Clinically Driven Artificial Intelligence

Workshop

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What is Artificial Intelligence?

Artificial Intelligence

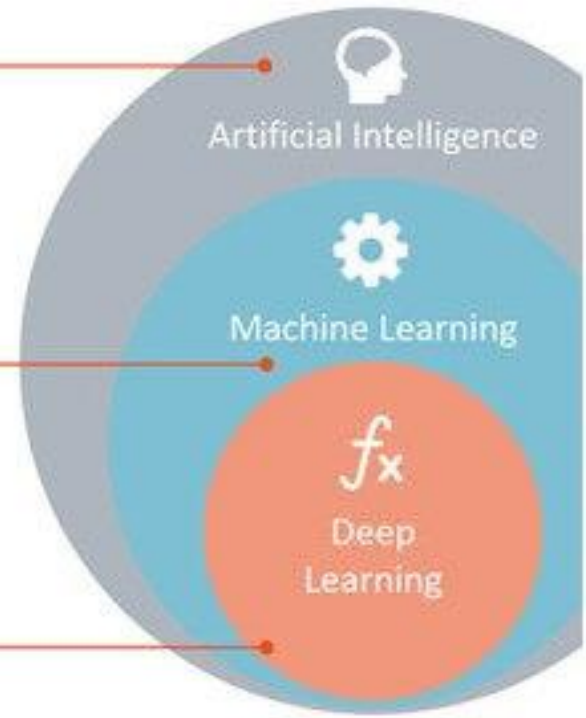
Any technique which enables computers to mimic human behavior.

Machine Learning

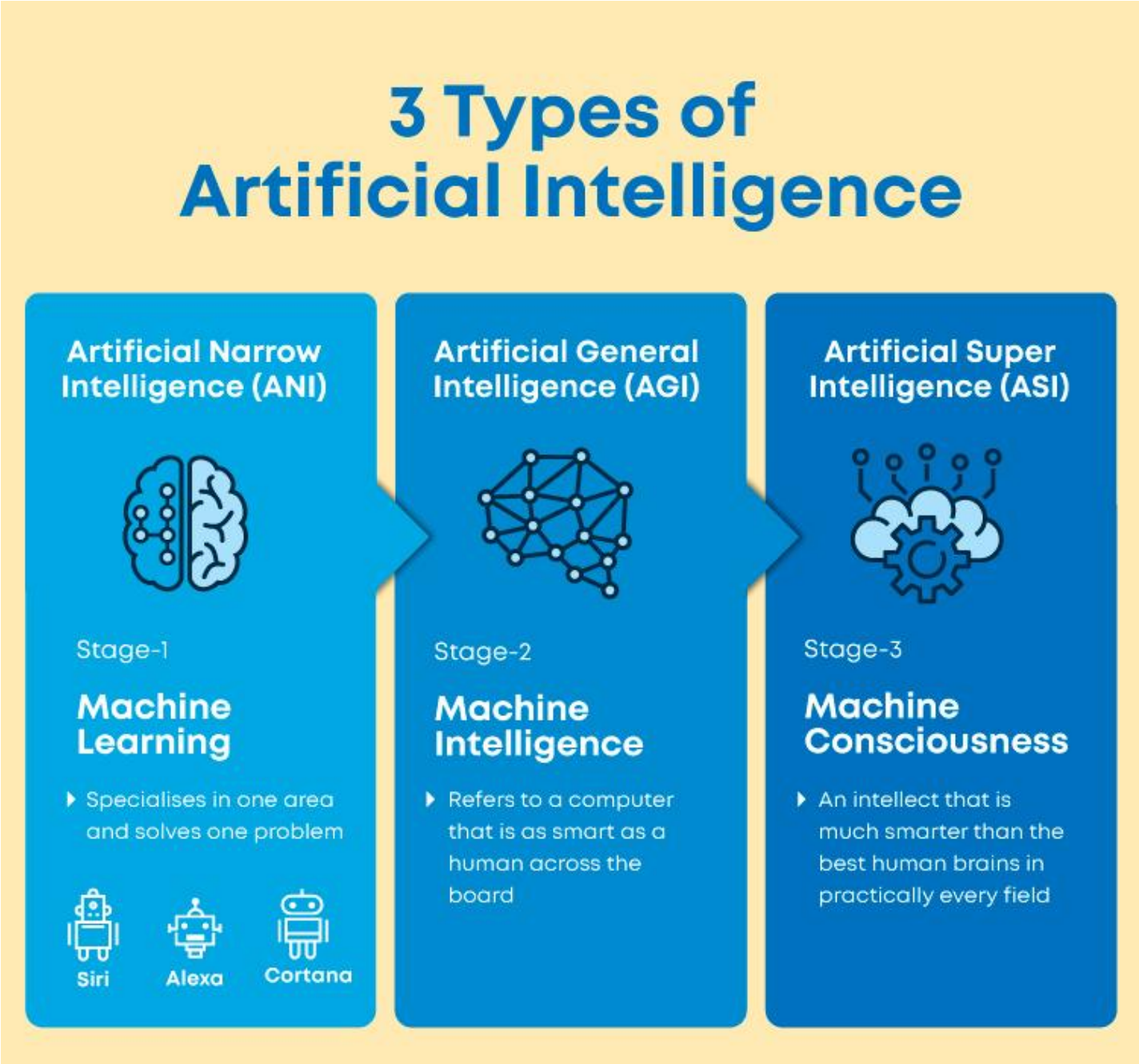
Subset of AI techniques which use statistical methods to enable machines to improve with experiences.

