

Machine Learning

- Term coined around 1960
- Why learn ? Why not just hire enough programmers and code in rules ?
 - Lots of patterns for an activity/event
 - Events can be dynamic
 - **Data** is increasing exponentially
 - **Data** is also in various formats [Text, Audio, Video]
 - Higher quality **data** due to cheaper storage
- Can be broadly classified into three categories
 - Unsupervised, Supervised and Reinforcement learning

Unsupervised Learning

- Takes a set of data that contains only inputs and finds structure in data E.g., Grouping or Clustering of data points
- **Marketing:** Finding groups of customers with similar behavior given a large database of customer data containing their properties and past buying records.
- **Biology:** Classification of plants and animals given their features.
- **Earthquake studies:** Clustering observed earthquake epicenters to identify dangerous zones.
- **World Wide Web:** Clustering weblog data to discover groups of similar access patterns.

Supervised Learning

- Builds mathematical model using data set that has both inputs and desired outputs E.g., Classification and Regression tasks

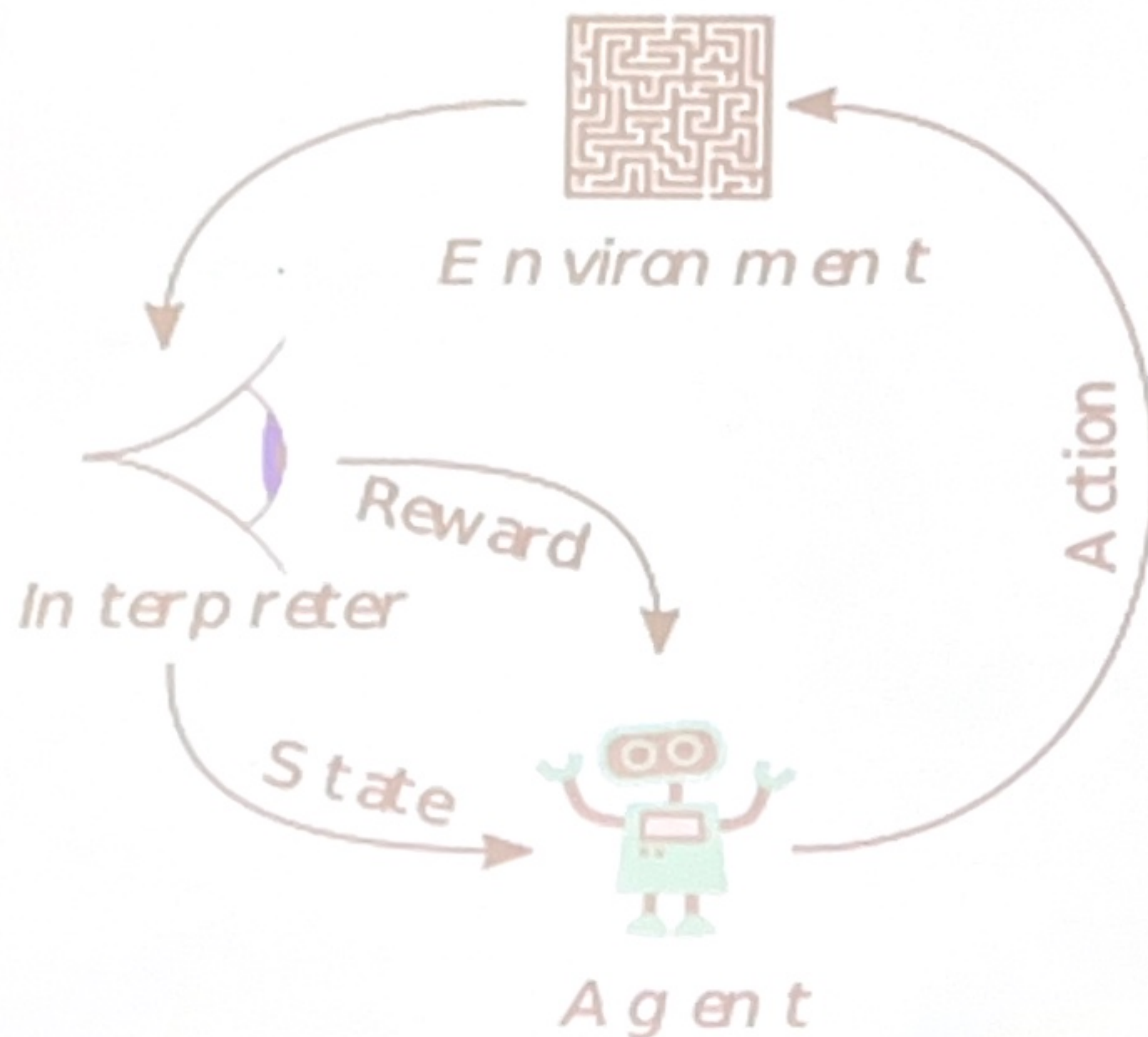
User ID	Gender	Age	Salary	Purchased	Temperature	Pressure	Relative Humidity	Wind Direction	Wind Speed
15624510	Male	19	19000	0	10.69261758	986.882019	54.19337313	195.7150879	3.278597116
15810944	Male	35	20000	1	13.59184184	987.8729248	48.0648859	189.2951202	2.909167767
15668575	Female	26	43000	0	17.70494885	988.1119385	39.11965597	192.9273834	2.973036289
15603246	Female	27	57000	0	20.95430404	987.8500366	30.66273218	202.0752869	2.965289593
15804002	Male	19	76000	1	22.9278274	987.2833862	26.06723423	210.6589203	2.798230886
15728773	Male	27	58000	1	24.04233986	986.2907104	23.46918024	221.1188507	2.627005816
15598044	Female	27	84000	0	24.41475295	985.2338867	22.25082295	233.7911987	2.448749781
15694829	Female	32	150000	1	23.93361956	984.8914795	22.35178837	244.3504333	2.454271793
15600575	Male	25	33000	1	22.68800023	984.8461304	23.7538641	253.0864716	2.418341875
15727311	Female	35	65000	0	20.56425726	984.8380737	27.07867944	264.5071106	2.318677425
15570769	Female	26	80000	1	17.76400389	985.4262085	33.54900114	280.7827454	2.343950987
15606274	Female	26	52000	0	11.25680746	988.9386597	53.74139903	68.15406036	1.650191426
15746139	Male	20	86000	1	14.37810685	989.6819458	40.70884681	72.62069702	1.553469896
15704987	Male	32	18000	0	18.45114201	990.2960205	30.85038484	71.70604706	1.005017161
15628972	Male	18	82000	0	22.54895853	989.9562988	22.81738811	44.66042709	0.264133632
15697686	Male	29	80000	0	24.23155922	988.796875	19.74790765	318.3214111	0.329656571
15733883	Male	47	25000	1					

Figure A: CLASSIFICATION

Figure B: REGRESSION

Reinforcement Learning

- Concerned with how software agents should take actions in an environment to maximize cumulative reward E.g. Autonomous vehicles, Computer games



Some Applications

- Search engines
- Information retrieval
- Recommendation systems
- Credit card fraud detection
- Disease diagnosis
- Election prediction
- Image processing
- Speech translation
- ...