CLAIMS

1. A control system comprising a device (100) for predicting the value of a control variable, the control variable depending on multiple parameters, the parameters comprising a non-explicit parameter, having no ground-truth, the link between the non-explicit parameter and the parameters on which the control variable depends being known, wherein the prediction device comprises a first neural network (2A)-based predictor (101) configured to compute an estimate of the non-explicit parameter and a second neural network (2B)-based predictor (102) configured to compute an estimate of said value of the control variable from the estimate of the non-explicit parameter, the two predictors (101, 102) receiving an input dataset, each neural network (2A, 2B) being associated with a set of weights, the prediction device (100) being configured to jointly train the two predictors, in a training phase, by applying a plurality of iterations of a single learning function to the two predictors (101, 102) to determine the weights of said first neural network and said second neural network, the learning function comprising:

- a forward propagation block (31), configured to compute, in response to the input datasets applied to the two predictors (101; 102), the gradient of a minimization function for minimizing a cost function of the first predictor (101);

- a backpropagation block (32), configured to update at least some of the weights of the neural networks of the two predictors by backpropagating the gradients computed by the forward propagation block,

the prediction device (100) being configured to estimate the value of the control variable at a future time, in a generalization phase, after said iterations of the learning function, by applying input data to the neural networks of the two predictors (101, 102) using said weights determined in the training phase,

wherein the control system is configured to use said estimated value of the control variable to perform control.

2. The control system as claimed in claim 1, wherein the backpropagation block (32) is configured to update the weights of the second predictor (102), while the weights of the first predictor (101) are fixed.

3. The control system as claimed in either of claims 1 and 2, wherein the first predictor (101) comprises a neural network receiving generic input data.

4. The control system as claimed in either of claims 1 and 2, wherein the first predictor (101) comprises a set of elementary neural networks each receiving specific input data.

5. The control system as claimed in one of the preceding claims, wherein the second predictor (102) is configured to apply the predicted value at input of the first predictor (101).

6. The control system as claimed in any one of the preceding claims, wherein the first predictor (101) is configured to broadcast the output value of the non-explicit parameter to external systems.

7. The control system as claimed in any one of the preceding claims, wherein the control system is an air traffic control system and wherein the control variable is the time of arrival of a given aircraft taking a trajectory between a departure point and an arrival point, the non-explicit parameter relating to the arrival point of the aircraft, the control system being configured to use the estimated value of the control variable to control air-traffic.

8. The control system as claimed in claim 7, wherein the non-explicit parameter is the congestion level at the arrival point.

9. The control system as claimed in claim 7, wherein the non-explicit parameter is a global delay parameter.

10. The control system as claimed in one of claims 7 to 9, wherein the input data of the first predictor (101) comprise features relating to said given aircraft, information relating to aircraft arriving at the arrival point, and the maximum number of aircraft associated with the arrival point.

11. The control system as claimed in claim 10, wherein the input data relating to aircraft arriving at the arrival point comprise the number and type of aircraft expected to land at the arrival point per time range.

12. The control system as claimed in one of the preceding claims 7 to 11, wherein the input data of the second predictor (102) comprise features relating to said given

aircraft, information relating to aircraft arriving at the arrival point, and capacity information associated with the arrival point.

13. The control system as claimed in one of claims 7 to 12, wherein the input data of the second predictor comprise a time slot representing the expected landing range for said given aircraft, and a history of values of the non-explicit parameter over a past time period.

14. The control system of claim 1, wherein the control system is an air traffic control system and wherein the control variable is the Estimated Time of Overflight to control air-traffic.