

Report for OAI Phase I Collaborative Core Research Project on

"Data Mining and Knowledge Discovery"

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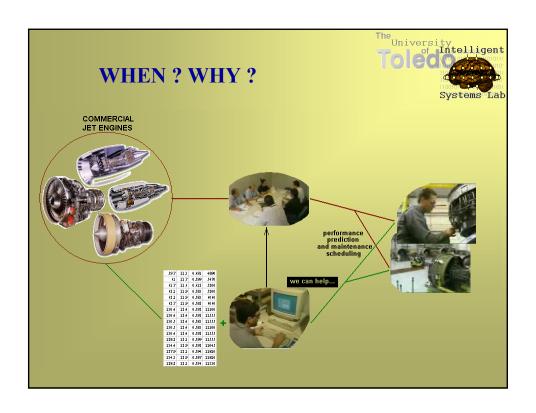
Michael Bailey Dion Duckett Kristy Gau Stephen Mitchell General Electric Aircraft Engines

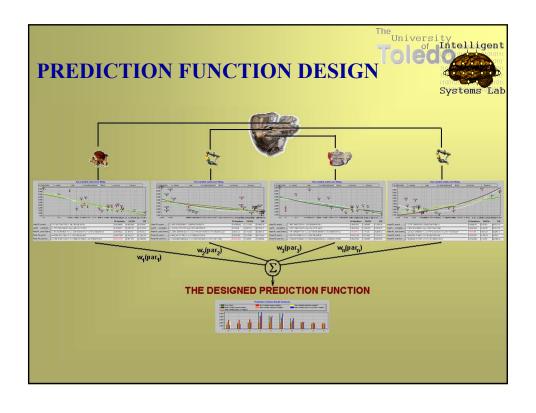
RESEARCH GOAL

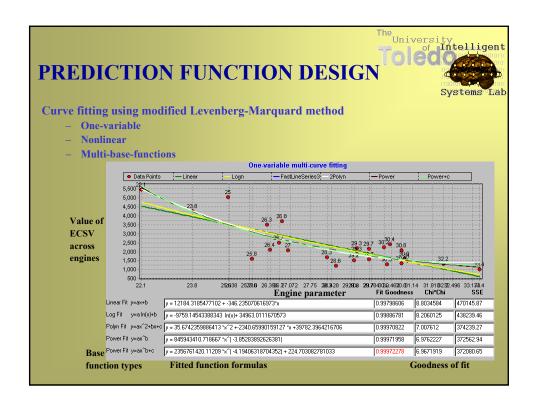


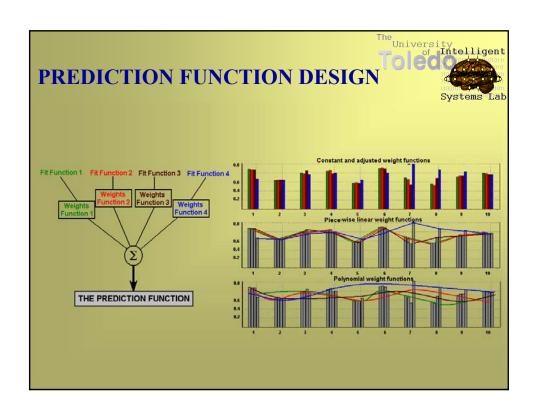
• Life time prediction of aircraft engines by mining in engine performance data

Presentation prepared using materials from GEAE web page: http://www.geae.net/index.html









RESULTS



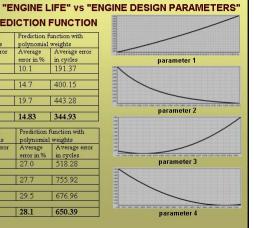
DESIGNED PREDICTION FUNCTION TESTING AND POSSIBLE APPLICATIONS

PREDICTED RELATIONSHIPS

ENGINE LIFE PREDICTION USING DESIGNED PREDICTION FUNCTION

TRAIN		unction with I adjusted weighs		function with linear weights	Prediction function with polynomial weights	
DATA	Average error in %	Average error in cycles	Average error in %	Average error in cycles	Average error in %	Average error in cycles
Engine 1	14.9	282.83	1.7	31.7	10.1	191.37
Engine 2	25.0	679.55	1.5	40.61	14.7	400.15
Engine 1&2	30.7	689.49	5.35	120.19	19.7	443.28
STIMMARY	23.5	550.62	2.8	55 53	14.83	344 93

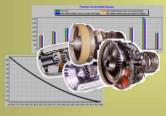
TEST	Prediction for constant and	nction with adjusted weighs		function with linear weights	Prediction function with polynomial weights	
DATA	Average error in %	Average error in cycles	Average error in %	Average error in cycles	Average error in %	Average error in cycles
Engine 1 TEST	22.2	430.43	23.0	437.75	27.0	518.28
Engine 2 TEST	33.4	912.28	27.3	747.98	27.7	755.92
Engine1&2TEST	34.1	790.26	27.7	631.68	29.5	676.96
SUMMARY	29.9	710.99	26.0	605.80	28.1	650.39



FUTURE WORK



CROSS-FAMILY PREDICTION ESTIMATES



MULTI PARAMETER TRANSFORMATIONS AND CROSS-CORRELATION

- *	*	-	-			ΔN		SIS		- 2	
183	- 83	*	*3	*	**		State Control		0 100	160	
- 6	- 8		- 6	3	- 37	- 6	- 67	- 67	- 67	- 10	
. 3.			-	0.647	-	- 6	- 1	100	- 1		
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0.933	0.983	3.	3.	3.	0.440	0.987	0.987	3	3)	3	
0.460	0.472	-	-		-	0.455	0.457	0.472	- 3		
0.979	8.974	*		-	0.430	0.978	0.978	0.994	0.472	- 10	

AVERAGE SV TIME ESTIMATION AND CAUSE FACTORS ANALYSIS

	1	25832	8096	5106	1544	5106	1544 D	3 03
	3	36249	8849	3417	430	3417	480 D	4 D6
	П	37581	7821	0	0	5960	936 0	4 D6
	2	34879	7807	6833	665	4683	665 D	5 D8
	1	34711	6519	3799	929	3799	929 0	IL DE
	6	41512	5968	7221	1415	7221	1415 D	5 DS
	П	47001	6914	0	0	!E+04	3106 D	3 04
	2	46121	5950	8840	1682	8840	1682 D	2 02
- 1	1	36591	6603	6656	1337	6656	1337 D	IL DE
	3	36881	9238	637	112	637	112 [6 O7
- [0	40113	8221	0	0	E+04	2139 D	6 D6
- 1	2	38217	7942	739	105	1967	221 0	5 08
ı	2	26158	8189	1344	478	1344	478 D	13 D4
	2	27 493	8109	0	0	0	0.0	IL DE
	3	26325	7942	682	239	2114	691 D	3 04
	2	45711	8081	3336	1785	3336	1785 0	IL DE
		40206	6056	6721	1360	7002	1419 0	B D5
	3	45306	7428	6161	1251	6161	1251 0	3 03
	1	18934	12969	2129	1724	2129	1724 0	9 09
- 5	0	20392	7369	0	0	1099	551 D	5 11
	0	27573	6771	0	0	1462	1507 0	5 D5
	2	7670	4540	3058	1687	3058	1687 0	2 02
	2	7634	4959		1466			
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	1	21678	7845	0	0	259	283 0	
		24110					0.0	
- 3	2			25009				
	1	21245	14174	2230	1826	2535	1905 D	6 DB
	1	45778	8579	60145	849	6045	849 0	5 D5