

SIMPLY BETTER DECISIONS

INTRODUCING HYBRID INTELLIGENCE

"Rather than trying to explain Black boxes, build models that are interpretable"

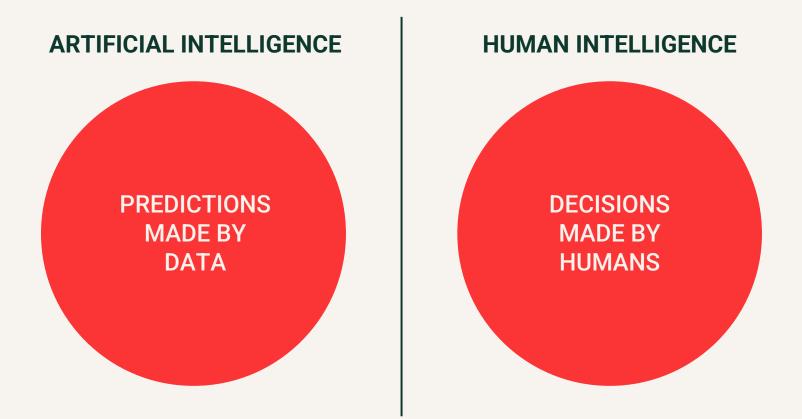
Cynthia Rudin

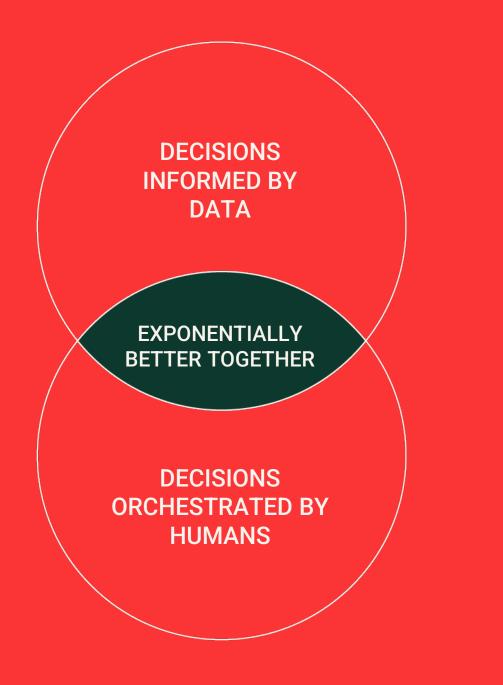
HYBRID INTELLIGENCE

- Hybrid Intelligence
- Some Use Case examples
- Collaboration
- Q&A



YOU SHOULDN'T HAVE TO CHOOSE





HYBRID INTELLIGENCE

The hallmark of a truly disruptive technology is the simplicity with which it solves problems and how quickly it lays bare the fundamental inadequacies of what it replaces



TIMELINES

Dec 2018 – first theoretical breakthroughs

2019 – initial implementation and validation of theory

2019/20 – IP development and protection, initial productisation attempts

2021 – First MVP build, benchmarking and further validation inc. a pivot or two

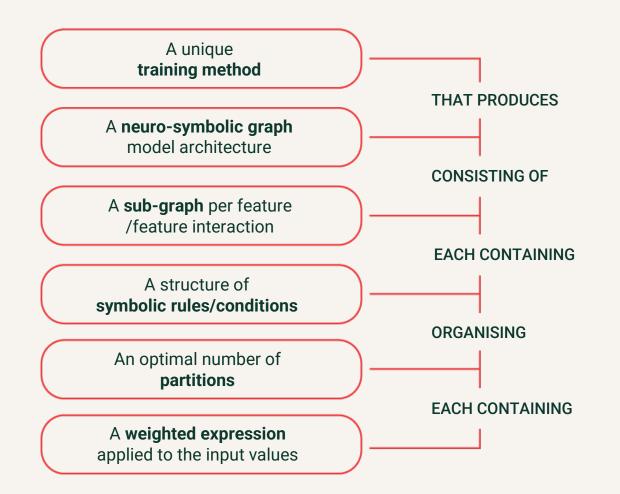
2022 – Final shippable MVP

WHAT IS IT?

