

Transfer Learning on Big Data

Qiang Yang

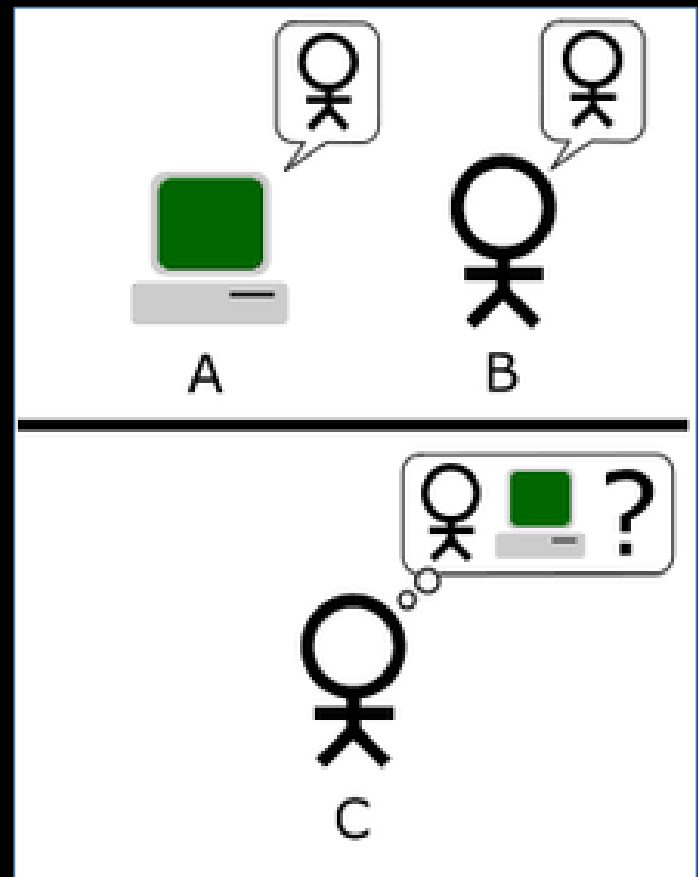
HKUST

Can Machines Think?



Turing Test :

“Can Machines Think?”

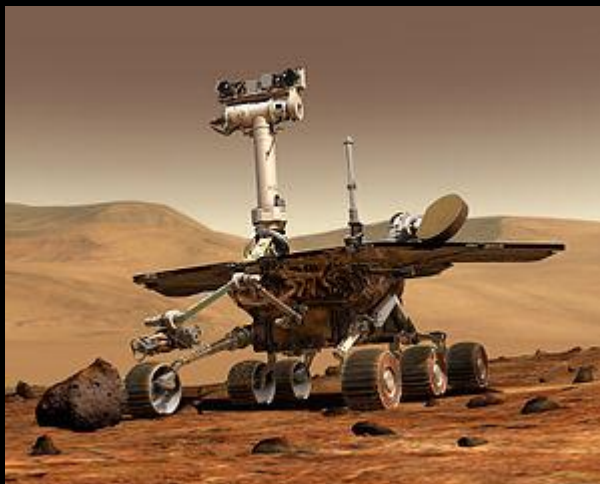


60's: Intelligence ... Logic Deduction

- **Herbert Simon & Allen Newell:**
 - **Logic Theorist**
 - **General Problem Solver: Heuristic Search**
 - **Physical Symbol System Hypothesis**



