

BUILDING MACHINES THAT LEARN AND THINK LIKE PEOPLE

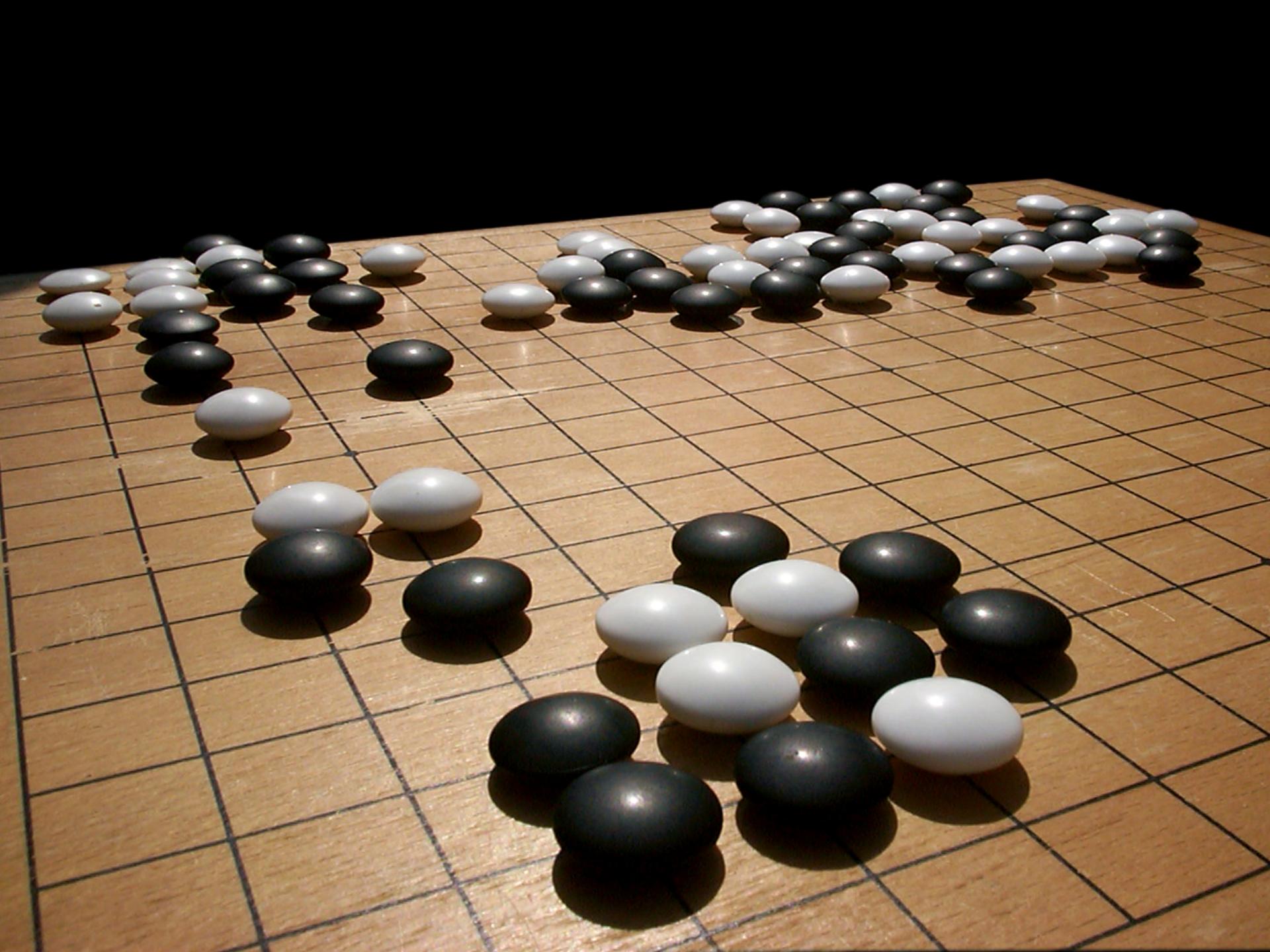
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CENTER FOR BRAINS MINDS AND MACHINES