- new, novel, proprietary, licensable technology.
- enabling technology, consisting of:
 - model Induction (training) library
 - novel model architecture and model inference library
 - development framework and toolkits
- productised to be a "drop-in" alternative to common current tools and techniques
- as predictively performant as best-in-class current modelling techniques in most use-cases
- agnostic

powered by UMNAI HYBRID INTELLIGENCE

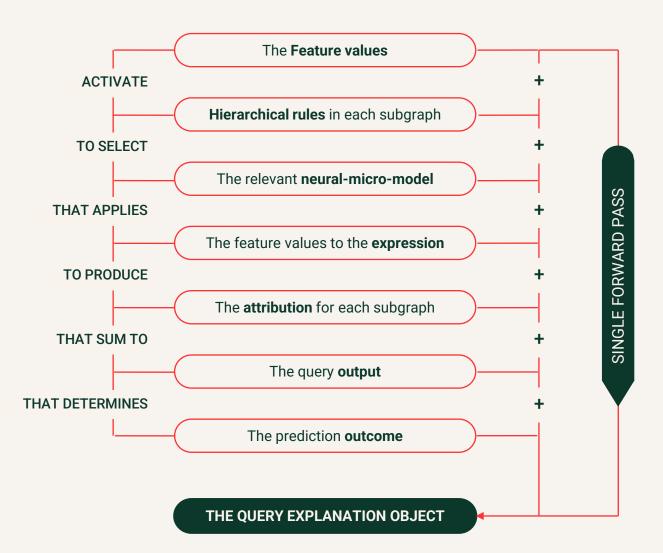
INDUCTION TRAINING AND MODELS



- ✓ Increasing similar behaviour within partitions
- Maximising dissimilarity between partitions
- ✓ Minimising complexity
- Preference for smaller over larger models
- ✓ Preference for wide over deep

Local Explanation Object the foundation of empowerment

- Realtime
- Guaranteed to be correct
- Complete
- Fully decomposed
- Programmatically Consumable
- No additional processing