Deep Learning

Subset of ML which make the computation of multi-layer neural networks feasible.



https://www.datarobot.com/wiki/artificial-intelligence/



https://www.mygreatlearning.com/blog/what-is-artificial-intelligence/

Machine Learning

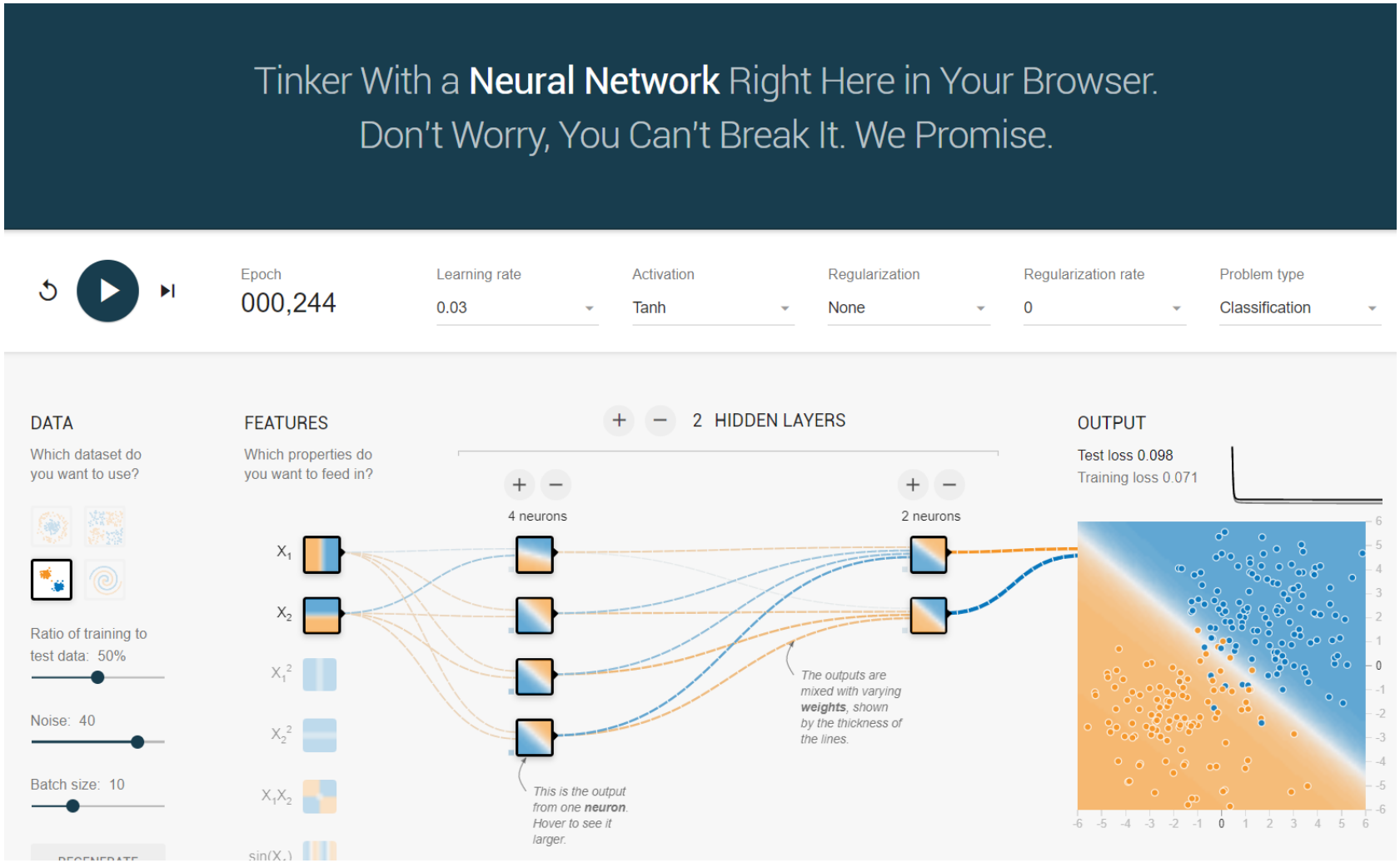
