100

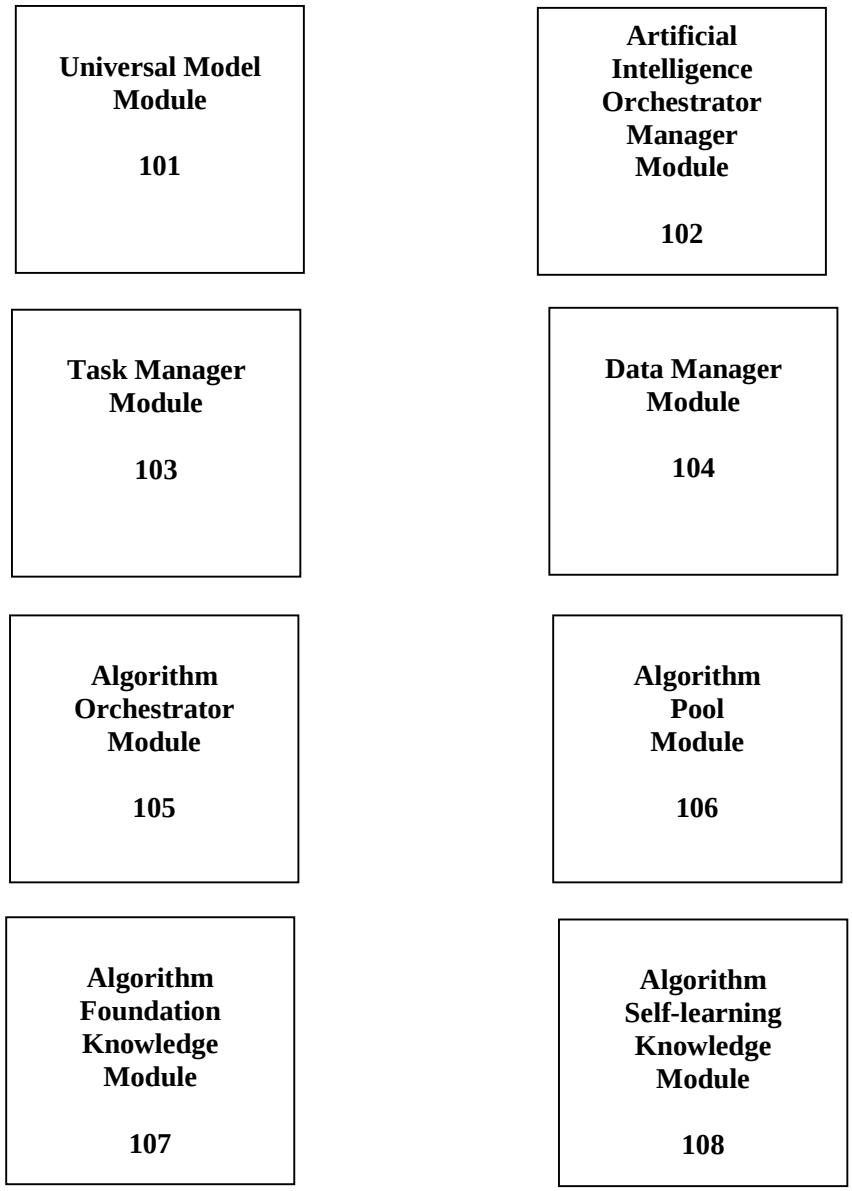

Universal Model Module
101
Artificial Intelligence Orchestrator Manager Module
102
Task Manager Module
103
Data Manager Module
104
Algorithm Orchestrator Module
105
Algorithm Pool Module
106
Algorithm Foundation Knowledge Module
107
Algorithm Self-learning Knowledge Module
108