HOW A LOCAL EXPLANATION OBJECT IS BUILT

Powered by UMNAI HYBRID INTELLIGENCE

														-
RANK	TO TAL ATTRIBUTION	% ION TRIBUTION	FEATU RE		RINLOW	RN HIGH	ATTRIBUTION	FEATU RE		RINLOW	ATTRIBUTION		ATION PARTITION	
1	0.164473	5.675%	Education	Masters	UN LOW	Sin mon	0.132569	Occupation	Managerial	0.112011	0.03190	54	4	
2	-0.122653	4.232%	Gender	Female			-0.081230	MaritalStatus	Divorced		0.04142	69	0	
3	0.091327	3.151%	EducationYrs Race	14 White	13.5	15.00	0.045510	Race Relationship	White		0.04582	64	6	
5	0.069460	2.397%	Age	43	42.5	43.50	0.034457	Gender	Female		0.03500	18	50	
6	-0.065308	2.253%	MaritalStatus	Divorced			-0.034191	Race	White		-0.03112	85	0	
7	-0.062954 0.061674	2.172%	CapitalG ain	0		7,073.50	0.021263	Education	Masters		0.01926	102	0	
8	0.051674	2.128%	Age MaritalStatus	43 Divoced	29.5	_	0.030695	Education Relationship	Masters Unmarried		0.03098	16	11	
10	-0.056506	1.950%	Gender	Female			-0.028933	Relations hip	Unmanted		-0.02757	73	0	
11	-0.054822	1.892%	MaritalStatus	Divorced	-	1 and	-0.031486	WorkClass	Selfempnotinc		-0.02334	87	0	
12 13	0.053502	1.846%	Hours PerWeek Capital Los s	45	41.5	-	0.012345	Occupation MaritalStatus	Execmanagerial Divorced		0.04116	78	2	
13	-0.051762	1.786%	Education	Masters	-		-0.022782	MaritalStatus	Divorced		-0.02898	52	0	
15	-0.051227	1.768%	MaritalStatus	Divorced			-0.051227					7	0	
16	0.049790	1.718%	Age	43	38.5	46.50	-0.024727	MaritalStatus	Divorced		0.02506	20	5	
17 18	0.049447	1.706%	Hours PerWeek NativeCountry		43.5		0.024624	Relationship Occupation	Unmarried Execmanagerial		0.02482	80	3	
19	0.047822	1.650%	CapitalGain	0		457.00	0.023632	Education	Masters		0.02419	28	5	
20	0.047618	1.643%	EducationNum		12.5		0.023811	fnlwgt	292,175.00		0.02381	67	5	
21	0.046361	1.600%	fnlwgt	292175	275969	*******	-0.046361					13	8	
22 23	0.046279	1.597%	MaritalStatus MaritalStatus	Divorced Divorced		-	0.023886	fnlwgt NativeCountry	292,175.00 UnitedStates		0.02239	88	0	
24	0.044728	1.543%	CapitalG ain	0		5,119.00	0.022296	EducationNun	14.00	13.5	0.02243	29	16	
25	0.044471	1.534%	CapitalG ain	0	-	5,119.00	-0.023376	WorkClass	Selfempnotinc		-0.02110	37	1	
26	0.044050	1.520%	CapitalG ain	0	43.5	2,337.50	-0.021335	MaritalStatus	Divorced		-0.02273	32	0	
27 28	0.043328	1.495%	Hours PerWeek CapitalGain	45	43.5	7,073.50	0.021302	MaritalStatus Occupation	Divorced Execmanagerial		0.02203	76	3	
29	0.042324	1.460%	Occupation	Execmanageria	4		0.042324					9	0	
30	0.039117	1.350%	CapitalLoss	0	1000	1,820.50	-0.018341	WorkClass	Selfempnotinc		-0.02078	47	0	
31 32	0.037977	1.310%	Gender	Female			0.018963	fnlwgt	292,175.00	192285	-0.01901 0.01935	75	8	
32	0.037861	1.306%	Occupation CapitalGain	Execmanageria 0			0.018507	Race Relationship	White Unmanied		0.01935	92	0	
34	0.037430	1.291%	CapitalLoss	0			-0.016560	Occupation	Execmanagerial		0.05399	45	0	
35	0.037315	1.287%	CapitalGain	0		5,119.00	0.018467	Occupation	Execmanagerial		0.01885	34	4	
36 37	-0.037219 0.036714	1.284												
38	0.034516	1.191			Т	ΌΤΑ				%				
39	-0.034343	1.185	RANK							/0				
40	0.033291	1.149				DIDI I	TION		ONTR	юн			EEAT	TURE
42	0.032013	1.105			4111	VIDU		<u> </u>		IDUI			FEA	IUKE
43	-0.031804													
		1.097			~						,			
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			_		0.3	1644	73		5.6	75%	6		Educ	ation
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44 45 46 47 48	0.030597 0.030107 0.028518 0.028089 0.027980	1.056 1.039 0.984 0.969 0.965	1 2			1644 <mark>122</mark> (75% 32%				ation nder
44 45 46 47 48 49	0.030597 0.030107 -0.028518 -0.028089 0.027980 0.026366	1.056 1.039 0.984 0.969 0.965 0.910	2		-0.	122	653		4.2	32%	6		Ger	nder
44 45 46 47 48	0.030597 0.030107 0.028518 0.028089 0.027980	1.056 1.039 0.984 0.969 0.965	-		-0.		653		4.2		6		Ger	
44 45 46 47 48 49 50 51 52	0.030597 0.030107 -0.028518 -0.0285089 0.027980 0.026366 -0.026003 -0.022881 0.021853	1.056 1.039 0.984 0.969 0.965 0.910 0.897 0.789 0.754	2 3		- <mark>0</mark> . 0.0	122 0913	653 827		4.2 3.1	32% 51%	6		Ger ducat	nder tionYrs
44 45 46 47 48 49 50 51 51 52 53	0.030597 0.030107 -0.028518 -0.028589 0.027980 0.026366 -0.026003 -0.022881 0.022881 0.022853 -0.022853	1.056 1.039 0.984 0.969 0.965 0.910 0.897 0.789 0.754 0.710	2		- <mark>0</mark> . 0.0	122	653 827		4.2 3.1	32%	6 6		Ger ducat	nder
44 45 46 47 48 49 50 51 51 52 53 54 55	0.030597 0.030107 0.028518 0.027980 0.027980 0.025366 0.026366 0.022881 0.022881 0.021853 0.021853 0.022853 0.022850 0.021853	1 056 1 039 0 969 0 969 0 965 0 910 0 897 0 789 0 754 0 710 0 651 0 640	2 3		-0. 0.0 -0.	122 0913 0844	653 827 489		4.2 3.1 2.9	32% 51% 15%	6 6		Ger ducat	nder tionYrs
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44 45 46 47 48 49 50 51 51 52 53 54 55	0.030597 0.030107 0.028518 0.027980 0.027980 0.025366 0.026366 0.022881 0.022881 0.021853 0.021853 0.022853 0.022850 0.021853	1 056 1 039 0 969 0 969 0 965 0 910 0 897 0 789 0 754 0 710 0 651 0 640	2 3		-0. 0.0 -0.	122 0913	653 827 489		4.2 3.1 2.9	32% 51%	6 6		Ger ducat Ra	nder tionYrs
44 45 46 47 48 49 50 51 52 53 53 54 55 55 55 55 55 55 55 55 55 55 55 55	0.030597 0.030107 0.028089 0.022980 0.022980 0.025856 0.025656 0.025656 0.022831 0.022831 0.022831 0.022831 0.022853 0.022853 0.022853 0.021854 0.018854 0.018546 0.016530 0.016530	1.056 1.019 0.969 0.969 0.969 0.969 0.959 0.754 0.754 0.754 0.651 0.640 0.652 0.579 0.579	2 3 4 5		-0. 0.(-0. 0.(122(0913 0844 0694	653 827 489 460	Hours Perlie eel	4.2 3.1 2.9 2.3	32% 51% 15% 97%	6 6 6		Ger ducat Ra	nder tionYrs ace
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AN EXTRACT