Machine Intelligence

https://screenrant.com/star-trek-data-logic-memes-hilarious/

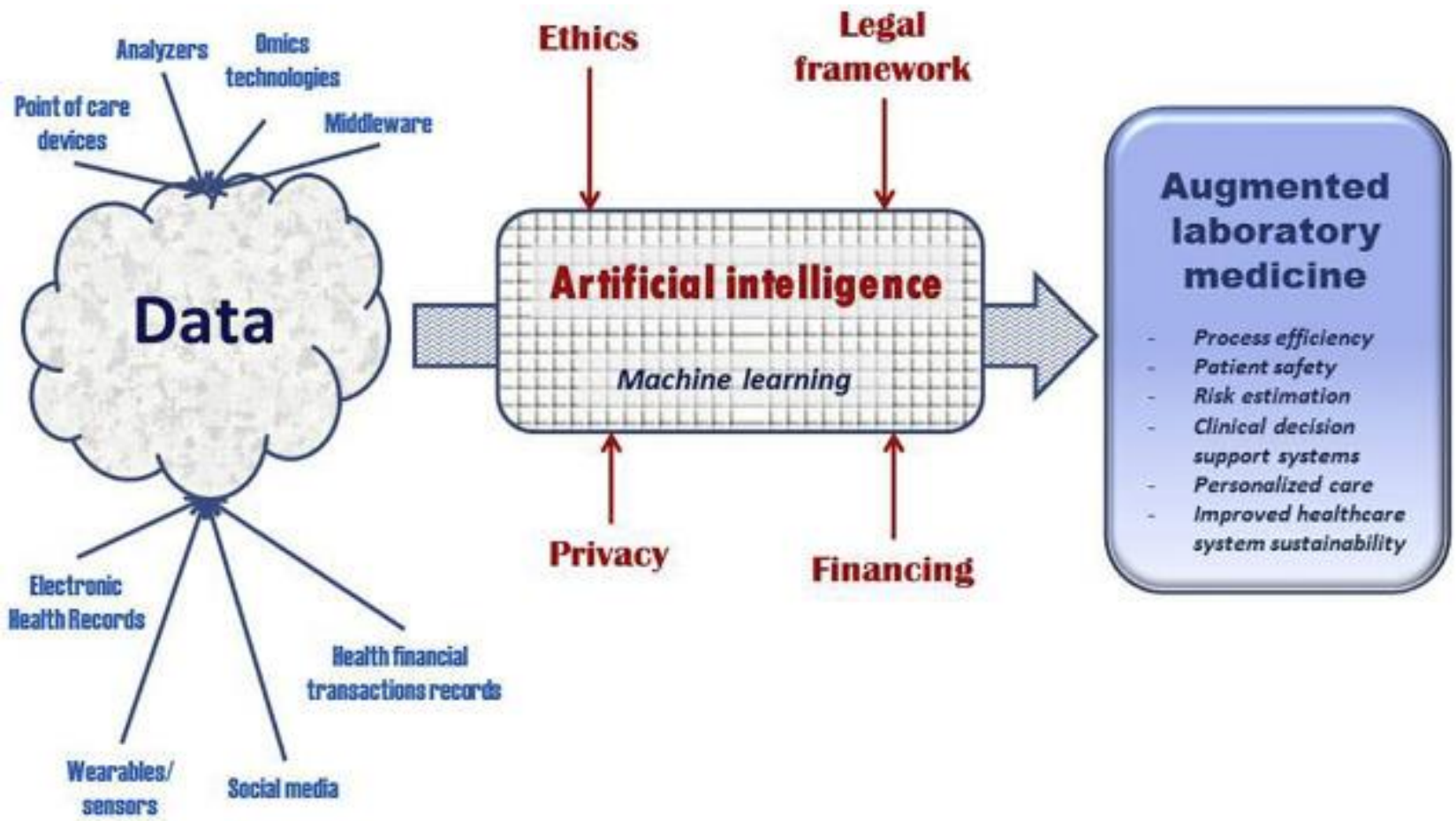
Machine Consciousness

https://www.marketwatch.com/story/this-is-what-happens-when-skynet-from-terminator-takes-over-the-stock-market-2018-02-14