90's: Intelligence ... Instinct



IBM: Intelligence ... Parallel Computing

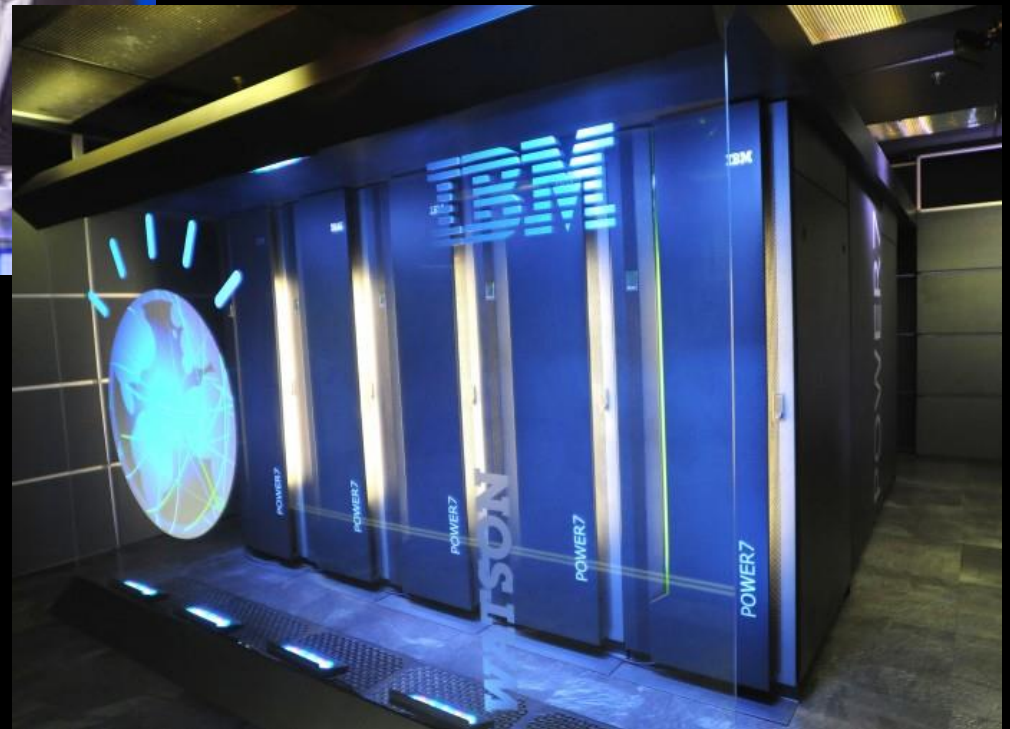


IBM

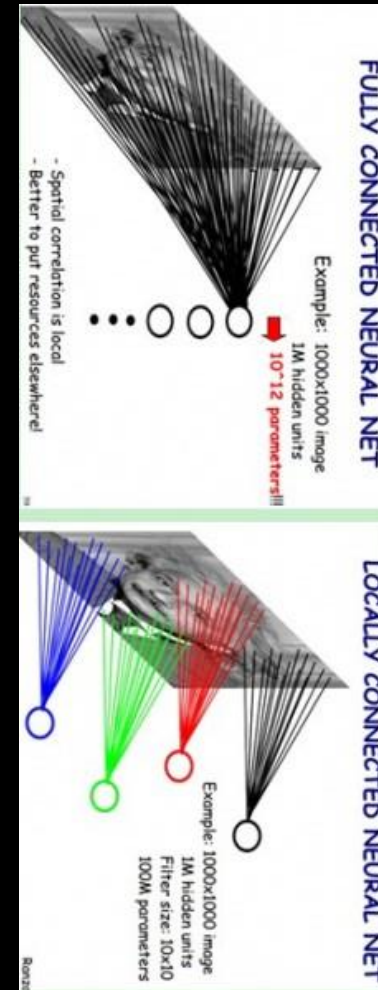
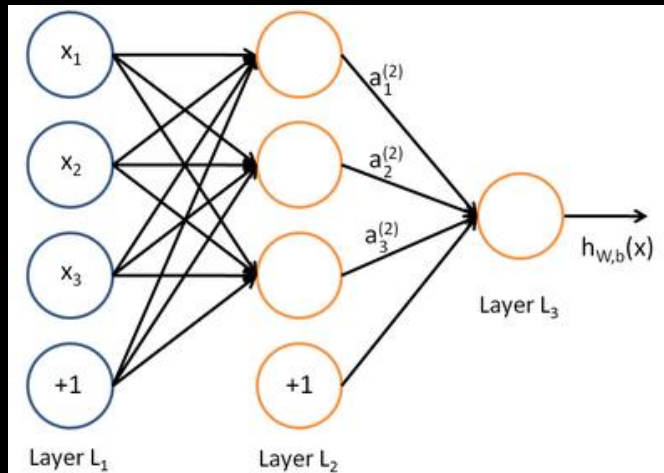
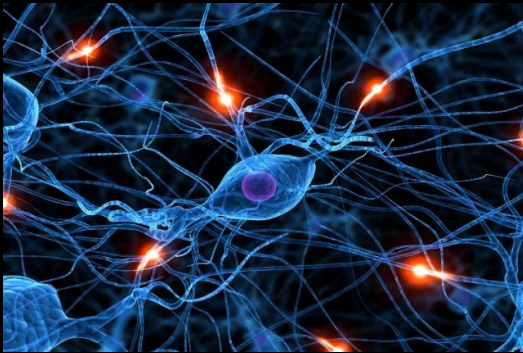


Kasparov

2010's: Intelligence ... Big Data!