.9	1.284													
5	1267 1191 1189 1189 RAN	TOTAL	%										ACTIV	ATION
3	1149 DVAIN 11137 1105	ATTRIBUTION	CONTRIBUTION	FEATURE	INPUT	BIN LOW	BIN HIGH	ATTRIBUTION	FEATURE	INPUT	BIN LOW	ATTRIBUTION	MODULE	PARTITION
7	1.097 1.056 1.039	0.164473	5.675%	Education	Masters			0.132569	Occupation	Managerial		0.03190	54	4
18 19 0	0.969 2	-0.122653	4.232%	Gender	Female			-0.081230	MaritalStatus	Divorced		-0.04142	69	0
6 0 03 0 81 0	0.910 0.897 0.789 3	0.091327	3.151%	EducationYrs	14	13.5	15.00	0.045510	Race	White		0.04582	64	6
3 0	0.754 0.710 4	-0.084489	2.915%	Race	White			-0.042244	Relationship	Unmarried		-0.04224	96	3
6 I	0.640 0.623 5	0.069460	2.397%	Age	43	42.5	43.50	0.034457	Gender	Female		0.03500	18	50
0	0.570													

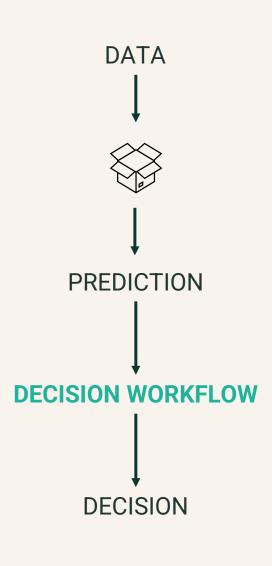




FIT TO DATA

FIT FOR PURPOSE ->

A statistically perfect prediction can be a catastrophic decision



MAKING BETTER DECISIONS

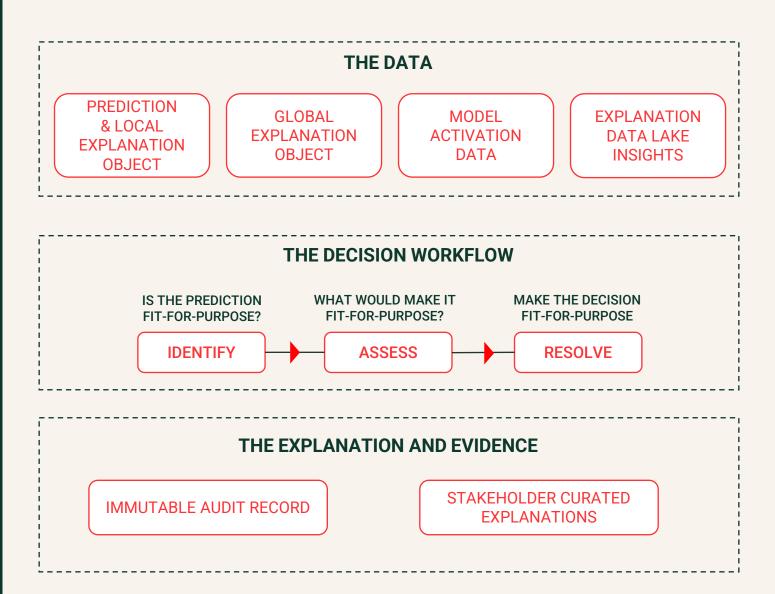
CHOICE *empowers good decisions*

OVERSIGHT *empowers fair decisions*

CERTAINTY *empowers safe decisions*

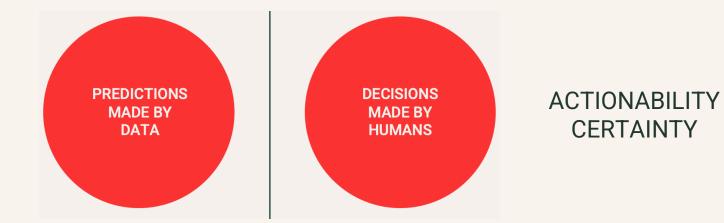
UNDERSTANDING empowers smart decisions

powered by UMNAI



A WHOLE NEW PLAYING FIELD

UNDERSTANDING INSIGHT



THE **CODIFICATION** OF INTENTION, OBLIGATION, ETHICS, KNOWLEDGE, CONTROLS



AUDTIABILITY

Full, granular compute graph of every prediction communicated directly by the model in real time. UVC codes inherently added for immutability, DLT compatible

Auditability solved out of the box



EXPLAINABILITY

Full, granular, decomposed attributions underpinning each prediction communicated directly by the model in real time.

