Research review:

On the development of historical improvement in the field of artificial intelligence search and planning, three cornerstone ideas have been:

Markov Decision Process

Markov Decision processes provide a framework to model processes where the outcome of an action is not fully predictable, i.e. there is randomness in the expected result. It relates current states with future states by the action selected to transition from the first to the former basing the relation on a probabilistic function. Markov decision processes take into consideration the history of decision, being used for reinforcement learning when the reward is expected several actions beyond the immediate effect of a single decision (greedy behavior).

[https://en.wikipedia.org/wiki/Markov_decision_process – Markov decision process]

Heuristic search planning:

Heuristic search planners are related to specialized domain solvers, but they differ mainly in the use of a general language for stating the problem constrains and a general mechanism to extract further heuristics as the agent interacts with the environment. This adaptability to main problems comes with a tradeoff in form of performance, as specialized solvers still beat generalized ones. Thus, when taken in consideration both flexibility (modeling a wide array of problems) and efficiency (in terms of speed and adequacy of the given solution).

[Blai Bonet ∗, Héctor Geffne - Planning as heuristic search]
[David Meger, Ioannis Rekleitis, and Gregory Dudek - Heuristic Search Planning to Reduce Exploration Uncertainty]

Hybrid Planning

Hybrid planning is the combination of several specific problem solvers in conjunction with the use of a more generalist solver. Several approaches are:

- Discretizing the general problem in order to be solvable by the specialized problem solvers
- Combination of different global searching techniques to obtain an improved ensemble searcher

[https://cecs.anu.edu.au/research/research-projects/robust-ai-planning-hybrid-systems- Robust AI Planning for Hybrid Systems]
[Dmitri Dolgov, Sebastian Thrun, Michael Montemerlo, James Diebel - Practical Search Techniques in Path Planning for Autonomous Driving]