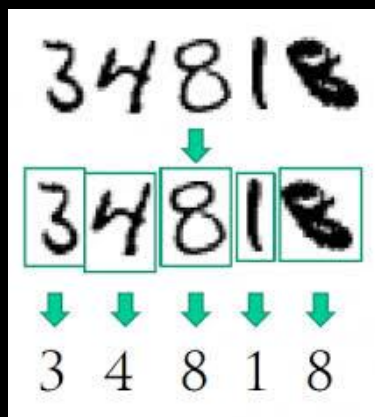


Intelligence... Big Data + Machine Learning !



Still Cannot Explain Key Intelligence

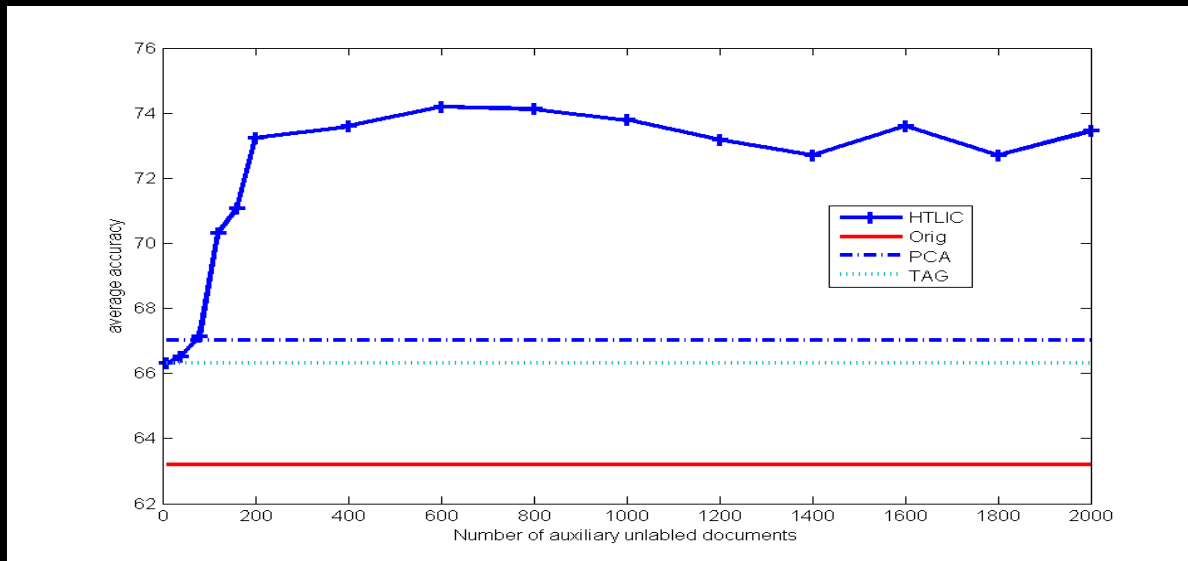
- Why can we learn with only a few examples?



Transfer Learning



Transfer Learning: One Pic = \leftrightarrow Words?



Knight Ride, a staidon flight into the dangerous world of a man who does not exist, Michael Knight, a young loner on a crusade to champion the cause of the innocent, the helpless in a world of criminals who operate above the law.

Thunder, thunder, thunder! All Thundercats are on the move, Thundercats are loose, feel the magic, hear the roar, Thundercats are loose, Thunder, Thunder, Thunder, Thundercat! Thunder, Thunder, Thundercat! Thunder, Thunder, Thundercat! Thunder, Thunder, Thunder, Thundercat! Thunder, Thunder, Thunder, Thundercat!

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Ulysses, Ulysses - Soaring through all the galaxies, in search of Earth, flying in to the night, Ulysses, Ulysses - Fighting evil and tyranny, with all his power, and with all of his might, Ulysses - no one else can do the things you do, Ulysses - He a bolt of thunder from the blue, Ulysses - always fighting all the evil forces bringing peace and justice to all.