Understand your use case and stakeholders and build stakeholder appropriate explanations.

Explainability solved out of the box



RISK CONFIDENCE

Hesitation, friction and conflict in internal risk assessment of potential, proposed or existing AI applications. Stakeholder support and buy-in.

- · Identify and assess risks with absolute, verifiable certainty
- Manage system and functional risks with precise, actionable and instant monitoring

DATA LAKE

The precise and complete audit record of every computation for every prediction made plus every identification, assessment and resolution applied

CODIFIED RISK TESTS

Applied to data lake periodically or in real/near time if justified

REPORT

Globally, individual items of interest with drill down to most granular detail if required



HIGH VELOCITY ANYTHING

Catastrophic failure, costs of delay/hesitation, ungraceful failure, confidence

- Monitor partition activation data and phase changes along to determine functional change within model.
- Build alternate failsafe/fallback logic actioned when things go wrong

ACTIVATION MAP

Every partition activated for every query provides precise ground truth for anomaly detection.

ANTICIPATE AND IDENTIFY

Build monitoring tools to aanticipate and identify functional anomalies or incoherencies before/as they happen

ACT GRACEFULLY

Build immediate fail-safes/fallbacks that gracefully handle anomalies as they happen

powered by UMNAI HYBRID INTELLIGENCE

SUSPICIOUS TRANSACTION MONITORING

Incredible level of false positives, huge cost of investigation, significant regulatory risk exposure

- Subject positives to additional, human codified, sanity and severity checks prior to investigation
- Cut investigation time by explaining positive flagging attributions

HUMAN CODIFIED FILTERING

Apply human derived tests and risk assessments on data classified positives to eliminate the low risk flagged transactions

INFORM and UNDERSTAND

Provide investigators with a complete "here is why this was flagged" before they start investigating

IMPROVE

Constantly evolve and improve the decision flows to enrich the codification and efficacy of the decision flows