Figure 1

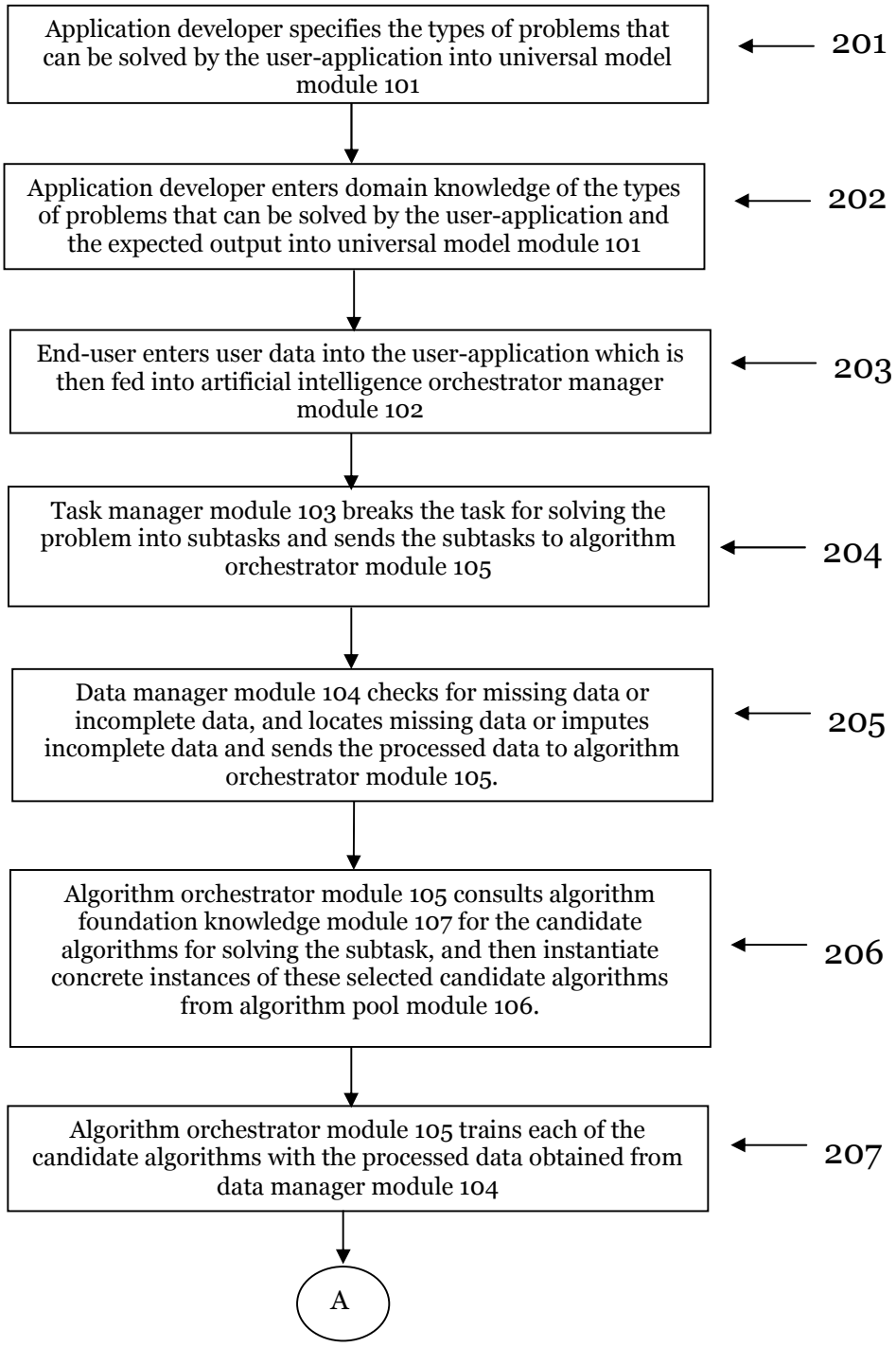

Application developer specifies the types of problems that can be solved by the user-application into universal model module 101
201
Application developer enters domain knowledge of the types of problems that can be solved by the user-application and the expected output into universal model module 101
202
End-user enters user data into the user-application which is then fed into artificial intelligence orchestrator manager module 102
203
Task manager module 103 breaks the task for solving the problem into subtasks and sends the subtasks to algorithm orchestrator module 105
204
Data manager module 104 checks for missing data or incomplete data, and locates missing data or imputes incomplete data and sends the processed data to algorithm orchestrator module 105.
205
Algorithm orchestrator module 105 consults algorithm foundation knowledge module 107 for the candidate algorithms for solving the subtask, and then instantiate concrete instances of these selected candidate algorithms from algorithm pool module 106.
206
Algorithm orchestrator module 105 trains each of the candidate algorithms with the processed data obtained from data manager module 104
207
A

