Learn and Think Like People

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The primary problem raised by this lengthy paper is that current learning methods are extremely data inefficient and are focusing too much on achieving prediction accuracy rather than models. I think there's a periodic pattern (almost a fad) of alternating focus on model-free (end to end) methods and model-based methods. Within the last 5 years there has been more focus on models, influenced by the highly successful PILCO system (Probabilistic Inference for Learning COntrol)[1] [2] which achieved competitive performance on RL tasks against model-free methods using an order of magnitude less training data.

The biggest obstacle to embracing models is the effect of model errors, since model-based methods inherently assume models describe the world sufficiently accurately. PILCO's address of this is to model using a Gaussian Process (GP), which is an inherently probabilistic model with deterministic uncertainty bounds. Explicitly representing model error/uncertainty was the key point of increasing data efficiency, and in general is something future methods should consider. In relation to the paper, GP can be thought of as performing Bayesian inference, which the paper mentions is a prominent method people use in an approximated manner for behaviours such as "childrens response variability" and "garden-path effects in sentence processing." This suggests a GP-like model is closer to human thinking than a neural net (somewhat ironically as neural nets mimic biology a lot more than GPs).

[1] http://mlg.eng.cam.ac.uk/pub/pdf/DeiRas11.pdf
[2] https://arxiv.org/pdf/1502.02860.pdf