	TOTAL	×		-						_	_	ACTO	/ATION
RAN K	ATTRIBUTION	ONTRIBUTION	FEATU RE			BIN HIGH	ATTRIBUTION	FEATU RE		BIN LOW	ATTRIBUTION		PARTITION
1	0.164473	5.675%	Education	Masters	1000		0.132569	Occupation	Managerial		0.03190	54	4
2	-0.122653	4.232%	Gender	Female			-0.081230	MaritalStatus	Divorced		-0.04142	69	0
3	0.091327	3.151%	EducationYrs	14	13.5	15.00	0.045510	Race	White		0.04582	64	6
4	-0.084489	2.915%	Race	White			-0.042244	Relationship	Unmanied		-0.04224	96	3
5	0.069460	2.397%	Age	43	42.5	43.50	0.034457	Gender	Female		0.03500	18	50
6	-0.065308	2.253%	MaritalStatus	Divorced			-0.034191	Race	White		-0.03112	85	0
7	-0.062954	2.172%	CapitalG ain	0		7,073.50	-0.021263	Education	Masters		-0.01926	102	0
8	0.061674	2.128%	Age	43	29.5		0.030695	Education	Masters		0.03098	16	11
9	-0.057393	1.980%	MaritalStatus	Divorced			-0.027984	Relationship	Unmanied		-0.02941	86	0
10	-0.056506	1.950%	Gender	Female			-0.028933	Relationship	Unmanied		-0.02757	73	0
11	-0.054822	1.892%	MaritalStatus	Divorced		110	-0.031486	WorkClass	Selfempnotinc		-0.02334	87	0
12	0.053502	1.846%	Hours PerWeek	45	41.5		0.012345	Occupation	Execmanagerial		0.04116	78	2
13	-0.052796	1.822%	CapitalLoss	0			-0.026097	MaritalStatus	Divorced		-0.02670	43	0
14	-0.051762	1.786%	Education	Masters			-0.022782	MaritalStatus	Divorced		-0.02898	52	0
15	-0.051227	1.768%	MaritalStatus	Divorced			-0.051227					7	0
16	-0.049790	1.718%	Age	43	38.5	46.50	-0.024727	MaritalStatus	Divorced		-0.02506	20	5
17	0.049447	1.706%	Hours PerWeek	45	43.5		0.024624	Relationship	Unmarried		0.02482	80	5
18	0.048138	1.661%	NativeCountry	UnitedStates			0.025282	Occupation	Execmanagerial		0.02286	89	3
19	0.047822	1.650%	CapitalGain	0		457.00	0.023632	Education	Masters		0.02419	28	5
20	0.047618	1.643%	EducationNum	14	12.5		0.023811	fnlwgt	292.175.00		0.02381	67	5
21	-0.046361	1.600%	fnlwgt	292175	275969	*******						13	8
22	-0.046279	1.597%	MaritalStatus	Divorced		-	-0.023886	fnlwgt	292.175.00		-0.02239	88	0
23	-0.045163	1.558%	MaritalStatus	Divorced	1.00	-	-0.046199	NativeCountry	UnitedStates		0.00104	83	0
24	0.044728	1.543%	CapitalG ain	0		5,119.00	0.022296	EducationNum	14.00	13.5	0.02243	29	16
25	-0.044471	1.534%	CapitalG ain	0	-	5,119.00	-0.023376	WorkClass	Selfempnotinc		-0.02110	37	1
26	-0.044060	1.520%	CapitalG ain	0	-	2,337.50	-0.021335	MaritalStatus	Divoced		-0.02273	32	0
27	0.043328	1.495%	Hours PerWeek	45	43.5	4,337.30	0.021302	MaritalStatus	Divorced		0.02203	76	3
28	-0.043121	1.488%	CapitalGain	0	43.5	7.073.50	-0.027577	Occupation	Execmanagerial		0.02755	105	0
29	0.042324	1.460%	Occupation	Execmanageria	1	7,073.30	0.042324	Occupation	exectionagena		0.02735	9	0
30	-0.039117	1.350%	CapitalLoss	0	-	1.820.50	-0.018341	WorkClass	Selfempnoting		-0.02078	47	0
31	-0.037977	1.310%	Gender	Female		4,620.30	0.018963	fnlwgt	292.175.00	192285	-0.01901	75	8
31	0.037861	1.306%		Execmanageria	1	-	0.018963	Bace	292,175.00 White	174405	0.01901	92	8
33	-0.037592	1.297%	CapitalGain	0			-0.010512	Relationship	Unmanied		-0.02708	36	0
34	0.037592	1.291%	CapitalGain	0			-0.010512	Occupation	Execmanagerial		0.05399	45	0
34	0.037315	1.291%	CapitalCoss	0		5.119.00	0.018467	Occupation	Execmanagerial		0.05399	34	4
36	-0.037219	1.284%		Execmanageria	4	3,215.00	-0.019071	WorkClass	Selfempnotinc		-0.01815	94	0
30	0.037219	1.284%	Education	Masters			0.021799	Hours PerWeek	seitemphotinc 45.00	41.5	0.01815	51	2
37	0.036714	1.191%	EducationNum		11.5		0.021799	NativeCountry	45.00 UnitedStates	+15	0.01492	62	2
39	0.034516		Gender		115		-0.017224				-0.01691	74	2
40	0.034343	1.185%		Female				WorkClass	Selfempnotinc			74	
		1.149%	Gender	Female	9.5		-0.018080	Occupation	Execmanagerial		-0.01521		0
41	0.032943	1.137%	EducationNum	14	9.5		-0.016446	MaritalStatus	Divorced		-0.01650	61	1
42	0.032013												
43	-0.031804				TO	DTAL			%				
44	0.030597					TAL			/0				
45	0.030107	I KA	NK										
46	-0.028518			•	TTDI			<u> </u>	NTDIE				EATI

BIAS and FAIRNESS

0.031804 1 0.030597 1 0.030107 1	RANK	TOTAL	%										ACTIV	ATION
0.028518 (0.028089 (0.027980 (KANK	ATTRIBUTION	CONTRIBUTION	FEATURE	INPUT	BIN LOW	BIN HIGH	ATTRIBUTION	FEATURE	INPUT	BIN LOW	ATTRIBUTION	MODULE	PARTITION
0.026366 0	1	0.164473	5.675%	Education	Masters			0.132569	Occupation	Managerial		0.03190	54	4
0.022881 0 0.021853 0 0.020570 0 0.018858 0	2	-0.122653	4.232%	Gender	Female			-0.081230	MaritalStatus	Divorced		-0.04142	69	0
0.018556 0 0.018544 0 0.018049 0 0.016606 0	3	0.091327	3.151%	EducationYrs	14	13.5	15.00	0.045510	Race	White		0.04582	64	6
0.016530 0 0.016487 0 0.016278 0	4	-0.084489	2.915%	Race	White			-0.042244	Relationship	Unmarried		-0.04224	96	3
0.015096 0	5	0.069460	2.397%	Age	43	42.5	43.50	0.034457	Gender	Female		0.03500	18	50
0.013959														