Figure 2

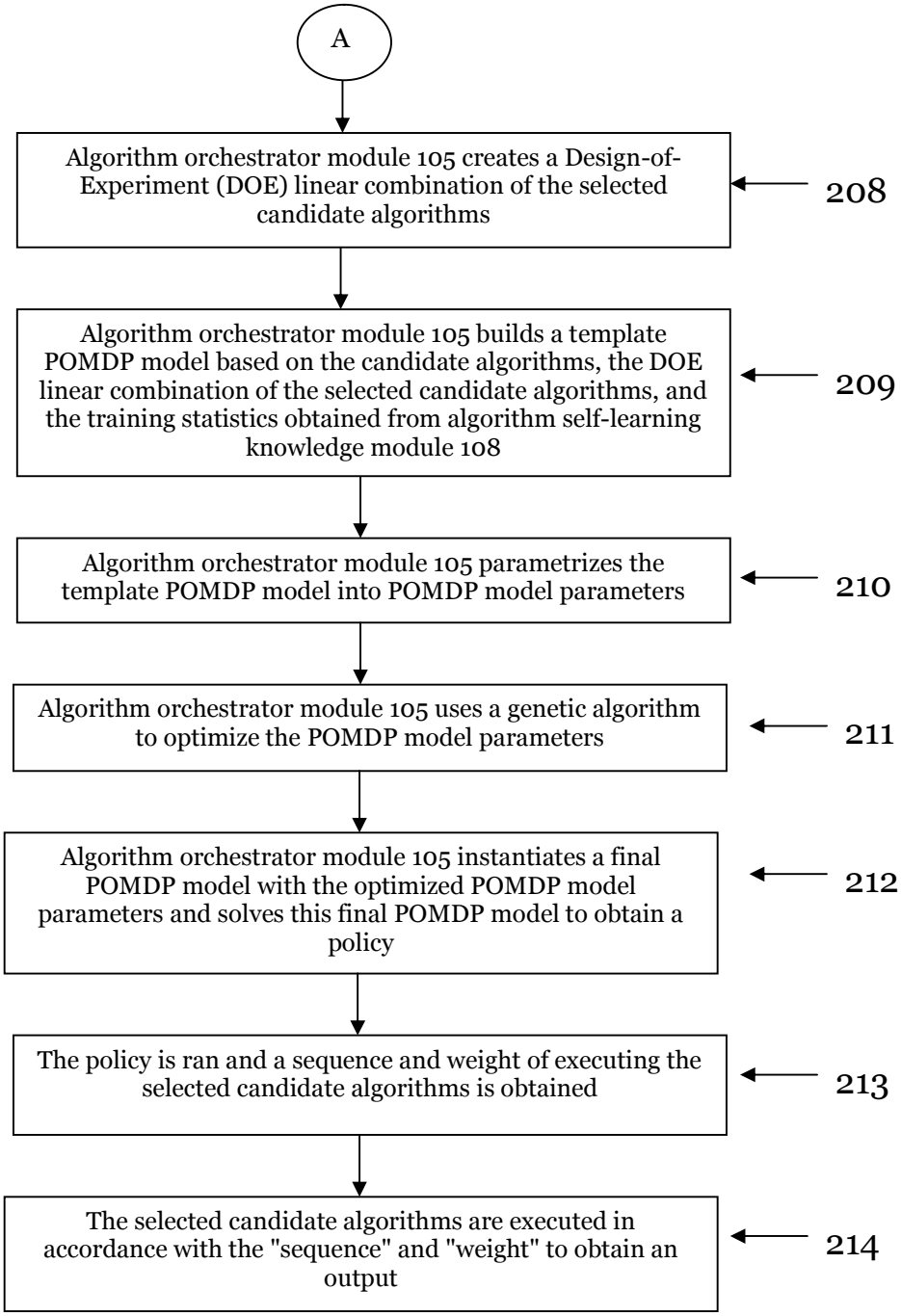


Figure 2
(continued)

