Bach meets Occam

Analyzing and generating fugal sequences

Fuga

BWV 578

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(1685-1750)

Models make predictions

If I can use Occam to take existing fugues and turn them into predictions, I can use those predictions to generate new fugues!

(that's the idea)

[67 74 70 69 67 70 69]

-3 +4 0 -1 -3 0 --> *-1*

Discovering the ideal number of preceding notes to take into account when predicting the next note:

ID	MODEL	Level	H	dDF	dLR	Alpha	Inf	%dH(DV)	dAIC	dBIC	Inc.Alpha	Prog.	%C(Data)	%cover
22	IV:ADZ:BDZ:CZ:EZ	7	9.1287	16996	3019.3988	1.0000	0.91193062	81.1199	-30972.6012	-113206.1360	0.9978	18	85.8521	0.0083
21	IV:AEZ:BDZ:CZ	7	9.1445	14896	2998.9258	1.0000	0.90574728	80.5698	-26793.0742	-98865.9581	1.0000	19	85.5305	0.0083
20	IV:ADZ:AEZ:BDZ	7	9.1736	22960	2961.3241	1.0000	0.89439067	79.5596	-42958.6759	-154048.4593	1.0000	18	83.6013	0.1846
19	IV:AEZ:BDZ	6	9.3206	14560	2771.1512	1.0000	0.83695391	74.4504	-26348.8488	-96796.0285	1.0000	15	80.2787	0.1846
18	IV:ADZ:BDZ:EZ	6	9.3354	16660	2752.1003	1.0000	0.83120009	73.9386	-30567.8997	-111175.7303	1.0000	15	80.9218	0.1846
17	IV:ABZ:BDZ:EZ	6	9.3672	18760	2710.9844	1.0000	0.81878208	72.8339	-34809.0156	-125577.4972	1.0000	15	79.5284	0.1846
16	IV:BDZ:CZ:EZ	5	9.6061	8176	2401.9813	1.0000	0.72545579	64.5322	-13950.0187	-53508.8196	0.4457	13	74.2765	0.1859
15	IV:AZ:BDZ:EZ	5	9.6284	8260	2373.1234	1.0000	0.71673998	63.7569	-14146.8766	-54112.1036	1.0000	13	73.5263	0.1846
14	IV:BEZ:CZ:DZ	5	9.6329	6426	2367.3323	1.0000	0.71499096	63.6013	-10484.6677	-41576.2595	0.0082	11	73.8478	0.1859
13	IV:BDZ:EZ	4	9.8681	7840	2063.1064	1.0000	0.62310746	55.4279	-13616.8936	-51549.9903	1.0000	8	66.2379	3.4455
12	IV:BEZ:DZ	4	9.8867	6090	2039.0502	1.0000	0.61584190	54.7816	-10140.9498	-39606.8375	0.0000	10	65.8092	3.4455
11	IV:BEZ:CZ	4	9.8956	6146	2027.5271	1.0000	0.61236166	54.4720	-10264.4729	-40001.3112	0.0507	10	63.5584	3.0192
10	IV:BEZ	3	10.1890	5810	1647.9479	1.0000	0.49771965	44.2742	-9972.0521	-38083.1863	1.0000	6	52.5188	35.8173
9*	IV:CZ:DZ:EZ	3	10.2049	826	1627.3872	0.0000	0.49150984	43.7218	-24.6128	-4021.1355	0.0000	5	61.0932	2.8452
8*	IV:BZ:DZ:EZ	3	10.2497	840	1569.5616	0.0000	0.47404514	42.1682	-110.4384	-4174.6987	0.0000	6	58.4137	3.4455
7*	IV:DZ:EZ	2	10.5415	490	1192.0810	0.0000	0.36003697	32.0267	212.0810	-2158.7375	0.0000	3	48.3387	28.2738
6*	IV:BZ:EZ	2	10.5772	560	1145.9266	0.0000	0.34609723	30.7867	25.9266	-2683.5803	0.0026	4	45.3376	35.8173
5*	IV:CZ:EZ	2	10.5901	546	1129.1971	0.0000	0.34104451	30.3373	37.1971	-2604.5722	0.0000	2	46.5166	31.0000
4*	IV:EZ	1	10.9081	210	717.9345	0.0000	0.21683339	19.2882	297.9345	-718.1306	0.0000	1	36.5488	100.0000
3*	IV:DZ	1	11.0063	280	590.9536	0.0000	0.17848212	15.8767	30.9536	-1323.7998	0.0000	1	38.3708	100.0000
2*	IV:CZ	1	11.0118	336	583.8542	0.0000	0.17633793	15.6860	-88.1458	-1713.8499	0.0000	1	37.6206	100.0000
1*	IV:Z	0	11.4632	0	0.0000	1.0000	0.00000000	0.0000	0.0000	0.0000	0.0000	0	28.4030	100.0000
ID	MODEL	Level	H	dDF	dLR	Alpha	Inf	%dH(DV)	dAIC	dBIC	Inc.Alpha	Prog.	%C(Data)	%cover

Best Model(s) by dBIC:

| 1* | IV:Z | 0 | 11.4632 | 0 | 0.0000 | 1.0000 | 0.00000000 | 0.0000 | 0.0000 | 0.0000 | 0.0000 | 0 | 28.4030 | 100.0000 |

Best Model(s) by dAIC:

| 4* | IV:EZ | 1 | 10.9081 | 210 | 717.9345 | 0.0000 | 0.21683339 | 19.2882 | 297.9345 | -718.1306 | 0.0000 | 1 | 36.5488 | 100.0000 |

Best Model(s) by Information, with all Inc. Alpha < 0.05:

| 9* | IV:CZ:DZ:EZ | 3 | 10.2049 | 826 | 1627.3872 | 0.0000 | 0.49150984 | 43.7218 | -24.6128 | -4021.1355 | 0.0000 | 5 | 61.0932 | 2.8452 |

Reading the fit tables produced by Occam for all previous note lengths less than or equal to 3 for note and duration data = 6 fits per fugue

(currently working with Joe to automate this part)

Transforming the fit tables into an engine for generating note sequences

Seed : (note duration) = (61 5)
First iteration = (61 5) (68 5) --> Predict next with note [-7 0], duration [0 0]
(61 5) (68 5) (64 6)   -->   [-3 +4 0]   [-1 -1 0]
(61 5) (68 5) (64 6) (63 4)   -->   [-2 +5 +1 0]   [+1 +1 2 0]
(61 5) (68 5) (64 6) (63 4) (61 4) -->   [+7 +3 +2 0]   [+1 +2 0 0]

Play them!

Thank you

occam (for reading, writing and manipulating Occam files)
http://github.com/prismofeverything/occam
fuga (for transforming midi through Occam into a musical note generator)
http://github.com/prismofeverything/fuga