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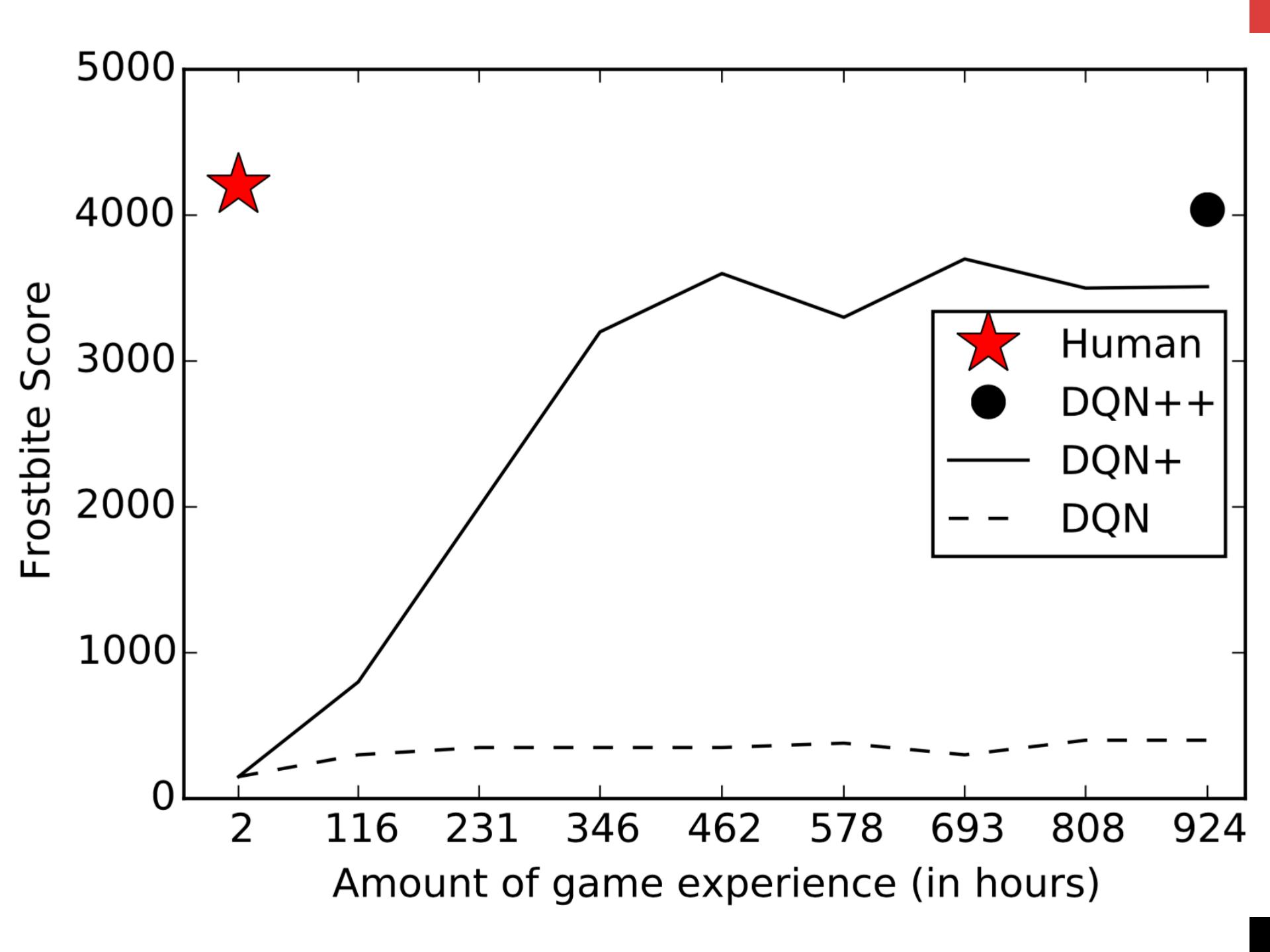
 ACTIVISION

The Activision logo, featuring a horizontal bar with red, yellow, green, and blue segments, followed by the word "ACTIVISION" in a bold, sans-serif font.



an airplane is parked on the tarmac at an airport

"Truly human-like learning and thinking machines will have to reach beyond current engineering trends in both what they learn, and how they learn it."



