What is state space search? Explain forward state space search and backward state space search.

In [artificial intelligence](https://en.wikipedia.org/wiki/Artificial_intelligence) and [computer programming](https://en.wikipedia.org/wiki/Computer_programming), state space planning is a process used in designing programs to search for data or solutions to problems. In a computer algorithm that searches a [data structure](https://en.wikipedia.org/wiki/Data_structure) for a piece of data, for example a program that looks up a word in a computer dictionary, the [state space](https://en.wikipedia.org/wiki/State_space) is a collective term for all the data to be searched. Similarly, artificial intelligence programs often employ a process of searching through a finite universe of possible procedures for reaching a goal, to find a procedure or the best procedure to achieve the goal. The universe of possible solutions to be searched is called the state space. State space planning is the process of deciding which parts of the state space the program will search, and in what order.

Forward search is an algorithm that searches forward from the initial state of the world to try to find a state that satisfies the goal formula.

Forward-search(O, s0, g)

s = S0

P = the empty plan

loop

if s satisfies g then return P

applicable = {a | a is a ground instance of an operator in O,and precond(a) is true in s}

if applicable = ∅ then return failure

nondeterministically choose an action a from applicable

s = γ(s,a)

P = P.a

Backward-search(O, s0, g)

s = s0

P = the empty plan

loop

if s satisfies g then return P

relevant = {a | a is a ground instance of an operator in O that is relevant for g}

if relevant = ∅ then return failure

nondeterministically choose an action a from relevant

P = a.P

s = γ−1(s,a)