A brief review of the Deep Blue paper:
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Deep Blue was the computer chess playing agent developed by the scientists at IBM TJ Watson Research center that in 1997 famously beat the then world chess champion Garry Kasparov. The paper walks through the years long evolution of the agent together with a detailed description of the hardware and software components and algorithm optimizations that went into its making. Given chess' huge search space, the IBM scientists decided to take a two-pronged approach to search - a slower but flexible software search on the early branches of the tree and a much faster and comparatively inflexible hardware (chess chip) search on deeper branches. The chess chip had 3 major components, the move generator, the evaluation function and search control. There were two variants of hardware evaluation function, a fast one that mostly evaluated moves based on piece placement value and a slower variant that took into account a myriad of chess concepts like square control, etc. For the software search, the team used various guiding principles like forcing / forced pairs, fractional extensions, dual credit, etc to prune the search tree and optimize search. The hardware search that was part of the computer chip carried out a fixed-window null search that included a quiescence search with various search extension heuristics. To speed up search, the team implemented various parallel search algorithm optimizations drawing from their extensive knowledge of chess game state space. The principal component of the winning strategy was the evaluation function which used approximately 8000 features to evaluate the value of a position. Although most of these features were drawn from human expertise, the team employed automated techniques to estimate and fine tune noisy features and their weights. This, together with an extensive opening book which was created with the help of chess grand masters (one of whom beat Deep Blue 1 twice) and an extended book (both online and offline) made Deep Blue a very able chess playing agent. The choice of the repertoire of opening moves for a particular game was was based on various game influenced factors chosen on the day of the game. Also, Deep Blue had access to all 4 and 5 piece endgames drawn from public databases resulting in the culmination of a comprehensive chess playing agent that beat the work champion Kasparov.