Back to Machine Learning



Machine Learning in Medicine



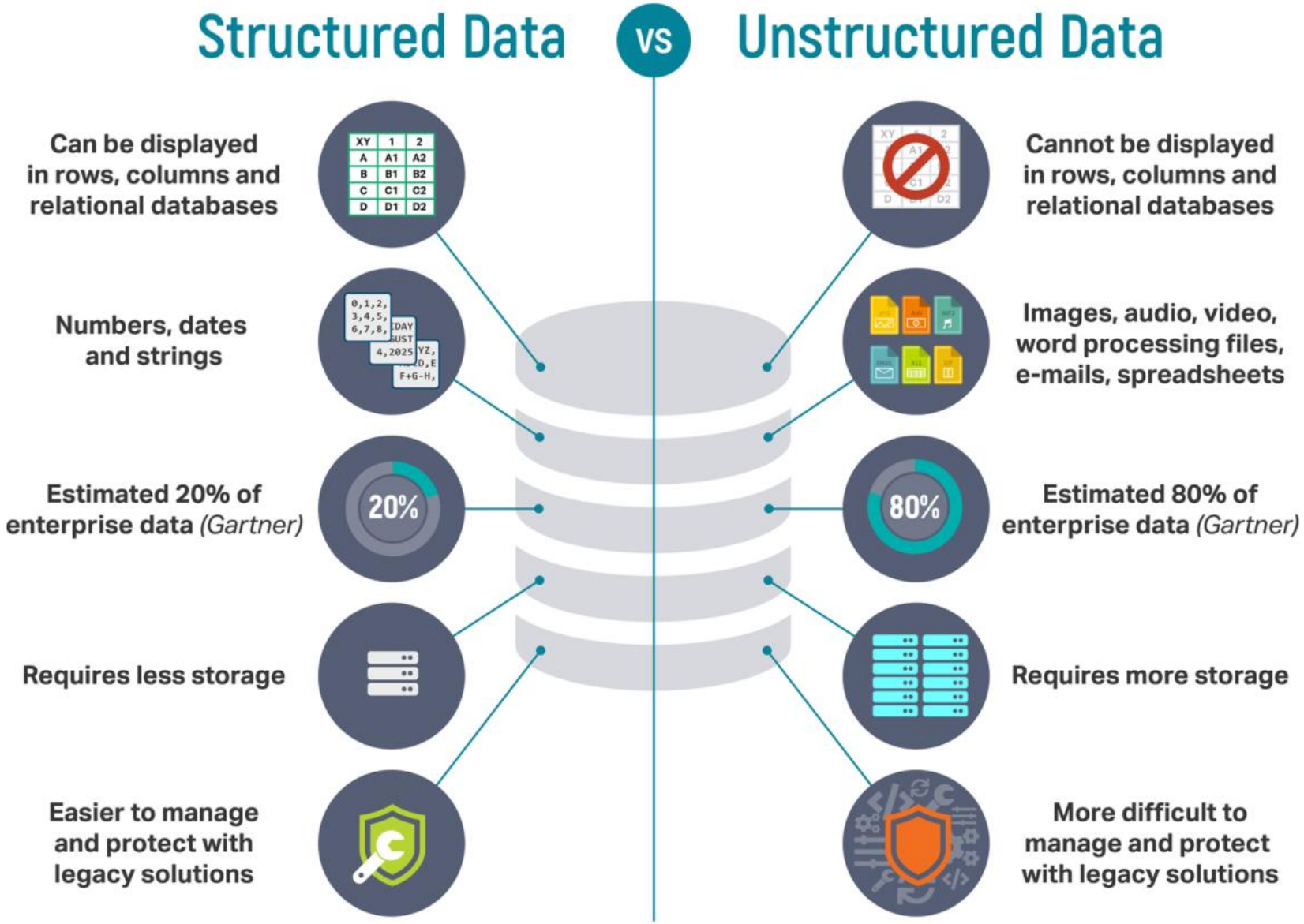
Data Driven vs. Clinically Driven AI

Clinically-Driven AI

Better Workflow

Organized Data

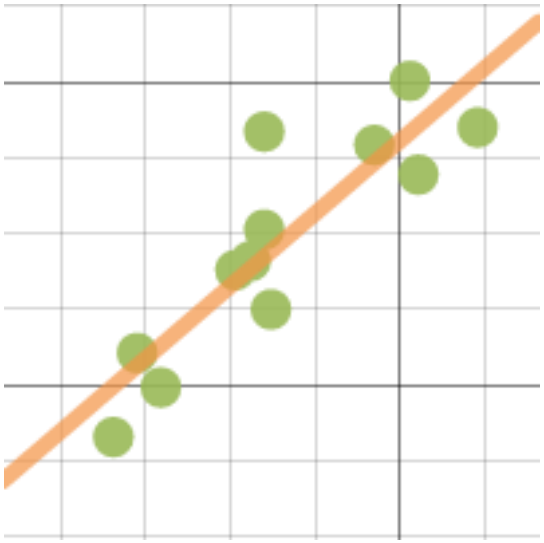
Explainable Model



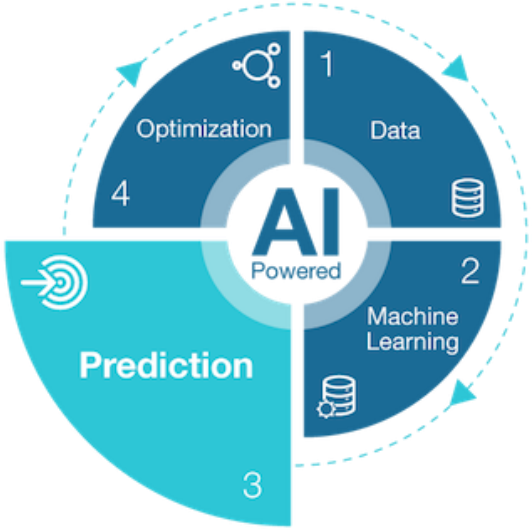
