Semantic Scholar Brings Artificial Intelligence to Neuroscience

First AI-Based Scientific Search Engine Speeds Neuroscience Research Process

SEATTLE (Nov. 11) – Today the Allen Institute for Artificial Intelligence (AI2) announced the launch of its artificial intelligence-based Semantic Scholar search engine (www.semanticscholar.org) for the biomedical research community, focusing initially on neuroscience. Semantic Scholar is the first free semantic search engine designed for scientists and is part of AI2’s mission to create “AI for the common good.” AI2 is the largest non-profit AI research institute in the U.S.

One of AI’s most important and immediate impacts is on scientific and medical research; surfacing the right studies from the right sources is critical to speeding this research. As Paul Allen put it, “Medical breakthroughs should not be hindered by the cumbersome process of searching the scientific literature. My vision for Semantic Scholar is to give researchers more powerful tools to comb through millions of academic papers online, to help them keep up with the explosive growth of science.”

Using data mining, natural language processing, and computer vision, Semantic Scholar extracts key academic paper elements like figures, influential citations, and topics including brain region, organism, and cell type in order to source the correct information. Until today, Semantic Scholar focused only on computer science research. Now the scope has widened to include neuroscience, which will be followed rapidly by the full biomedical literature in 2017.

“Semantic Scholar puts AI at the service of the scientific community,” said Dr. Oren Etzioni, CEO of AI2. “The brain continues to mystify the scientific and medical research community and harbors some of the diseases that are the most challenging to cure. Our hope is that the field of neuroscience can benefit from AI methods to ensure the best and most relevant studies are easily queried so medical research can move with maximum speed and efficiency.”

Semantic Scholar currently searches over 10 million computer science and neuroscience documents, and will cover the full biomedical literature as defined by PubMed in 2017. “For neuroscientists, Semantic Scholar already has substantial advantages over PubMed and Google Scholar; we are collaborating with AI2 to further extend its capabilities,” said Christof Koch, President and Chief Scientific Officer of the Allen Institute for Brain Science.

About the Allen Institute for Artificial Intelligence (AI2)

AI2 was founded by Paul Allen in 2014 with the goal of conducting high-impact research and engineering in the field of artificial intelligence, all for the common good. AI2’s CEO is Dr. Oren Etzioni, a leading researcher in the field of AI. AI2 employs over 60 top-notch researchers and engineers in Seattle, making it the largest non-profit AI research institute in the U.S.
The Semantic Scholar search results page for the query: “songbird basal ganglia”.

Incomplete and Inaccurate Vocal Imitation after Knockdown of FoxP2 in Songbird Basal Ganglia Nucleus Area X
Sebastian Haenier, Christelle Rochefort, Benjamin Georgi, Pawel Licznerski, Pawel Osten, Constance Scharff • PloS Biology • 2007
The gene encoding the forkhead box transcription factor, FOXP2, is essential for developing the full articulary power of human language. Mutations of FOXP2 cause developmental verbal dyspraxia (DDV), a speech and language disorder that compromises the fluent production of words and the correct use and comprehension of grammar. FoxP2 patients have... (More)

Vocal Experimentation in the Juvenile Songbird Requires a Basal Ganglia Circuit
Bence P. Ovéczky, Aaron S. Andelman, Michelle S. Fee • PloS biology • 2006
Songbirds learn their songs by trial-and-error experimentation, producing highly variable vocal output as juveniles. By comparing their own sounds to the song of a tutor, young songbirds gradually converge to a stable song that can be a remarkably good copy of the tutor song. Here we show that vocal variability in the learning songbird is induced by a... (More)

Organization of the songbird basal ganglia, including area X.
Abigail L. Person, Samuel D. Gale, Michael A. Ferrera, David J. Perkel • The Journal of comparative neurology • 2008
Area X is a songbird basal ganglia nucleus that is required for vocal learning. Both Area X and its immediate surround, the medial striatum (MS), contain cells displaying either striatal or pallidal characteristics. We used pathway-tracing techniques to compare directly the targets of Area X and MS with those of the lateral striatum (LS) and globus... (More)

Anatomy of a songbird basal ganglia circuit essential for vocal learning and plasticity.
Samuel D. Gale, David J. Perkel • Journal of chemical neuroanatomy • 2010
Vocal learning in songbirds requires an anatomically discrete and functionally dedicated circuit called the anterior forebrain pathway (AFP). The AFP is homologous to cortico-basal ganglia-thalamo-cortical loops in mammals. The basal ganglia portion of this pathway, Area X, shares many features characteristic of the mammalian striatum and pallidum,... (More)

Properties of dopamine release and uptake in the songbird basal ganglia.
Samuel D. Gale, David J. Perkel • Journal of neuropysiology • 2005
Vocal learning in songbirds requires a basal ganglia circuit termed the anterior forebrain pathway (AFP). The AFP is not required for song production, and its role in song learning is not well understood. Like the mammalian striatum, the striatal component of the AFP, Area X, receives dense dopaminergic innervation from the midbrain. Since dopamine (DA)... (More)
The mirror-neuron system.
Giacomo Rizzolatti, Lella Craighero - Annual review of neuroscience - 2004

Abstract
A category of stimuli of great importance for primates, humans in particular, is that formed by actions done by other individuals. If we want to survive, we must understand the actions of others. Furthermore, without action understanding, social organization is impossible. In the case of humans, there is another faculty that depends on the observation of others' actions: imitation learning. Unlike most species, we are able to learn by imitation, and this faculty is at the basis of human culture. In this review we present data on a neurophysiological mechanism—the mirror-neuron mechanism—that appears to play a fundamental role in both action understanding and imitation. We describe first the functional properties of mirror neurons in monkeys. We review next the characteristics of the mirror-neuron system in humans. We stress, in particular, those properties specific to the human mirror-neuron system that might explain the human capacity to learn by imitation. We conclude by discussing the relationship between the mirror-neuron system and language.

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Extracted Key Phrases
Motor Activation, Conspecific, Cognitive Mechanism, Learning by Imitation, Language Development

3 Figures and Tables

The Semantic Scholar page for the paper “The Mirror-neuron system”

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