptional noses as we come across. Way back on 1923, two gentlemen Arthur Thomson and L.H. Dudley Buxton, published in the Journal of the Royal Anthropological Institute of Great Britain and Ireland, an article, "Man's Nasal Index in Relation to Certain Climatic Conditions",[1], in which they have catalogued human nasal indices, living as well as dead(from crania), obtained through studies over the global masses. Nasal index of a human is breadth divided by height of a nose multiplied by hundred. If we arrange the nasal indices in the decreasing order, take natural logarithm, divide by the maximum of the natural logarithms and plot against the natural logarithm of the corresponding rankings(the maximum nasal index being assigned a rank one), do we see a magnetisation curve appearing? Do we find the presence of the graphical law? Answer to it is in the affirmative as appears in the three figures Fig.1-Fig.3 to follow, with f and k denoting the nasal index and the corresponding rank respectively. In our earlier paper, [27], on the Hebrew language, we have concluded that a magnetisation curve of a Spin-Glass in the presence of a little external magnetic field, underlies Hebrew words. In the figure, 2, we draw the Hebrew langauage data points and nasal indices data points together. We go on to the next two sections for routine deliberations.

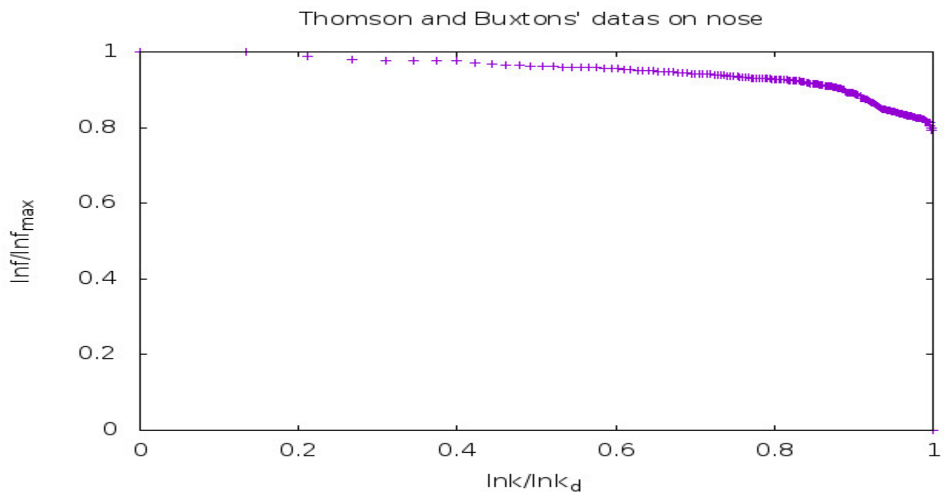

FIG. 1. The vertical axis is $\frac{lnf}{lnf_{max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the noses, [1], of human beings. f and k denote the nasal index and the corresponding rank respectively, with f_{max} being the largest nasal index.