65 66 67	0.011859 0.011698	0.409%	CapitalG ain	0		7.073.50	0.004171	Education	Masters 1 1		0.00436	101	13
	0.011608												
4.00		0.404%	Age	43	35.5	43.50	0.000496	Occupation	Execmanagerial		0.01120	22	3
	0.011555	0.399%	Age	43	36.5	43.50	0.005752	fnlwgt	292,175.00	128888	0.00580	26	20
68	0.010712	0.370%	Hours PerWeek	45	41.5	49.50	0.005233	NativeCountry	UnitedStates		0.00548	77	3
69	-0.010109	0.349%	CapitalLoss	0			-0.004334	Relationship	Unmanied		-0.00577	46	0
70	0.009475	0.327%	Hours PerWeek	45	41.5	49.50	0.009475					6	2
71	-0.008703	0.300%	CapitalG ain	0		4,668.50	-0.002636	EducationNum	14.00	12.5	-0.00255	103	8
72	-0.008539	0.295%	NativeCountry	UnitedStates			-0.001733	WorkClass	Selfempnotinc		-0.00681	91	0
73	0.008134	0.281%	Age	43	29.5		0.008134					0	1
74	-0.007877	0.272%	Age	43	42.5	43.50	-0.003835	CapitalLoss			-0.00404	15	22
75	-0.007657	0.264%	Age	43	41.5	49.50	-0.003831	Relationship	Unmanied		-0.00383	24	13
76	0.007584	0.262%	Age	43	38.5	43.50	0.003531	NativeCountry	UnitedStates		0.00405	21	6
77	0.007412	0.256%	EducationNum	14			-0.003663	Relationship	Unmanied		-0.00375	65	0
78	0.007165	0.247%	Education	Masters			0.007108	WorkClass	Selfempnotinc		0.00006	57	0
79	0.006413	0.221%	CapitalLoss	0			-0.003041	Gender	Female		-0.00337	41	0
80	0.006186	0.213%	CapitalLoss	0		1,568.50	0.003042	fnlwgt	292,175.00	209923	0.00314	48	1
81	-0.006110	0.211%	Relationship	Unmanted			-0.006110					11	0
82	-0.005963	0.206%	CapitalLoss	0		77.50	-0.016886	NativeCountry	UnitedStates		0.01092	44	0
83	-0.005730	0.198%	CapitalLoss	0		1,820.50	-0.005974	Education	Masters		0.00024	39	0
84	0.005100	0.176%	WorkClass	Selfempnotinc			0.001533	fnlwgt	292,175.00	209923	0.00357	100	2
85	-0.004350	0.150%	CapitalLoss	0		1,115.00	-0.004350					2	0
86	0.004166	0.144%	Age	43	38.5	43.50	0.001892	Race	White		0.00227	23	6
87	0.003892	0.134%	Hours PerWeek	45	41.5	49.50	0.004612	WorkClass	Selfempnotinc		-0.00072	81	2
88	0.003394	0.117%	CapitalG ain	0		57.00	-0.007656	NativeCountry	UnitedStates		0.01105	33	0
89	0.003209	0.111%	Education	Masters			0.001435	NativeCountry	UnitedStates		0.00177	53	0
90	0.003124	0.108%	EducationNum	14			-0.001541	Hours PerWeek	45.00		-0.00158	60	0
91	0.002969	0.102%	NativeCountry	UnitedStates			0.002969					8	0
92	0.002955	0.102%	CapitalG ain	0		57.00	0.000687	Race	White		0.00227	35	0
93	0.002882	0.099%	Education	Masters			0.002882					3	0
94	-0.002851	0.098%	Race	White			-0.000038	WorkClass	Selfempnotinc		-0.00281	97	0
95	0.002693	0.093%	Education	Masters			-0.001774	Race	White		-0.00092	55	0
96	0.002518	0.087%	Education	Masters			-0.000999	fnlwgt	292,175.00		-0.00152	58	0
97	-0.002073	0.072%	Race	White			-0.002073					10	0
98	-0.002045	0.071%	CapitalG ain	0		57.00	-0.001106	fnlwgt	292,175.00		-0.00094	38	0
99	0.001786	0.062%	CapitalG ain	0		7,073.50	0.000510	EducationYrs	14.00	13.5	0.00094	104	8
100	0.001776	0.061%	EducationYrs	14			0.001776					4	0
101	0.001235	0.043%	Gender	Female			0.000618	Hours PerW eek	45.00		0.00062	68	0
102	-0.001223	0.042%	Education	Masters			0.000450	Gender	Female		-0.00167	50	0
103	-0.000815	0.028%	NativeCountry	UnitedStates			0.000475	Relationship	Unmanied		-0.00129	90	0
104	-0.000752	0.026%	CapitalG ain	0			-0.000376	CapitalLoss			-0.00038	27	0
105	0.000643	0.022%	CapitalG ain	0			0.000643					1	0
106	0.000625	0.022%	WorkClass	Selfemployed			0.000625					12	0



