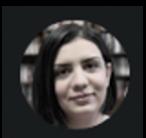


# AI PLANNING: THEORY AND PRACTICE



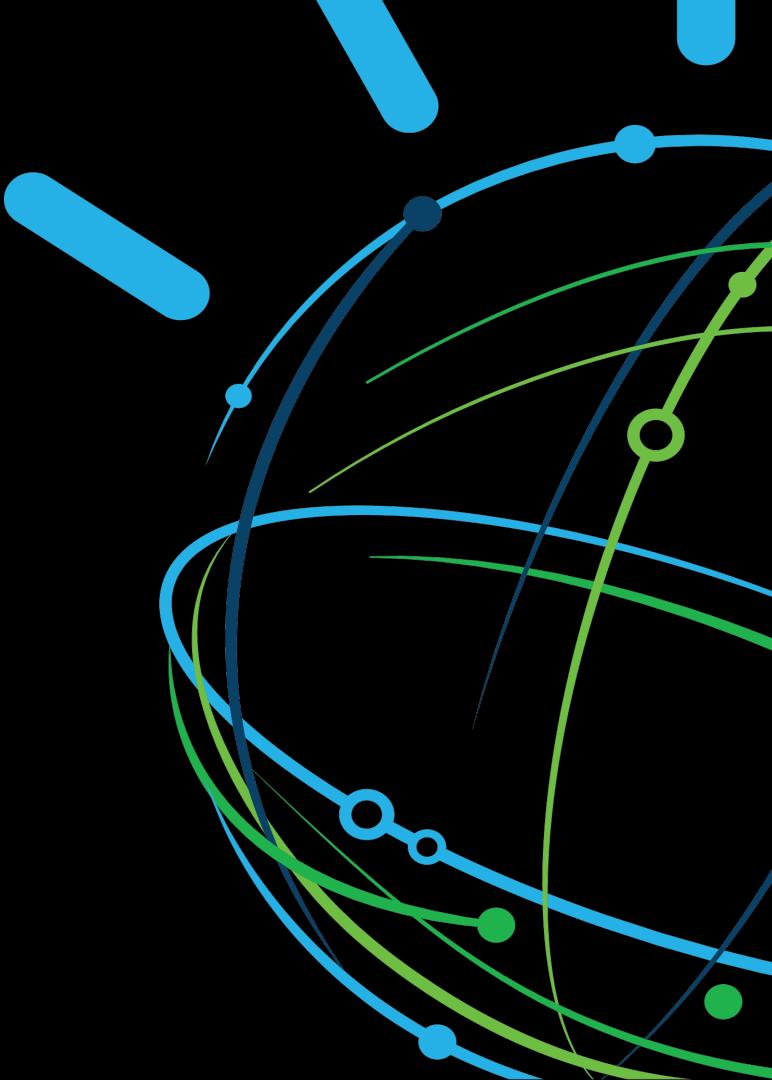
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# What is AI Planning...

Task of finding a procedural course of action  
for a declaratively described system  
to reach its goals  
while optimizing overall performance measures



# Brief introduction to AI planning

## Basic Planning Problem

Given descriptions of

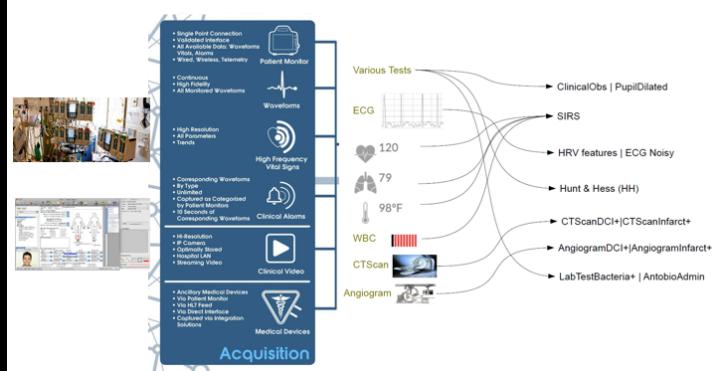
- possible initial states of the world
- desired goals
- a set of possible actions

Synthesize a plan that is guaranteed to generate a state which contains the desired goals.