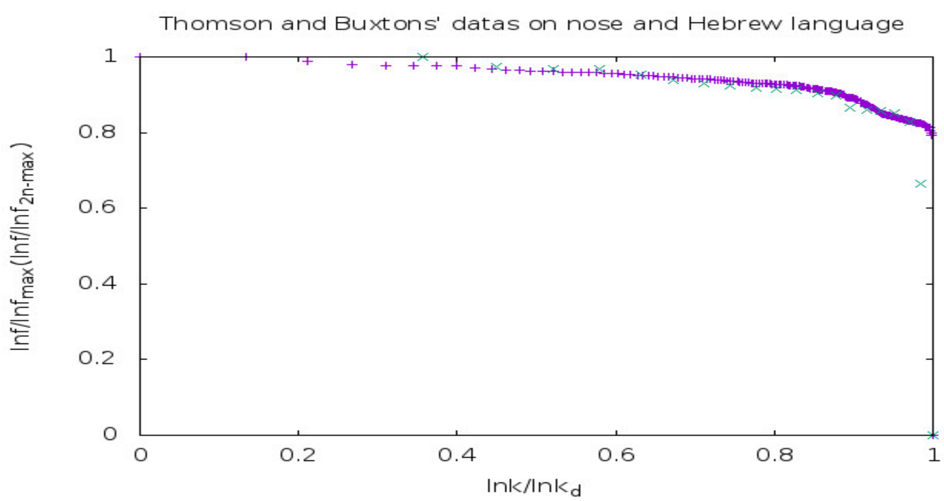

FIG. 2. The vertical axis is $\frac{lnf}{lnf_{max}}$ and the horizontal axis is $\frac{lnk}{lnk_{lim}}$. The + points represent the noses, [1], of human beings, f and k denoting the nasal index and the corresponding rank respectively, with f_{max} being the largest nasal index. For comparison we have drawn the Hebrew language points, $\times$, with $\frac{lnf}{lnf_{2n-max}}$ along the vertical axis, [27], f and k denoting the number of words starting with a letter and the corresponding ranked letter respectively, with f_{2n-max} being the third largest number of words set to start with a letter.

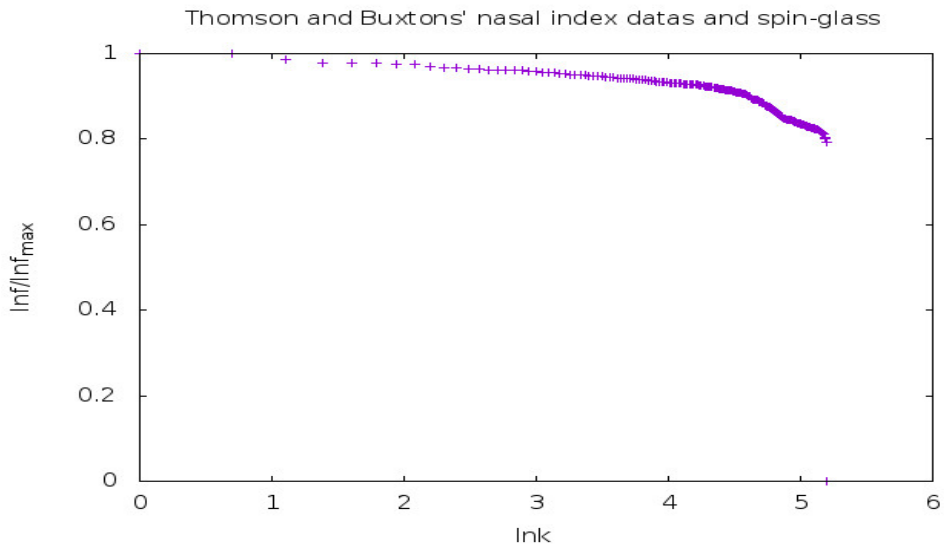

FIG. 3. The vertical axis is $\frac{lnf}{lnf_{max}}$ and the horizontal axis is lnk(in the place of $\frac{lnk}{lnk_{lim}}$). The + points represent the noses,[1], of human beings. f and k denote the nasal index and the corresponding rank respectively.

A. conclusion

In the figures Fig.1-Fig.3, the pointslines have smothened transition, [133]. Above the transition point(s),the lines are straight and almost horizontal. Below the transition point(s), points-lines, plausibly, rises like the branch of a rectangular hyperbola. As below the transition point, which is from the figure Fig.3, $lnk = 5.193$, nasal indices even if available now will be very few, bordering on pathological cases, making the lnk_{lim} very close to $lnk = 5.193$, thereby yielding the lower part to rise like the branch of a rectangular hyperbola. Hence, the noses of human beings, [1], are suited to be described by a Spin-Glass magnetisation curve, [118], in the presence of little external magnetic field. Moreover, the associated correspondence is,

$$\frac{lnf}{lnf_{max}} \longleftrightarrow \frac{M}{M_{max}},$$
$$lnk \longleftrightarrow T.$$

k corresponds to temperature in an exponential scale, [117].

