Recursive Self-Improvement

Tero Keski-Valkama

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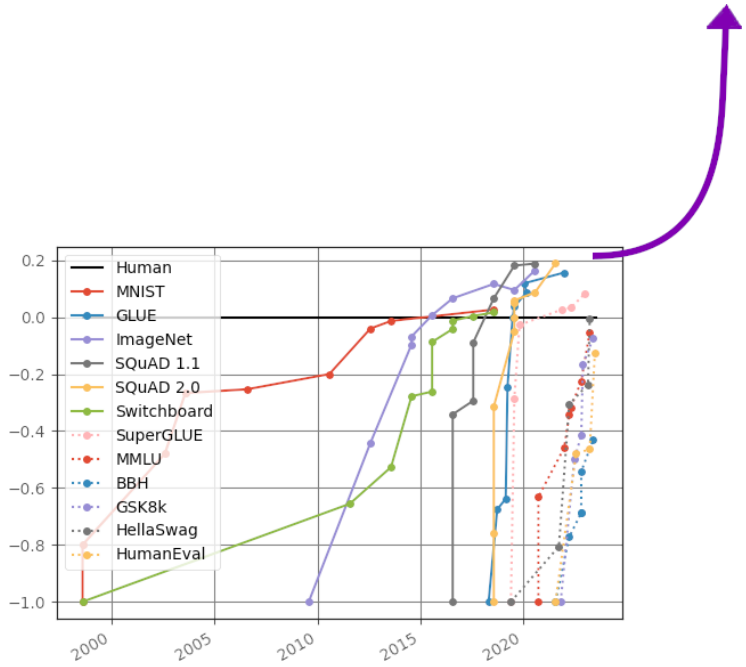
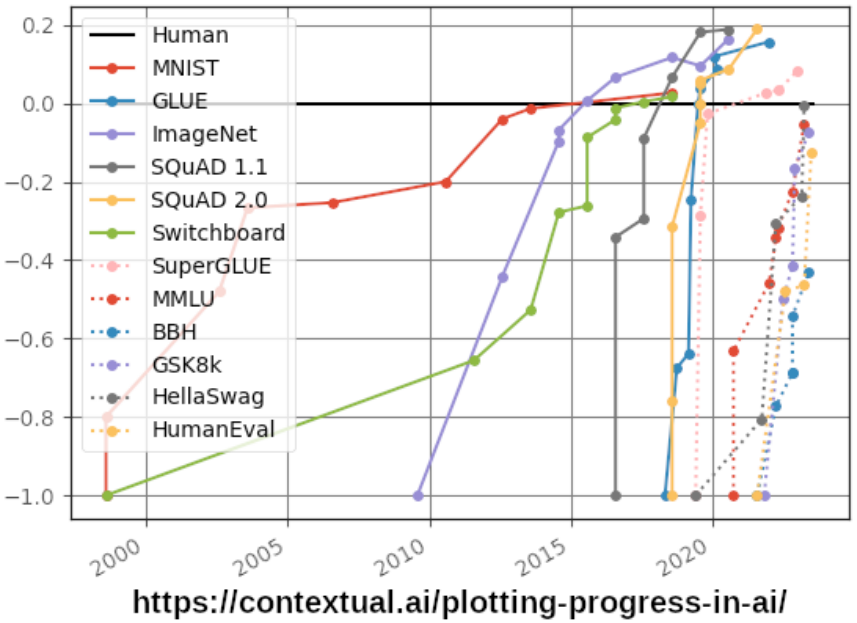
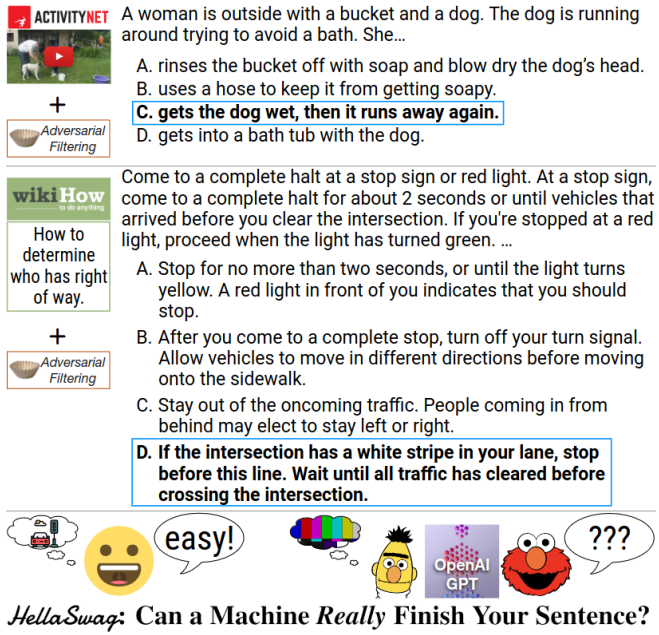