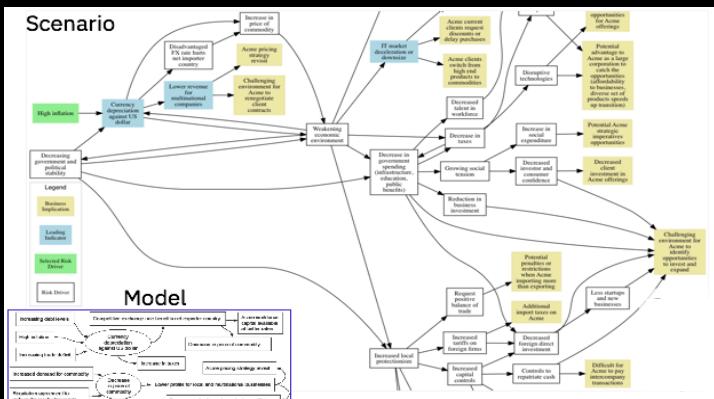
# Brief introduction to AI planning



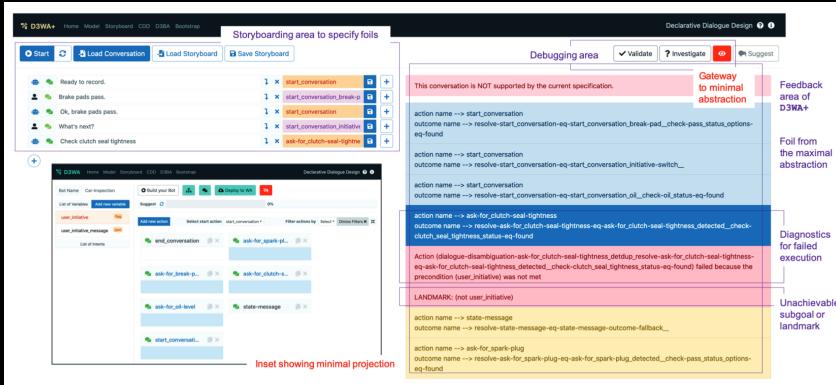
# Motivation



[Automated large-scale data analysis, ICAPS 2015]



<sup>6</sup> [Scenario planning for enterprise risk management, AAAI 2018]



[D3WA+: A Case Study of XAIP in a Model Acquisition Task, ICAPS 2020]



[Exploring Context-Free Languages via Planning: The Case for Automating Machine Learning, ICAPS 2020]

# Scenario Planning Advisor

The screenshot shows the SPA landing page. At the top, there's a purple header bar with the SPA logo (three arrows forming a circle) and the text "IBM Scenario Planning Advisor". Below the header, the main content area has a white background. It features a paragraph about the project, a "Get started now" button, and links for terms and conditions and third-party licenses. A "Privacy notice" section at the bottom contains detailed information about data collection and user rights, with a link to the IBM privacy statement.

IBM Scenario Planning Advisor

The Scenario Planning Advisor (SPA) is a project developed by [IBM Research AI](#) and the office of IBM's Chief Risk Officer. SPA is a technology that automatically projects many different futures to provide insights for strategic decision making. To find out more about the technology and the research behind it, please [visit us here](#).

SPA is available for use on a trial basis by other organizations. [Get started now.](#)

Read our [terms and conditions](#) and the [3rd party licenses](#).

Privacy notice

The IBM Scenario Planning Advisor service is used to derive insights from complex causal models between risk drivers. This service collects personal information you provide to sign up such as your name and email address. This information is used for two purposes only: (1) to allow you to login into the application and (2) show your name (if provided) or email address attached to artifacts you create such as scenarios and models; this is only displayed to your collaborators that you explicitly allowed to access models you created or that are members of models you explicitly requested to join. The name and email address you provide are securely stored on the IBM Cloud. You can immediately remove your name and email address from all artifacts associated with the IBM Scenario Planning Advisor by selecting the option *Delete My Data* from the *Manage my profile* menu. Your name may be retained by application logs for up to 90 days after your last login.

Please read the [IBM privacy statement](#).

