

**ComS 610as: Developmental Robotics
Homework 1**

Out: Tuesday, September 13

Due: Thursday, September 22

Choose five of the following eight questions and answer them.

1. In your own words describe what is developmental robotics?
What is the main research hypothesis of this emerging field of robotics?
2. Pick two of your favorite main points from Hawkins' theory and summarize each one. Make sure that you mention their implications for the ways in which we design autonomous robots.
3. What is an invariant representation? How can it be learned? How can it be used?
4. Having an auto-associative memory that stores sequences of past sensorimotor interactions with the world gave humans a strong evolutionary advantage over other species. Give two examples in which having such a memory can be useful for performing everyday tasks. How is the memory used in each case?
5. If Hawkins' theory of the evolution of the cortex is correct (i.e., the different ways in which the cortex used behaviors encoded in the older parts of the brain throughout its evolution [see pages 97-105]) then what are the implications for behavior-based robotics?
6. In his book, Hawkins briefly describes the capabilities of auto-associative memories. Use your favorite web search engine to find examples of such memories and their implementation. Test one of these models with examples of your own choosing. What types of variations does it handle well? Not so well?
7. Catching a ball that is thrown at you is a complicated motor task. What do you think goes on in your brain while you try to catch the ball? Relate your answer to the memory-prediction model described by Hawkins.
8. What are the implications of Rich Sutton's *verification principle* for designing AI systems?