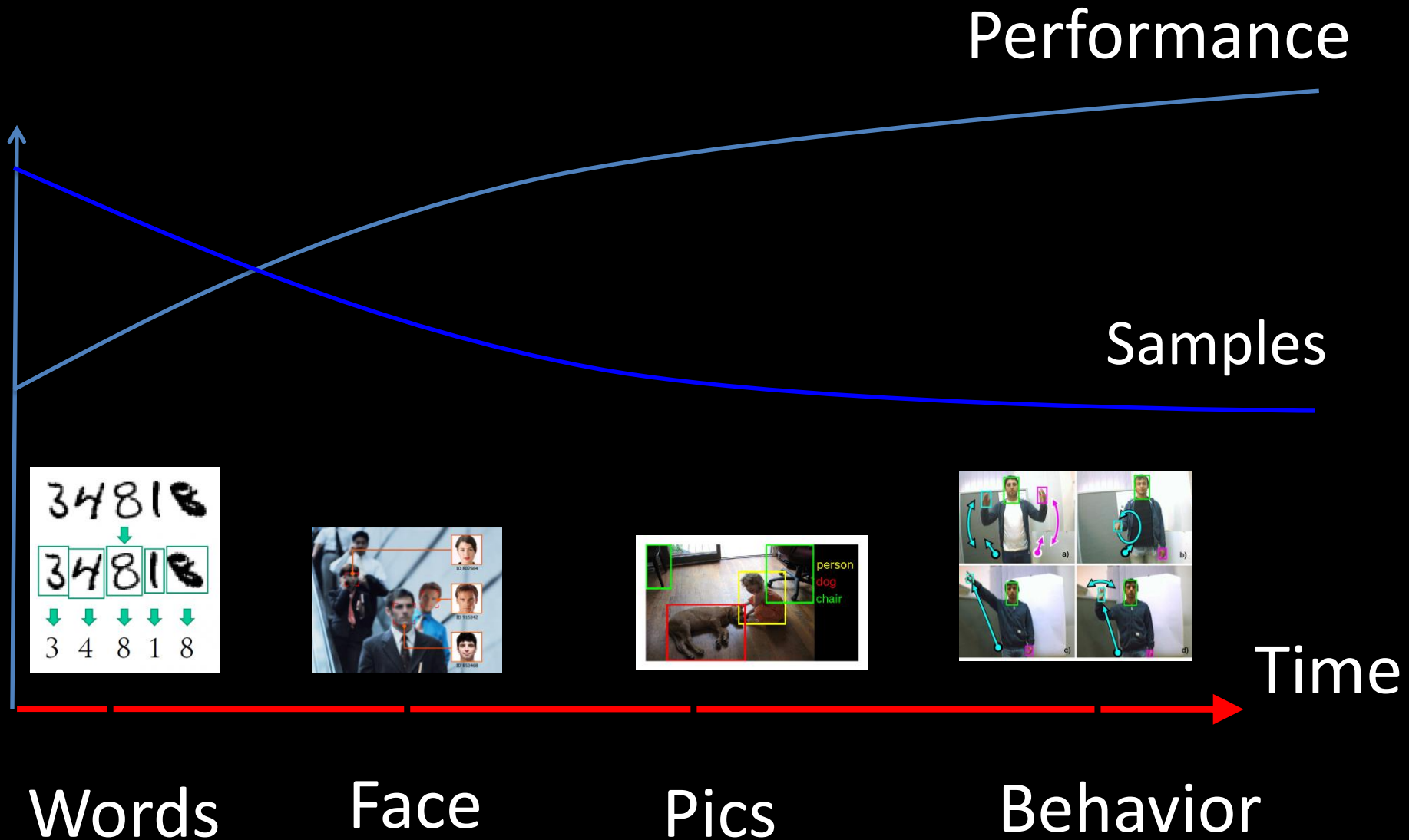
Just the good ol' boys, never makes' no harm, Beats all you've ever seen, Been in trouble with the law since the day they was born, Straighten' the curve, Kickin' the dirt, Someday the mountain might get lerr, but the lea never will, Makin' their way, the only way they know how, that's just a little bit more than the law will allow, Just good ol' boys, wouldn't change if they could, fightin' the system like a true modern-day Robin Hood.



recognition



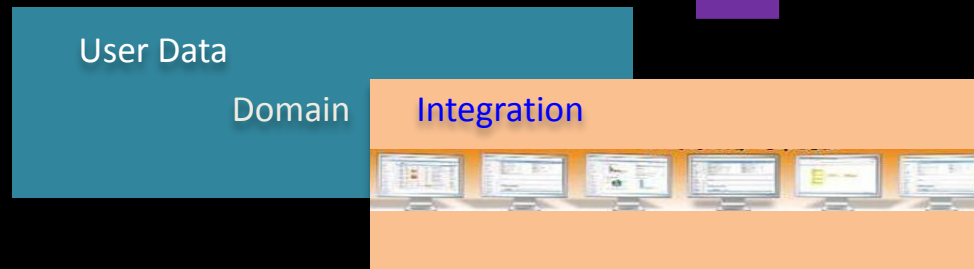
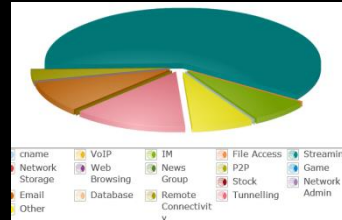
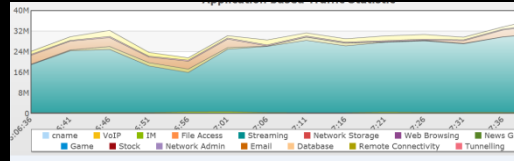
Lifelong Machine Learning



Relevant to Big Data Industry?