https://wikibigdata.com/what-is-structured-data-and-unstructured-data/

Clinically-Driven
AI Ready Dataset

Diagnosis



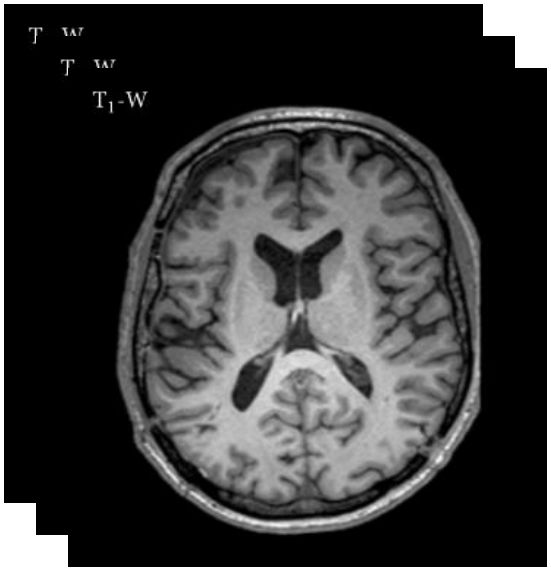
Evaluation



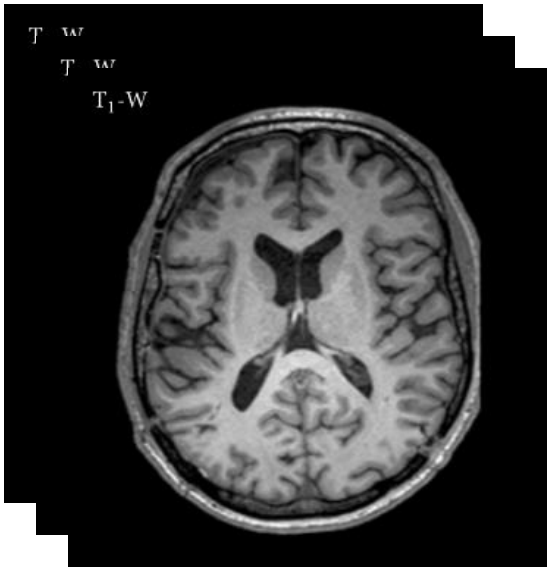
Prediction

How to Organize Data for…

- Diagnosing Schizophrenia?



