Continua for Training a Robot

Do you have a robot that is laborious to program and optimize? Would you like a plug-in solution that allows you to simply teach your robot the skills and knowledge it needs instead? Would you like your robots to reuse what they've done in the past and adapt it to new situations — even if it was first learned on a different robot?

Continua provides Continual Learning as a cloud service. The learning platform collects all your robots' experiences, learns to achieve the goals you set for it, and coalesces these into a reservoir of abilities that can be deployed as needed. Your robots get frequent updates, continually improving their abilities with every update. The following example illustrates how Continua can help support your robotics operations.

Automation of Robot Training

1. You have a robot with sensors, actuators, sophisticated computation on board, and a control process which repeatedly selects actions with long-term consequences.
2. Your robot opens a communication stream with our platform, where it can occasionally upload its experiences (time series of sensor and actuator data).
3. You determine which set of objectives you would like the robot to learn. The robot then self-trains using Continua for learning support. Continua periodically downloads new controllers into the robot so it can make fast, real-time action decisions on board.
4. Your employees or users train the robot via demonstrations and/or feedback on past decisions. The skills and knowledge that are learned in the process provide the basis for learning new skills and knowledge.
5. Continua learns about many objectives simultaneously, which allows you to update which objective(s) the robot tries to achieve at any time.
6. Over time, Continua learns which actions at each decision-point lead to better performance on the objective(s) you provide.

EXPECTED RESULTS: Through its interaction with your robots, Continua learns which actions work best in each situation. Performance improves automatically and continually over time for the objective(s) you define. Skills and knowledge build up incrementally.

HOW TO GET STARTED: We will work closely with you on defining items 2-6 above, which can be adjusted to better fit your particular situation. See the back of this brochure for information your developers can use to assess how they would deploy Continua.

KEEP IN MIND: This is just one example of how Continua can automate decision-making processes and enable them to improve continually.

Integrating your robot(s) with Continua

The Cogitai platform Continua is hosted in the cloud. To access Continua from your systems, you will first need to create a corporate account on the platform. Once the account is established, your services will use that account information to establish secure connections to Continua.

Continua has a relatively simple but flexible RESTful interface. We will work with you to define the format of the data and the objectives that Continua should learn to maximize.

For each robot in the automation examples illustrated on the front of this brochure, the interaction between your system and Continua will follow this basic pattern:

1. **Input from robot:** Whenever feasible, your system will upload information from your robot's interaction, including information about the robot's choices. The robot interaction data can include user demonstrations of desired behavior, and/or feedback on past decisions.

2. **Suggested action:** At each decision-point in your robot's interaction with its environment, your system will request an action recommendation from Continua. Your system will then execute that action, an action from the downloaded controller, or an action of your controller's choosing, recording which action was taken.

3. **Outcome:** At any point during the robot's operation, your system can send values characterizing the quality of the robot's interaction according to the objective(s) you wish Continua to optimize. This allows Continua to improve its future performance according to those objectives; simultaneously, Continua will recognize, optimize and store the robot's skills and knowledge as they develop in a form that can be shared with other robots.
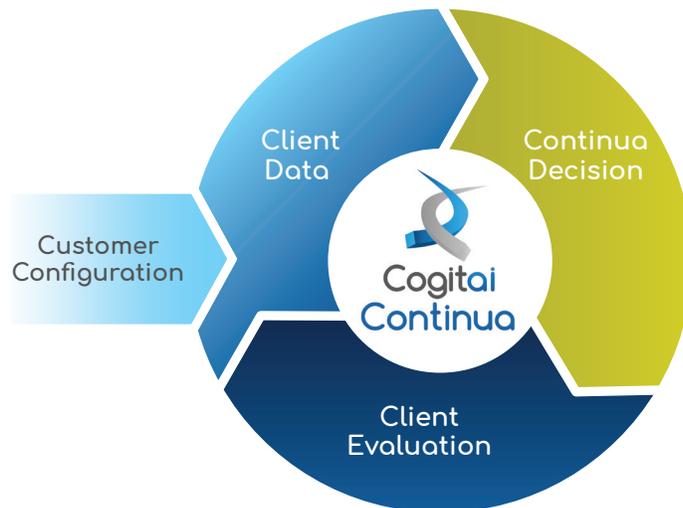
Data is passed to Continua in JSON format. To simplify interaction with the Continua platform, Cogitai supplies client libraries in Java, Javascript, Python and other languages that communicate with Continua as described in the steps above. Beyond these tools, Cogitai also supplies a lower-level API for developers with strong backgrounds in Machine Learning and Reinforcement Learning, who wish to modify finer details of Continua's learning methods. Cogitai also makes available a set of interfaces to let you monitor your Cogitai account.

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