BIAS and FAIRNESS

MODULE INTERACTION
Gender x MaritalStatus
Gender x Age
Gender x Relationship
Gender x fnlwgt
Gender x WorkClass
Gender x Occupation
Gender x Race
Gender x NativeCountry
Gender x CapitalGain
Gender
Gender x EducationNum
Gender x CapitalLoss
Gender x HoursPerWeek
Gender x Education

FEMALE GENDER							
FEATURE	ATTRIBUTION						
Gender	-0.08123						
Gender	0.03500						
Gender	-0.02893						
Gender	-0.01896						
Gender	-0.01744						
Gender	-0.01808						
Gender	-0.01627						
Gender	-0.01310						
Gender	-0.01461						
Gender	-0.01854						
Gender	0.00670						
Gender	-0.00337						
Gender	0.00062						
Gender	-0.00167						

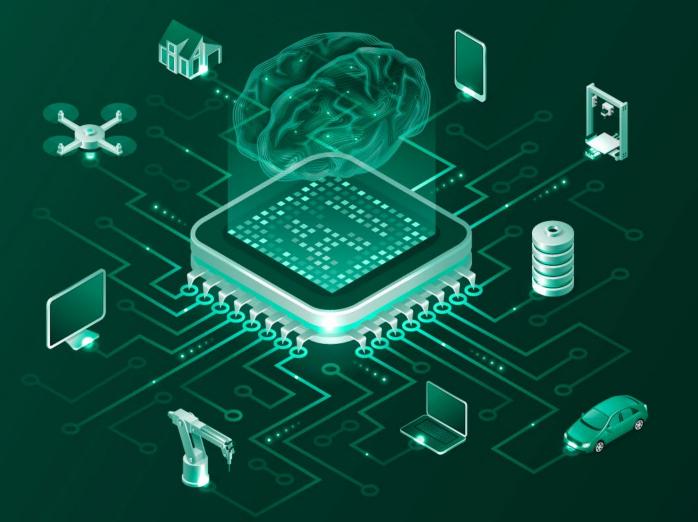
Negatives	-0.23222
Positives	0.04232
Total	-0.18989

INTERACTING WITH								
FEATURE	ATTRIBUTION							
MaritalStatus	-0.04142							
Age	0.03446							
Relationship	-0.02757							
fnlwgt	-0.01901							
WorkClass	-0.01691							
Occupation	-0.01521							
Race	-0.01553							
NativeCountry	-0.01290							
CapitalGain	-0.00827							
EducationNum	0.00670							
CapitalLoss	-0.00304							
HoursPerWeek	0.00062							
Education	0.00045							

Original Prediction Score		-0.209330
	minus	
Negative Attributions		-0.232215
	equals	
Adjusted Prediction Score		0.022885



UMNAI



COLLABORATE WITH US

- Research
- Application
- Co-development
- Consultants/system integrator
- Sales partners
- Platforms

THANK YOU

ken.cassar@umnai.com

-0.0000377958785975352*Race_White - 0.0000377958785975352*Relationship_Unmarried - 0.0844129174947739 NEURAL-MICRO-MODEL EXPRESSION : EXAMPLE 1

0.00106377946212888*MaritalStatus_Divorced + 0.00172187818679959*MaritalStatus_MarriedAFspouse -0.000123299338156357*MaritalStatus_Marriedspouseabsent - 0.00230870861560106*MaritalStatus_Nevermarried -0.00081091292668134*MaritalStatus_Separated + 0.00257309433072805*MaritalStatus_Widowed + 0.000447018042905256*Relationship_Husband + 0.00730239134281874*Relationship_Notinfamily - 0.00183948513586074*Relationship_Otherrelative - 0.00383506948128343*Relationship_Ownchild -0.000360738165909424*Relationship_Unmarried + 0.00137223361525685*Relationship_Wife - 0.0580957233905792

NEURAL-MICRO-MODEL EXPRESSION : EXAMPLE 2

3.08478083752561e-5*EducationNum + 0.00134426879230887

NEURAL-MICRO-MODEL EXPRESSION : EXAMPLE 3

SIMPLE TO DEPLOY, OPERATE AND USE

- Libraries deploy and operate in client's environment
- Native cloud support
- Minimal DevOps effort
- Support for notebook systems
- Easy MLOps Integration
- Drop-in replacement
- Easy up/down stream integration
- Universally compatible outputs
- Use standard BI and Data Lake tools