II. THE GRAPHICAL LAW ANALYSIS

We have started considering magnetic field pattern in [2], in the languages we converse with. We have studied there, a set of natural languages, [2] and have found existence of a magnetisation curve under each language. We have termed this phenomenon as the Graphical Law. This was followed by finding the graphical law in the references [3]-[109]. For the purpose of exploring graphical law, here, we assort the nasal indices, in the descending order, denoted by f and the respective rank, [110], denoted by k. k is a positive integer starting from one. Moreover, the minimum nasal index is 40.3. Hence, we attach a limiting nasal index one. The limiting rank is maximum rank plus one, here it is one hundred eighty one i.e k_{lim} or k_d is 181. As a result both $\frac{lnf}{lnf_{max}}$ and $\frac{lnk}{lnk_{lim}}$ varies from zero to one. Then we tabulate in the adjoining table, Table I, and plot $\frac{lnf}{lnf_{max}}$ against $\frac{lnk}{lnk_{lim}}$ and lnk, in the figures fig.1,2,3.

k	lnk	lnk/lnk_{lim}	f	lnf	lnf/lnf_{max}
1	0	0	104.8	4.652	1
2	0.693	0.133	104.6	4.650	0.9996
3	1.099	0.211	98.6	4.591	0.987
4	1.386	0.267	94.8	4.552	0.979
5	1.609	0.310	94.7	4.551	0.978
6	1.792	0.345	94.0	4.543	0.977
7	1.946	0.374	93.9	4.542	0.976
8	2.079	0.400	93.6	4.539	0.976
9	2.197	0.423	91.1	4.512	0.970
10	2.303	0.443	89.8	4.498	0.967
11	2.398	0.461	89.7	4.496	0.966
12	2.485	0.478	88.5	4.483	0.964
13	2.565	0.493	88.3	4.481	0.963
14	2.639	0.508	88.0	4.477	0.962
15	2.708	0.521	87.9	4.476	0.962
16	2.773	0.533	87.2	4.468	0.960
17	2.833	0.545	87.1	4.467	0.960
18	2.890	0.556	86.9	4.465	0.960
19	2.944	0.566	86.5	4.460	0.959
20	2.996	0.576	86.2	4.457	0.958
21	3.045	0.586	85.7	4.451	0.957
22	3.091	0.595	85.1	4.444	0.955
23	3.135	0.603	85.0	4.443	0.955
24	3.178	0.611	84.5	4.437	0.954
25	3.219	0.619	84.2	4.433	0.953
26	3.258	0.627	83.3	4.422	0.951
27	3.296	0.634	83.0	4.419	0.950
28	3.332	0.641	82.7	4.415	0.949
29	3.367	0.648	82.6	4.414	0.949
30	3.401	0.654	82.3	4.410	0.948
31	3.434	0.661	82.2	4.409	0.948
32	3.466	0.667	82.1	4.408	0.948
33	3.497	0.673	81.9	4.405	0.947
34	3.526	0.678	80.9	4.393	0.944
35	3.555	0.684	80.8	4.392	0.944
36	3.584	0.689	80.7	4.391	0.944
37	3.611	0.695	80.6	4.389	0.943
38	3.638	0.700	80.4	4.387	0.943
39	3.664	0.705	80.1	4.383	0.942
40	3.689	0.710	79.9	4.381	0.942
41	3.714	0.715	79.8	4.380	0.942
42	3.738	0.719	79.5	4.376	0.941
43	3.761	0.724	79.4	4.374	0.940
44	3.784	0.728	79.3	4.373	0.940
45	3.807	0.732	79.2	4.372	0.940
46	3.829	0.737	78.7	4.366	0.939
47	3.850	0.741	78.3	4.361	0.937
48	3.871	0.745	78.0	4.357	0.937
49	3.892	0.749	77.9	4.355	0.936
50	3.912	0.753	77.5	4.350	0.935

