WORKSHOP

MIRIX PEOPLE

Things we have shown:

We spent a lot of time talking about S, the Speed prior. S is a computable semi-measure. AIS is like AIξ but with S instead of ξ.

(1) S is not universal, because it is computable (and there is not universal computable prior)
(2) S is not a measure, for exactly the same reason that the Solomonoff prior is not a measure
(3) The algorithm AS from that paper is wrong, because it's not actually ϵ-optimal. Counterexample: you have a small program that outputs x, and then a bunch of large programs which also output x. The algorithm halts prematurely and has a bad estimate.
(4) However, we made up our own algorithm which does the same thing. Basically, it's clear that S is lower semi-computable. So we show that $S(x) - S(x0) - S(x1)$ is also lower semi-computable, which leads to $S(x0)$ being computable.
(5) ϵ-optimal AIS is computable.

Definition 1 (Monotone Turing Machine [LV08, Def. 4.5.2 & Def. 4.5.3][Hut05, Def. 2.6])**.** A *monotone Turing machine* is a Turing machine with one unidirectional read-only input tape, one unidirectional write-only output tape, a finite number of work tapes, and no final states. A monotone Turing machine implements a function q that maps $x \in \mathcal{X}^\sharp$ to $y \in \mathcal{X}^\sharp$: the input tape is initialized with x and y is read from the output tape according to the following cases.

(i) $x \in \mathcal{X}^*$ is finite and $y \in \mathcal{X}^*$ is to the left of the output tape's head when the head of the input tape reads the next character left of x.
(ii) The head of the output tape writes $y \in \mathcal{X}^*$ but no more as the machine runs forever where x is infinite or the head on the read-only input tape never reads any characters left of x.
(iii) The machine writes $y \in \mathcal{X}^\omega$ to the output tape as it runs forever where x is infinite or the head on the read-only input tape never reads any characters left of x.

References

[Hut05] Marcus Hutter. *Universal Artificial Intelligence: Sequential Decisions based on Algorithmic Probability*. Springer, 2005.

[LV08] Ming Li and Paul M. B. Vitnyi. *An Introduction to Kolmogorov Complexity and its Applications*. Texts in Computer Science. Springer, 3rd edition, 2008.