## Problem

Scenario Planning for risk mitigation is a mostly manual process

Only a few scenarios can be constructed manually and explored

High impact low likelihood events are overlooked

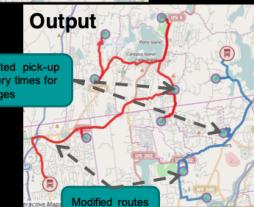
## Benefits

- Reduction in time for building scenarios from months to hours
- Exploration of orders of magnitude more scenarios than possible if built manually

## Solution

- Exploit NLU techniques to semi-automatically construct scenario planning models
- Automatically explore the space of possible scenarios with an AI Planner
- Choose scenarios of high relevance to a client at a particular time

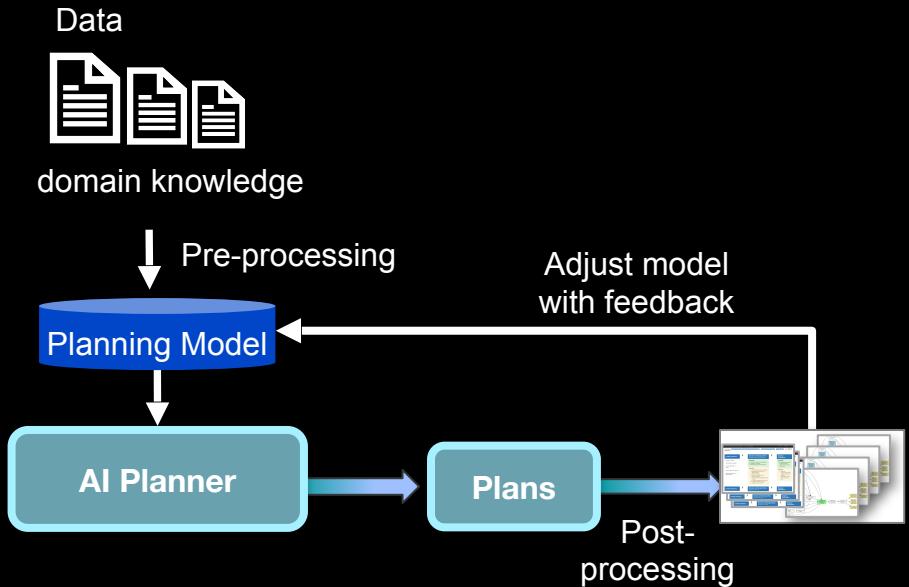
# Why AI Planning is Important?



# How to Spot a Planning Problem

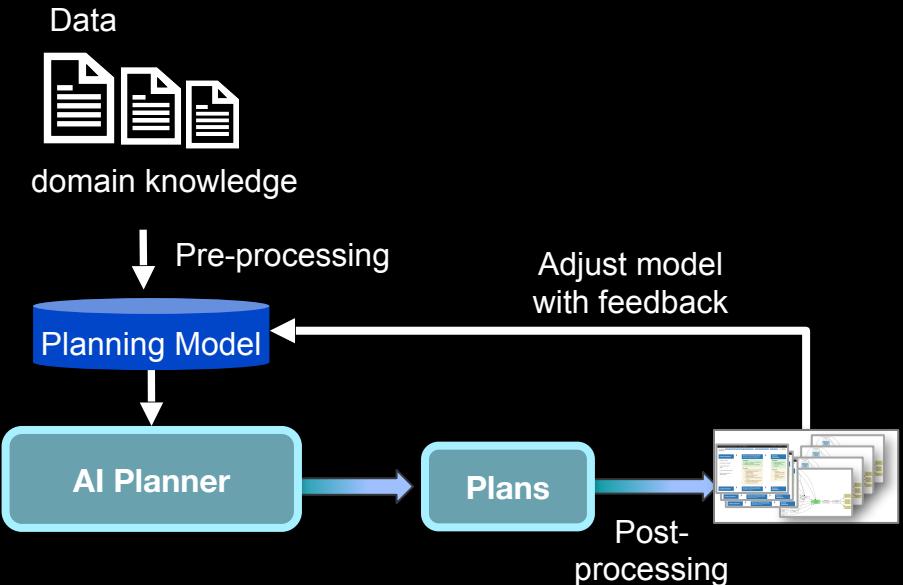
- 1) Your problem can be described in a declarative way
- 2) You have domain knowledge that should not be ignored
- 3) Pure learning techniques are difficult to use either because there is a structure of the problem that cannot be learned by training or that there is little to no available training data
- 4) You want to be able to explain a particular course of action the system took
- 5) You can leverage the existing relationship between a problem that is similar to yours to AI Planning

# AI Planning



1. Create an initial planning model for the problem domain of interest
2. Run an appropriate planner on the model to solve the model
3. Translate the solution for the model into a solution for the problem of interest and inspect the solution
4. Adjust the model, if needed and go to step 2

# Plan



- |             |              |
|-------------|--------------|
| 1. Theory   | 11:45 AM EST |
| 2. Modeling | 1:00 AM EST  |
| 3. Practice | 2:30 PM EST  |