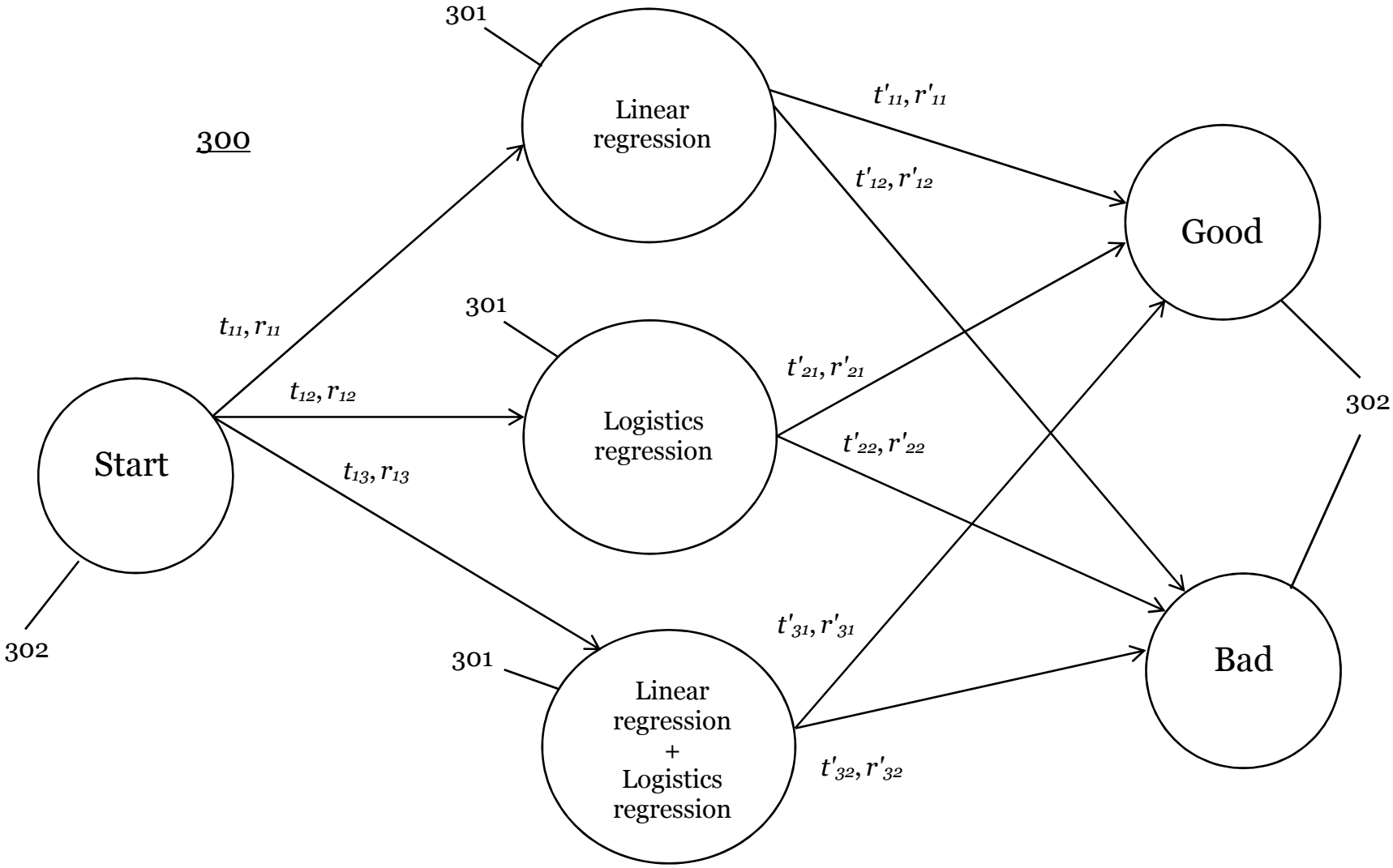

300
301
Linear regression
301
Logistics regression
301
Linear regression + Logistics regression
Start
302
302
Good
Bad
t_{11}, r_{11}
t_{12}, r_{12}
t_{13}, r_{13}
t'_{11}, r'_{11}
t'_{12}, r'_{12}
t'_{21}, r'_{21}
t'_{22}, r'_{22}
t'_{31}, r'_{31}
t'_{32}, r'_{32}