Schizophrenia



Healthy Control

How to Organize Data for…

- Evaluating Schizophrenia?

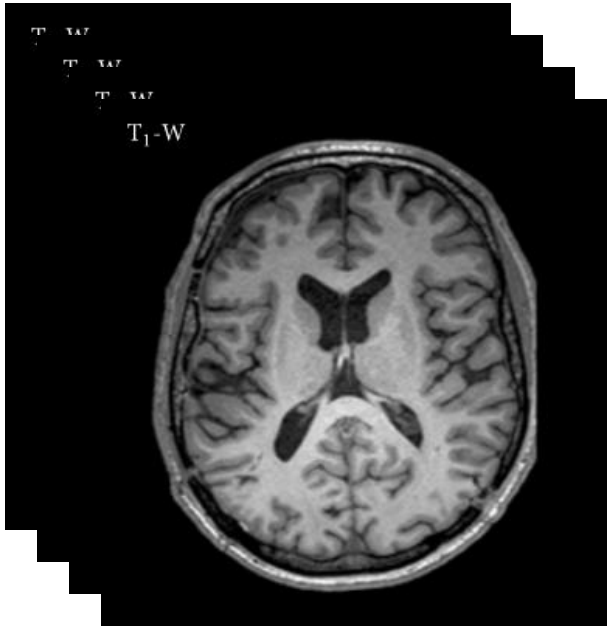
Schizophrenia

Rating Scales

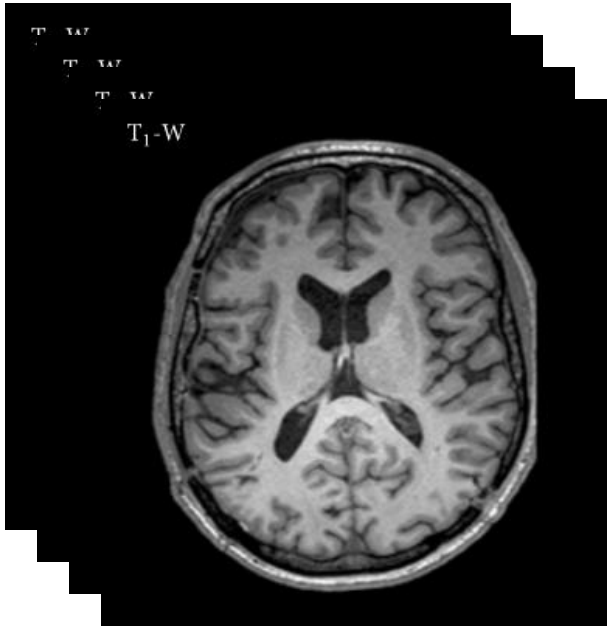
How to Organize Data for…

- Predicting Outcome of Schizophrenia?

Time



Schizophrenia
with Good Outcome



Schizophrenia
with Bad Outcome

AI Ready Dataset

- 10 Chest X-Ray Files
- 5 with pneumonia and 5 without findings

- Unstructured data
  - Chest X-Ray Files

- Structured data
  - 0: Normal Chest X-Ray
  - 1: Pneumonia
  - Labels.xls

How to Automate the Sorting Task Using Matlab?

```
% Read excel files
[num,txt,raw] = xlsread('Label.xlsx');

% Make two directories for normal and pneumonia chest x-ray
mkdir('0');
mkdir('1');

% Sorting files into corresponding directory
files = dir('*.dcm');
nf = length(files);
for i=1:nf
    index = find(strcmp(txt, files(i).name));
    copyfile([pwd '\' files(i).name],[pwd '\' sprintf('%0d',num(index)) '\' files(i).name]);
end
```