k	lnk	lnk/lnk_{lim}	f	lnf	lnf/lnf_{max}
51	3.932	0.756	77.0	4.344	0.934
52	3.951	0.760	76.9	4.343	0.934
53	3.970	0.764	76.8	4.341	0.933
54	3.989	0.767	76.6	4.339	0.933
55	4.007	0.771	76.2	4.333	0.931
56	4.025	0.774	76.0	4.331	0.931
57	4.043	0.778	75.9	4.329	0.931
58	4.060	0.781	75.8	4.328	0.930
59	4.078	0.785	75.7	4.327	0.930
60	4.094	0.788	75.6	4.325	0.930
61	4.111	0.791	75.4	4.323	0.929
62	4.127	0.794	75.2	4.320	0.929
63	4.143	0.797	75.0	4.317	0.928
64	4.159	0.800	74.9	4.316	0.928
65	4.174	0.803	74.8	4.315	0.928
66	4.190	0.806	74.7	4.313	0.927
67	4.205	0.809	74.6	4.312	0.927
68	4.220	0.812	74.5	4.311	0.927
69	4.234	0.815	74.4	4.309	0.926
70	4.248	0.817	74.1	4.305	0.925
71	4.263	0.820	73.8	4.301	0.925
72	4.277	0.823	73.6	4.299	0.924
73	4.290	0.825	73.4	4.296	0.923
74	4.304	0.828	73.2	4.293	0.923
75	4.317	0.831	73.1	4.292	0.923
76	4.331	0.833	72.8	4.288	0.922
77	4.344	0.836	72.7	4.286	0.921
78	4.357	0.838	72.5	4.284	0.921
79	4.369	0.841	72.0	4.277	0.919
80	4.382	0.843	71.4	4.268	0.917
81	4.394	0.845	71.0	4.263	0.916
82	4.407	0.848	70.9	4.261	0.916
83	4.419	0.850	70.8	4.260	0.916
84	4.431	0.852	70.3	4.253	0.914
85	4.443	0.855	70.2	4.251	0.914
86	4.454	0.857	70.0	4.248	0.913
87	4.466	0.859	69.9	4.247	0.913
88	4.477	0.861	69.8	4.246	0.913
89	4.489	0.864	69.4	4.240	0.911
90	4.500	0.866	69.1	4.236	0.911
91	4.511	0.868	68.8	4.231	0.910
92	4.522	0.870	68.6	4.228	0.909
93	4.533	0.872	68.5	4.227	0.909
94	4.543	0.874	68.3	4.224	0.908
95	4.554	0.876	67.9	4.218	0.907
96	4.564	0.878	67.8	4.217	0.906
97	4.575	0.880	67.5	4.212	0.905
98	4.585	0.882	67.2	4.208	0.905
99	4.595	0.884	66.7	4.200	0.903
100	4.605	0.886	66.0	4.190	0.901
101	4.615	0.888	65.7	4.185	0.900

k	lnk	lnk/lnk_{lim}	f	lnf	lnf/lnf_{max}
102	4.625	0.890	64.5	4.167	0.896
103	4.635	0.892	63.8	4.156	0.893
104	4.644	0.893	63.7	4.154	0.893
105	4.654	0.895	63.5	4.151	0.892
106	4.663	0.897	63.2	4.146	0.891
107	4.673	0.899	63.0	4.143	0.891
108	4.682	0.901	62.4	4.134	0.889
109	4.691	0.902	62.2	4.130	0.888
110	4.700	0.904	62.1	4.129	0.888
111	4.710	0.906	61.7	4.122	0.886
112	4.718	0.908	61.1	4.113	0.884
113	4.727	0.909	59.5	4.086	0.878
114	4.736	0.911	59.3	4.083	0.878
115	4.745	0.913	59.2	4.081	0.877
116	4.754	0.915	58.9	4.076	0.876
117	4.762	0.916	58.5	4.069	0.875
118	4.771	0.918	58.0	4.060	0.873
119	4.779	0.919	57.8	4.057	0.872
120	4.787	0.921	57.3	4.048	0.870
121	4.796	0.923	56.5	4.034	0.867
122	4.804	0.924	56.3	4.031	0.867
123	4.812	0.926	55.3	4.013	0.863
124	4.820	0.927	55.2	4.011	0.862
125	4.828	0.929	55.0	4.007	0.861
126	4.836	0.930	53.7	3.983	0.856
127	4.844	0.932	53.4	3.978	0.855
128	4.852	0.933	52.8	3.967	0.853
129	4.860	0.935	52.5	3.961	0.851
130	4.868	0.937	52.0	3.951	0.849
131	4.875	0.938	51.8	3.947	0.848
132	4.883	0.939	51.7	3.945	0.848
133	4.890	0.941	51.2	3.936	0.846
134	4.898	0.942	51.1	3.934	0.846
135	4.905	0.944	51.0	3.932	0.845
136	4.913	0.945	50.9	3.930	0.821
137	4.920	0.947	50.8	3.928	0.844
138	4.927	0.948	50.7	3.926	0.844
139	4.934	0.949	50.6	3.924	0.844
140	4.942	0.951	50.4	3.920	0.843
141	4.949	0.952	50.2	3.916	0.842
142	4.956	0.953	50.0	3.912	0.841
143	4.963	0.955	49.7	3.906	0.840
144	4.970	0.956	49.5	3.902	0.839
145	4.977	0.957	49.1	3.894	0.837
146	4.984	0.959	49.0	3.892	0.837
147	4.990	0.960	48.9	3.890	0.836
148	4.997	0.961	48.8	3.888	0.836
149	5.004	0.963	48.7	3.886	0.835
150	5.011	0.964	48.6	3.884	0.835
151	5.017	0.965	48.3	3.877	0.833