Figure 3

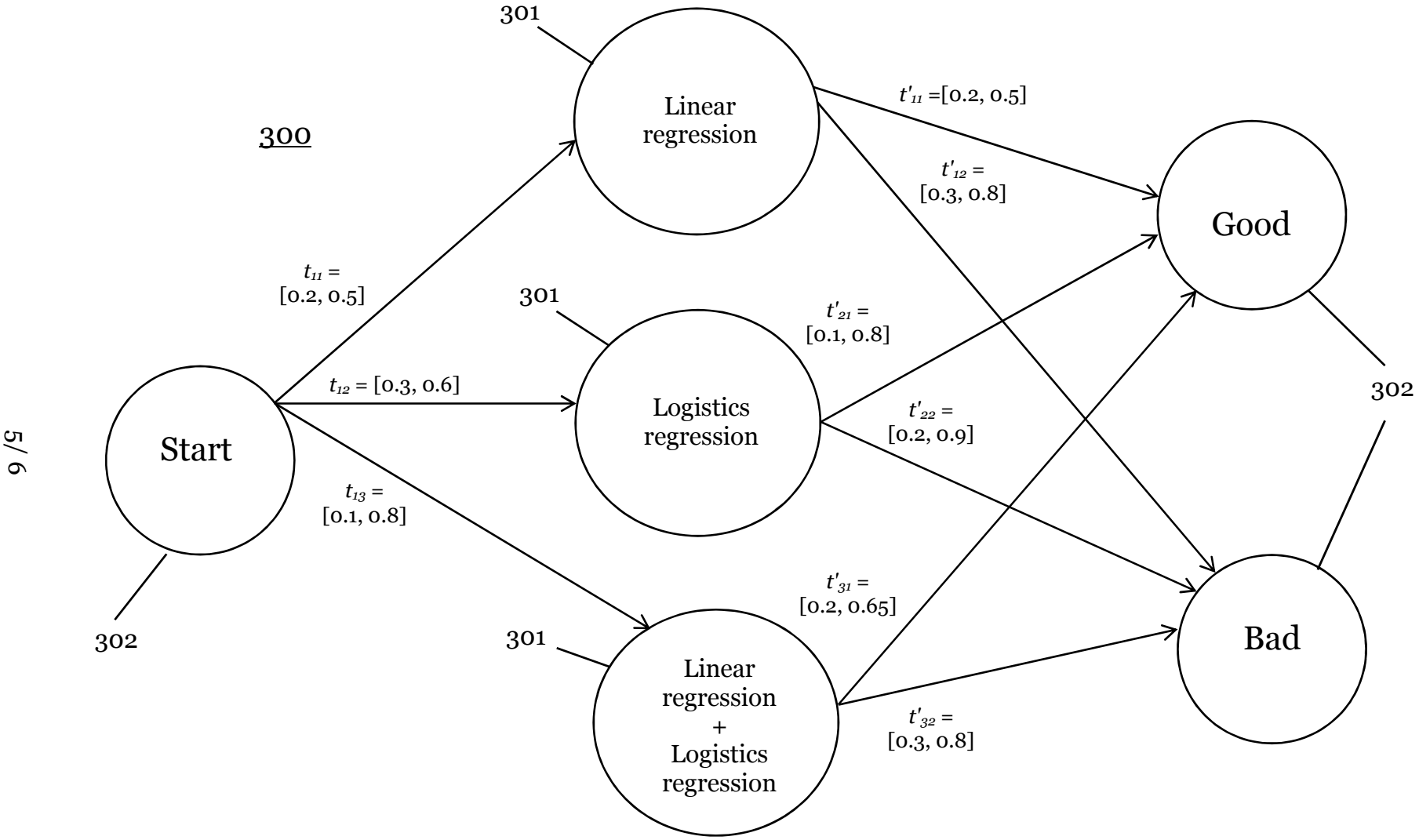

300
301
Linear regression
t'_{11} =[0.2, 0.5]
t'_{12} = [0.3, 0.8]
Good
t_{11} = [0.2, 0.5]
301
Logistics regression
t'_{21} = [0.1, 0.8]
t_{12} = [0.3, 0.6]
302
Start
t'_{22} = [0.2, 0.9]
t_{13} = [0.1, 0.8]
t'_{31} = [0.2, 0.65]
302
301
Linear regression + Logistics regression
Bad
t'_{32} = [0.3, 0.8]