THIS ISN'T THE ONLY WAY

“The quest for ‘artificial flight’ succeeded when the Wright brothers and others stopped imitating birds and started using wind tunnels and learning about aerodynamics.”

- **build causal models of the world that support explanation and understanding, rather than merely solving pattern recognition problems**
- **ground learning in intuitive theories of physics and psychology, to support and enrich the knowledge that is learned**
- **harness compositionality and learning-to-learn to rapidly acquire and generalize knowledge to new tasks and situations.**

"Just as scientists seek to explain nature, not simply predict it, we see human thought as fundamentally a model-building activity."



helicopter is on the ground in the desert

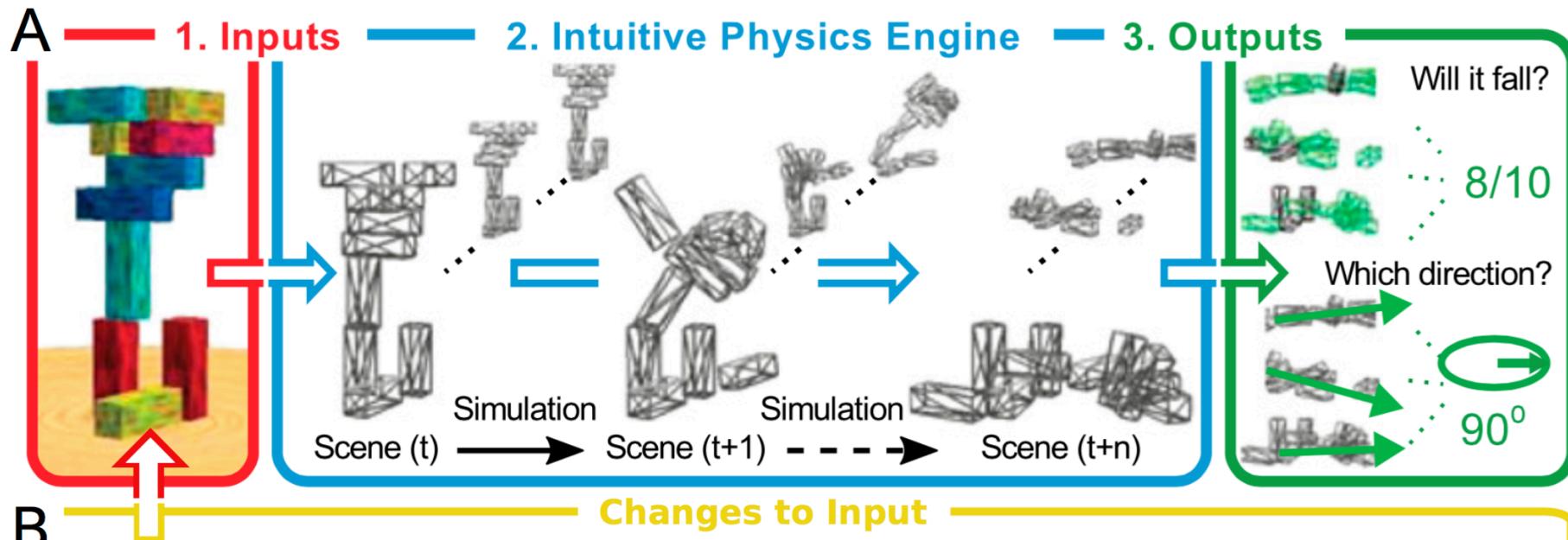
CORE INGREDIENTS

- **start-up software**
- **model-building**
- **turning models into action**

HUMAN START-UP SOFTWARE

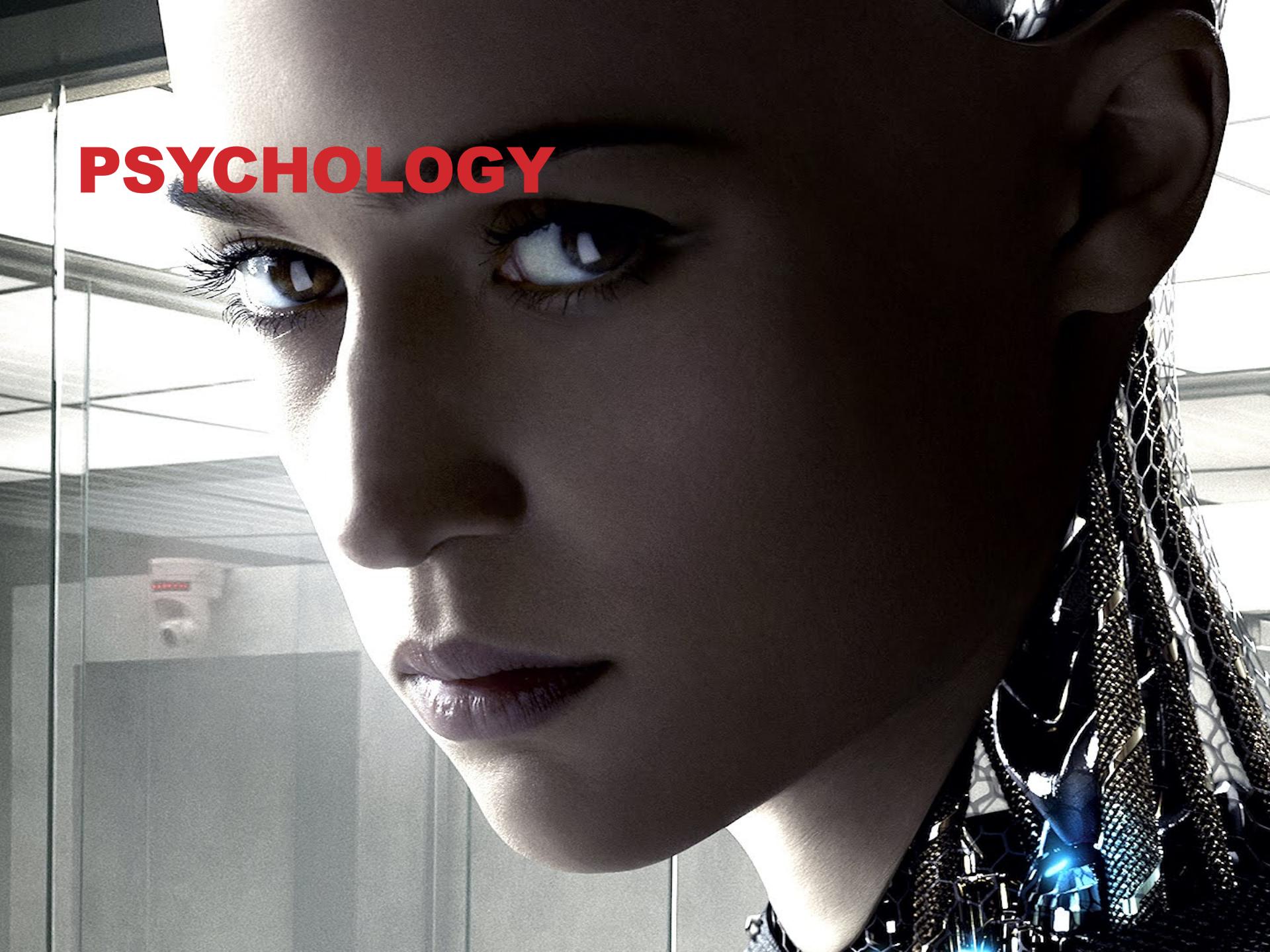
- **Numbers**
 - numerical and set operations
- **Space**
 - geometry and navigation
- **Physics**
 - inanimate objects and mechanics
- **Psychology**
 - agents and groups