k	lnk	lnk/lnk_{lim}	f	lnf	lnf/lnf_{max}
152	5.024	0.967	48.1	3.873	0.833
153	5.030	0.968	48.0	3.871	0.832
154	5.037	0.969	47.8	3.867	0.831
155	5.043	0.970	47.7	3.865	0.831
156	5.050	0.972	47.6	3.863	0.830
157	5.056	0.973	47.5	3.861	0.830
158	5.063	0.974	47.2	3.854	0.828
159	5.069	0.975	47.1	3.852	0.828
160	5.075	0.976	47.0	3.850	0.828
161	5.081	0.977	46.8	3.846	0.827
162	5.088	0.979	46.7	3.844	0.826
163	5.094	0.980	46.6	3.842	0.826
164	5.100	0.981	46.4	3.837	0.825
165	5.106	0.982	46.3	3.835	0.824
166	5.112	0.983	46.2	3.833	0.824
167	5.118	0.985	46.1	3.831	0.824
168	5.124	0.986	46.0	3.829	0.823
169	5.130	0.987	45.8	3.824	0.822
170	5.136	0.988	45.6	3.820	0.821
171	5.142	0.989	45.5	3.818	0.821
172	5.147	0.990	45.1	3.809	0.819
173	5.153	0.991	44.7	3.800	0.817
174	5.159	0.992	44.4	3.793	0.815
175	5.165	0.994	44.2	3.789	0.814
176	5.170	0.995	44.0	3.784	0.813
177	5.176	0.996	43.8	3.780	0.813
178	5.182	0.997	42.0	3.738	0.804
179	5.187	0.998	41.4	3.723	0.800
180	5.193	0.999	40.3	3.696	0.794
181	5.198	0	1	0	0

TABLE I. Nasal indices: ranking, natural logarithm, normalisations

III. MAGNETISATION: SPIN GLASS

In the case coupling between(among) the spins, not necessarily n.n, for the Ising model is(are) random, we get Spin-Glass. When a lattice of spins randomly coupled and in an external magnetic field, goes over to the Spin-Glass phase, magnetisation increases steeply like $\frac{1}{T-T_c}$ i.e. like the branch of rectangular hyperbola, up to the the phase transition temperature, followed by very little increase,[118–120], in magnetisation, as the ambient temperature continues to drop.

Theoretical study of Spin Glass started with the paper by Edwards, Anderson,[121]. They were trying to explain two experimental results concerning continuous disordered freezing(phase transition) and sharp cusp in static magnetic susceptibility. This was followed by a paper by Sherrington, Kickpatrick, [122], who dealt with Ising model with interactions being present among all neighbours. The interaction is random, follows Gaussian distribution and does not distinguish one pair of neighbours from another pair of neighbours, irrespective of the distance between two neighbours. In presence of external magnetic field, they predicted in their next paper, [123], below spin-glass transition temperature a spin-glass phase with non-zero magnetisation. Almeida etal, [124], Gray and Moore, [125],finally Parisi, [126], [127] improved and gave final touch, [128], to their line of work. Parisi and collaborators, [129]-[133], wrote a series of papers in postscript, all revolving around a consistent assumption of constant magnetisation in the spin-glass phase in presence of little constant external magnetic field.

In another sequence of theoretical work, by Fisher etal,[134–136], concluded that for Ising model with nearest neighbour or, short range interaction of random type spin-glass phase does not exist in presence of external magnetic field.

For recent series of experiments on spin-glass, the references, [137, 138], are the places to look into.

For an in depth account, accessible to a commoner, the series of articles by late P. W. Anderson in Physics Today, [139]-[145], is probably the best place to look into. For a book to enter into the subject of spin-glass, one may start at [146].

IV. ACKNOWLEDGEMENT

We have used gnuplot for drawing the figures.

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