Figure 4

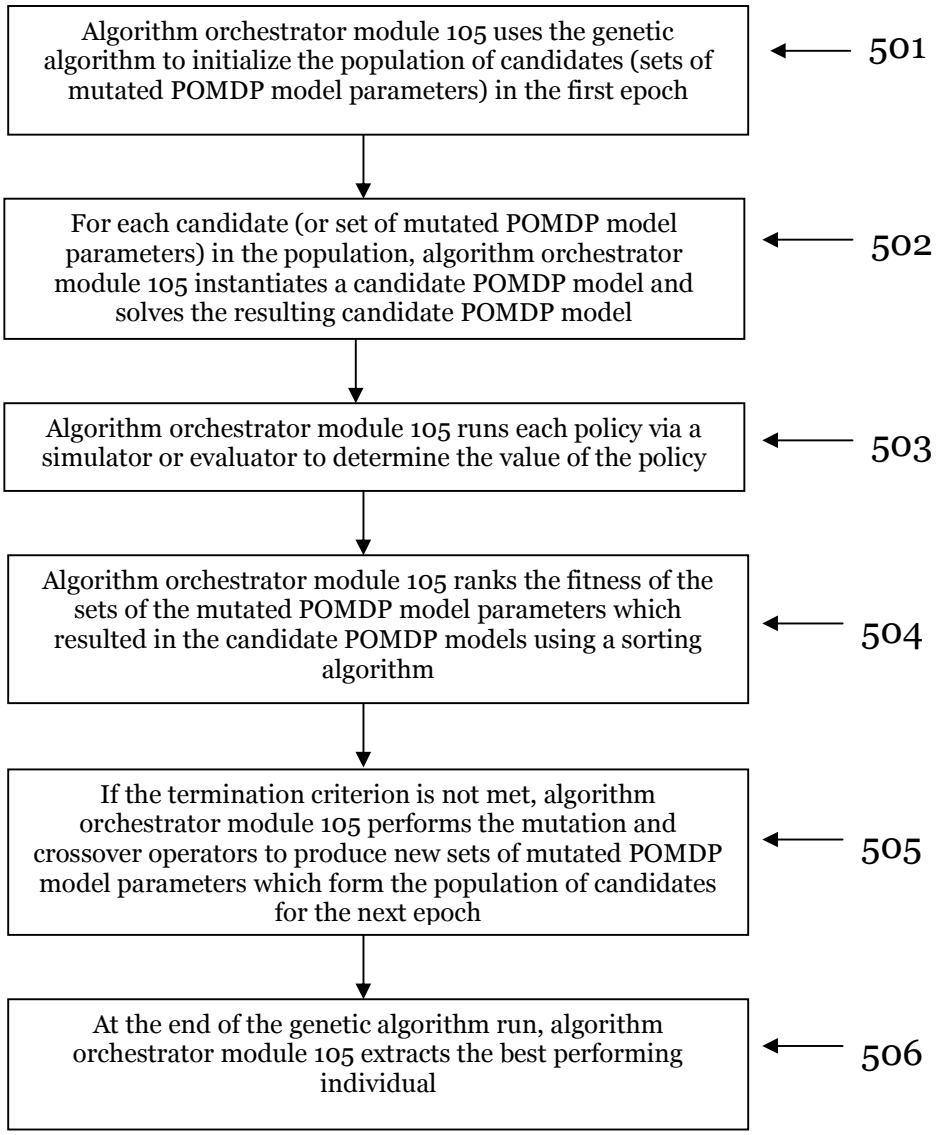

Algorithm orchestrator module 105 uses the genetic algorithm to initialize the population of candidates (sets of mutated POMDP model parameters) in the first epoch
501
For each candidate (or set of mutated POMDP model parameters) in the population, algorithm orchestrator module 105 instantiates a candidate POMDP model and solves the resulting candidate POMDP model
502
Algorithm orchestrator module 105 runs each policy via a simulator or evaluator to determine the value of the policy
503
Algorithm orchestrator module 105 ranks the fitness of the sets of the mutated POMDP model parameters which resulted in the candidate POMDP models using a sorting algorithm
504
If the termination criterion is not met, algorithm orchestrator module 105 performs the mutation and crossover operators to produce new sets of mutated POMDP model parameters which form the population of candidates for the next epoch
505
At the end of the genetic algorithm run, algorithm orchestrator module 105 extracts the best performing individual
506

Figure 5