PHYSICS



Add blocks, blocks made of styrofoam, blocks made of lead, blocks made of goo, table is made of rubber, table is actually quicksand, pour water on the tower, pour honey on the tower, blue blocks are glued together, red blocks are magnetic, gravity is reversed, wind blows over table, table has slippery ice on top...

PSYCHOLOGY



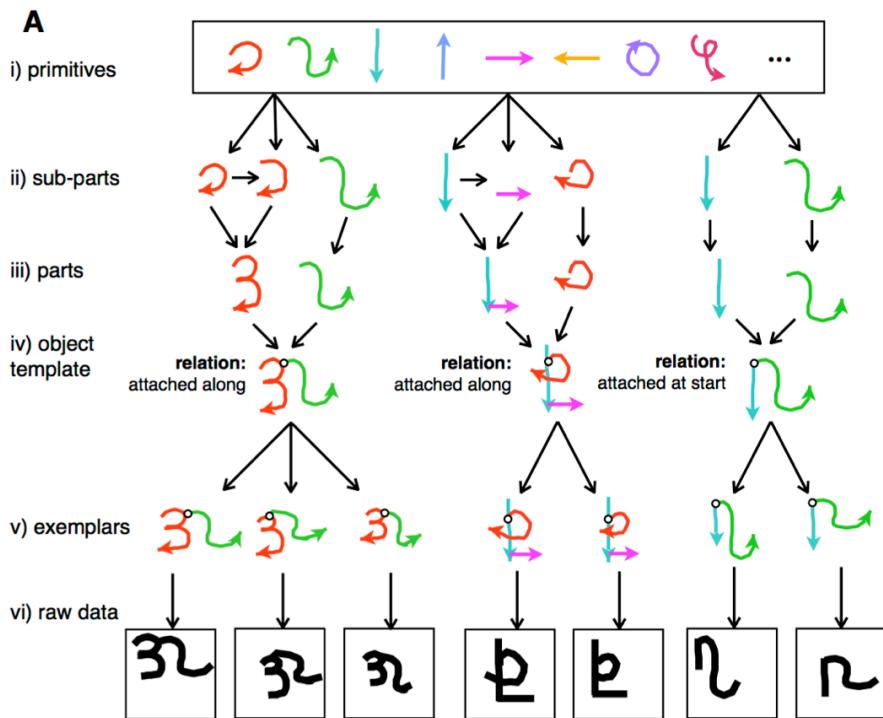
MODEL BUILDING

Beyond classification, concepts support:

- **prediction**
- **action**
- **communication**
- **explanation**
- **Composition**

“This richness and flexibility suggests that learning as model building is a better metaphor than learning as pattern recognition.”