Big Data: 3 Stages



Stream Systems, Hive, M/R, Hadoop, Hbase, etc.

Big Data – Big Problem

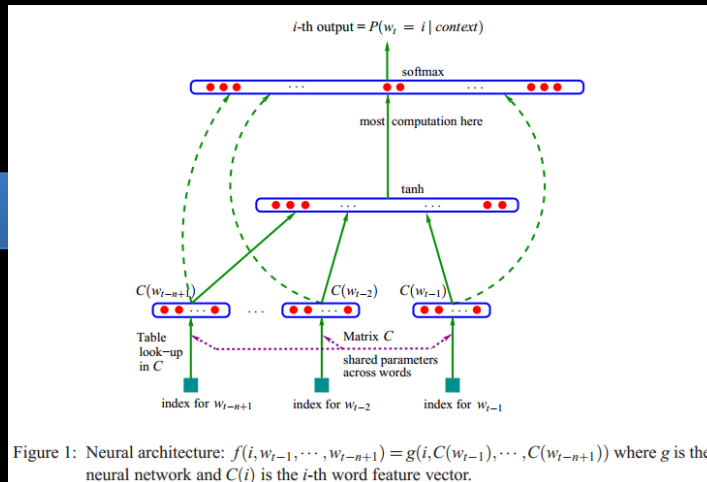
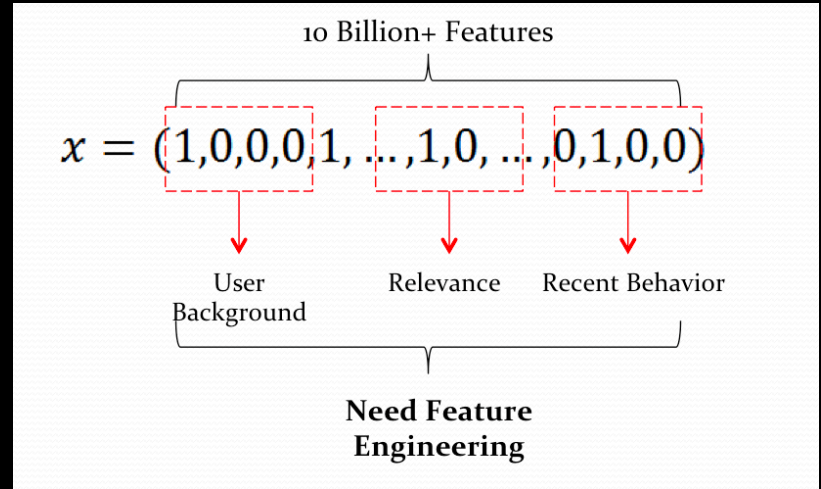
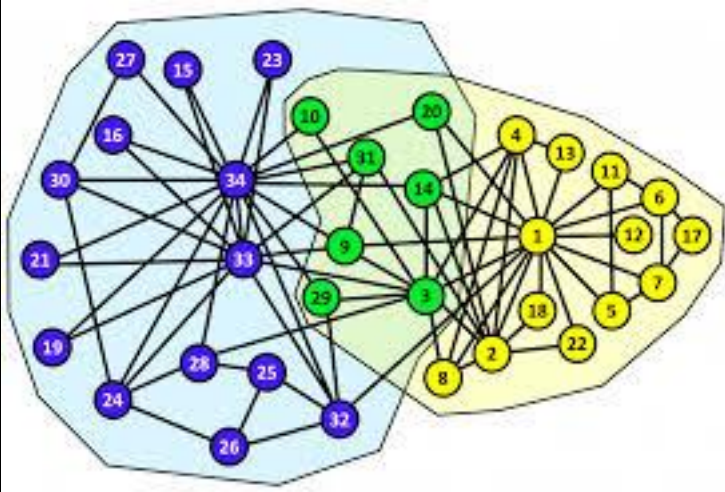


Figure 1: Neural architecture: $f(i, w_{t-1}, \dots, w_{t-n+1}) = g(i, C(w_{t-1}), \dots, C(w_{t-n+1}))$ where g is the neural network and $C(i)$ is the i -th word feature vector.

Can Machines Transfer?

Lifelong Learning Test :

“Can Machines learn how to learn?”