Introduction: Tero Keski-Valkama

- Tero Keski-Valkama is an AI generalist with over 25 years of experience spanning four countries, currently living in Spain.
- Worked with machine vision, complex control, SLAM, sensor fusion, semantic web, perceptrons, genetic algorithms, simulated annealing, SVMs, gradient boosting, deep learning, deep reinforcement learning, GANs, CNNs, Transformers, **LLMs**, **AGI**, embodiment, meta-learning, ...
- Robotics, pre-LLM chatbots, **LLM chatbots**, facial emotion recognition, automatic mapping, logistics, supply chain, **healthcare**...
- He has authored over 20 patents in the topic among countless other publications.
- Authored the first correct open source Google WaveNet implementation, the first communist AI, cofounded the second largest recurring AI event in Finland (AI Morning), ...

Capping at the Human-Level: Imitative Benchmarks





- All the common AI benchmarks we have tend to saturate at human-level, why?
- Because they are inherently imitative: They pick some tasks which are typically trivial for humans, but in which AIs still struggle. These tasks have correct answers produced by humans.
- Yes, even BIG[1]-Bench Hard is largely imitative.

[1] Beyond the Imitation Game

Imitative vs Non-Imitative Training

- Examples of **imitative** training: Pre-training of LLMs from web corpuses, instruct-tuning, anything with human generated labels.
- Examples of **non-imitative** training: **RLHF** (but specific in scope and limited by human bandwidth), **Code Llama** (but just one small task).
- We need a suite of open-ended, non-imitative tasks involving generalist skills with preferential machine judges.
- The tasks can be judged procedurally (like chess), or by LLMs (like social agent tasks).
- If a task is judged by an LLM, the act of judgement must also be judged $\Rightarrow$ **Recursive self-improvement**.
- The training itself is just fine-tuning for example with **DPO**, but it requires access to weights.

Recursive Self-Improvement Suite

- I predicted **"unambiguous AGI"** to be reached before the end of 2023, because the step to do it is so easy. Sadly the large labs didn't start properly working on it.
- So I started my own project, Recursive Self-Improvement Suite[2], to show how it's done.
- It's a work in progress with lots of collected references. It will be a suite of tasks and related preference judgement processes, which creates a large corpus of synthetic data which can be used to fine-tune any LLM with e.g. DPO.
- Implemented tasks so far: "Create a programming task", "Rank programming tasks", "Rank programming task rankings", "Create an evaluation code for a programming task", "Rank evaluation codes", "Rank evaluation code rankings", "Solve a programming task", "Rank programming task solutions", "Rank programming task solution rankings", ...

[2] Team: Tero Keski-Valkama, Asli Yaman

Try This at Home!

- The step to **recursive self-improvement** and **unambiguous AGI** is so small that anyone can now do it at home!
- You'll just need a large corpus of synthetic task performances involving generalist skills, preference evaluations on those, and apply DPO on some LLM with this data.