MODEL BUILDING



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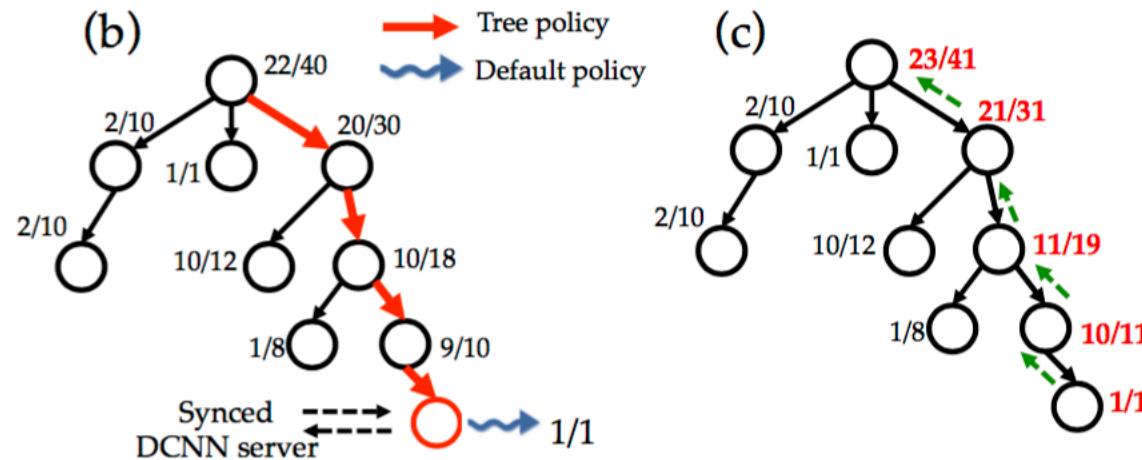
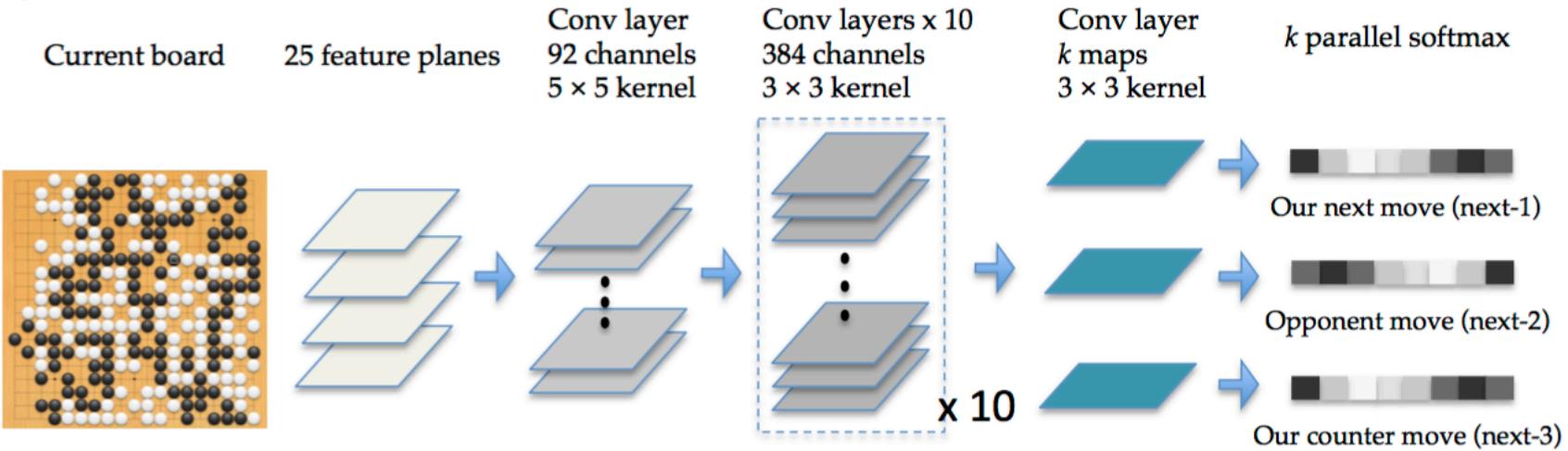
		Human or Machine?			
		M	JT	K	
		1	2	1	2
M	1	M M M	M M M	M M M	M M M
	2	M M M	M M M	M M M	M M M
		M M M	M M M	M M M	M M M
JT	1	JT JT JT	JT JT JT	JT JT JT	JT JT JT
	2	JT JT JT	JT JT JT	JT JT JT	JT JT JT
		JT JT JT	JT JT JT	JT JT JT	JT JT JT
K	1	K K K	K K K	K K K	K K K
	2	K K K	K K K	K K K	K K K
		K K K	K K K	K K K	K K K



a couple of men in suits and ties



a truck that is parked in front of a garage





a man in a black jacket is standing in the middle of a woman wearing rocks

FIN