Artificial intelligence seems to be making enormous advances. It has become the (1)_____ technology behind self-driving cars, automatic translation systems, speech and textual analysis, image (2)_____ and all kinds of diagnosis and recognition systems. A.I. can (3)_____ the best human performance levels at specific tasks.

We are witnessing the emergence of a new commercial industry with intense activity, massive financial investment, and tremendous (4)_____. It would seem that there are no areas that are (5)_____ improvement by A.I. – no tasks that can't be automated, no problems that can't at least be helped by an A.I. application. But is this strictly true?

Theoretical studies of computation have shown there are some things that are not computable. Alan Turing, the brilliant mathematician and (6)_____ breaker, proved that some computations might never finish ((7)_____ others would take years or even centuries). For example, we can easily compute a few moves ahead in a game of chess, but to examine all the (8)_____ to the end of a typical 80-move chess game is completely impractical. Even using one of the world's (9)_____ supercomputers, running at over one hundred thousand trillion operations per second, it would take over a year to (10)_____ just a tiny portion of the chess space explored. This is also known as the scaling-up problem.

Early A.I. research often produced good results on small numbers of combinations of a problem (like (11)_____ and crosses, known as toy problems) but would not scale up to larger ones like chess (real-life problems). Fortunately, modern A.I. has developed alternative ways of dealing with such problems. These can (12)_____ the world's best human players, not by looking at all possible moves ahead, but by looking a lot further than the human mind can manage. It does this by using methods involving approximations, (13)_____ estimates, large neural networks and other machine-learning techniques.

But these are really problems of computer science, not artificial intelligence. Are there any fundamental limitations on A.I. performing (14)_____? A serious issue becomes clear when we consider human-computer interaction. It is widely expected that future A.I. systems will communicate with and assist humans in friendly, (15)_____ interactive, social exchanges.