Case Presentation 1

- Sex classification using MRI brain volume data

Brain Genomics Superstruct Project

NEUROINFORMATICS RESEARCH GROUP

DATASETS

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Perm_ID	Subject_ID	Sex	Age_Bin	Educ	ICV	BrainSegV	BrainSegV	postCorCa	midpostCc	centCorCa	midantCor	antCorCal	R_AvgCo	L_AvgCor	R_TotCor	L_TotCort
2	17	Sub0291_Ses1	0	19	12	1515015	1189565	1177053	1071	661	601	556	913	2.363	2.397	83427	83629
3	32	Sub1279_Ses1	0	23	16	1463183	1144258	1130784	1054	574	489	425	945	2.526	2.465	75787	76370
4	35	Sub0439_Ses1	0	21	14	1437914	1126298	1117216	920	464	522	474	807	2.604	2.621	80599	78591
5	43	Sub1162_Ses1	0	21	13	1544790	1234031	1223971	960	593	774	715	1147	2.399	2.394	84926	84718
6	45	Sub0915_Ses1	0	21	15	1644119	1259277	1250056	962	610	626	633	866	2.35	2.393	91801	90889
7	59	Sub1107_Ses1	0	23	16	1536547	1248211	1237336	941	478	512	487	886	2.501	2.522	83399	83540
8	60	Sub0095_Ses1	0	19	13	1498116	1165208	1151957	1104	447	424	527	829	2.577	2.539	83236	83142
9	93	Sub0476_Ses1	0	21	15	1394714	1139605	1126518	918	550	509	495	925	2.464	2.474	78040	77408
10	107	Sub0005_Ses1	0	21	15	1528838	1175892	1164037	918	549	513	417	842	2.628	2.658	79299	80250
11	109	Sub1186_Ses1	0	21	15	1380286	1097100	1080649	868	395	375	366	705	2.486	2.459	80092	78638
12	113	Sub0998_Ses1	0	21	14	1451722	1169329	1156849	876	455	486	416	941	2.479	2.465	83166	81475
13	114	Sub0142_Ses1	0	23	15	1313845	1006265	993326	906	398	425	428	846	2.34	2.358	73149	73062
14	[illegible]	Sub0271_[illegible]	0	23	[illegible]	[illegible]	[illegible]	[illegible]	915	448	531	[illegible]	[illegible]	[illegible]	2.491	84564	[illegible]
15	147	Sub06[illegible]_Ses1	[illegible]	19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	841	[illegible]	865	[illegible]	[illegible]	[illegible]	[illegible]
16	158	Sub05[illegible]_Ses1	[illegible]	19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	313	[illegible]	[illegible]	2.514	2.491	[illegible]	[illegible]
17	176	Sub0441_Ses1	0	23	17	1480330	1161407	1145072	752	296	350	367	830	2.443	2.488	79286	78331
18	189	Sub0933_Ses1	0	21	15	1479548	1163231	1150676	1015	453	435	422	805	2.496	2.467	82013	82947
19	208	Sub1223_Ses1	0	19	13	1394437	1127640	1113453	1202	593	622	478	797	2.542	2.545	79327	78215
20	220	Sub0631_Ses1	0	19	13	1456474	1230971	1211737	902	503	494	530	995	2.642	2.624	80304	79866
21	251	Sub0663_Ses1	0	19	12	1365751	1068984	1059388	948	689	636	588	905	2.501	2.486	74316	73720
22	304	Sub1097_Ses1	0	21	15	1590916	1280409	1265526	811	488	443	386	830	2.527	2.525	89727	88567
23	325	Sub0329_Ses1	0	19	12	1549740	1227013	1224149	954	632	558	516	703	2.537	2.528	82944	82417
24	330	Sub1393_Ses1	0	21	15	1528450	1232411	1219417	749	355	439	367	766	2.543	2.524	84157	84536
25	367	Sub1479_Ses1	0	21	14	1658179	1295147	1278287	1042	559	664	523	1102	2.529	2.539	88732	88201
26	378	Sub1230_Ses1	0	21	14	1360426	1123569	1120317	718	406	616	479	826	2.468	2.54	76153	76138
27	380	Sub1455_Ses1	0	21	15	1487383	1212421	1196932	1076	421	438	490	834	2.54	2.53	81299	81230
28	386	Sub0689_Ses1	0	19	12	1358918	1086663	1076786	791	435	460	350	604	2.522	2.567	75962	74761
29	402	Sub0270_Ses1	0	19	13	1464604	1154044	1138719	986	535	595	466	944	2.524	2.471	80599	80982
30	404	Sub0014_Ses1	0	21	14	1546439	1285275	1275866	1035	504	689	566	1113	2.562	2.605	87596	86740
31	410	Sub1311_Ses1	0	21	16	1546281	1195850	1184162	965	553	551	509	910	2.466	2.496	83228	82850

1200 Cases (600 Male; 600 Female)