

# Supply Chain Management League (SCML)

*Deadlines were extended in light of the COVID-19 situation. The competition will run in all cases whether IJCAI was delayed or went virtual (see dates below).*

## Challenge

**Design and build an autonomous agent that negotiates on behalf of a factory manager situated in a supply chain management simulation.**

The goal of a factory manager in SCML is to maximize its profit given its private production capabilities by negotiating trades with other agents. A factory manager can engage in several negotiations simultaneously, for which its utility functions are in general interdependent. These negotiations, and any ensuing contracts, are bilateral. Moreover, they are private to the agents involved.

The full description of the game is available [here](#).

## Negotiation Protocol

Participating agents are factory managers that control factories with predefined manufacturing profiles which are revealed privately to each agent at the start of each simulation. Factory manager agents need to negotiate bilaterally with other agents to buy the necessary inputs to their manufacturing process, and to sell the outputs.

All negotiations are carried out via the alternating offers protocol. This protocol specifies that two negotiators take turns making offers. One agent starts the negotiation with an opening bid, after which the other party can take the following actions:

1. Accept the offer
2. Make a counter offer, thus rejecting and overriding the previous offer
3. Walk away, thus declaring an end to the negotiation without having reached an agreement

This process is repeated until either an agreement is reached, or the deadline arrives. To reach an agreement, both parties must accept the offer. If no agreement has been reached by the deadline, the negotiation fails.

A single simulation runs for a predefined number of steps with an overall time limit of two hours. All negotiations are conducted for a predefined number of steps/turns of the alternating offers protocol (with a predefined time limit on each).

Factory manager agents are reset after each simulation. This means that they cannot learn from previous simulations. They can, however, accumulate information about agents during a simulation, as they know their negotiating partners' names.

## Platform

Entrants to the competition will develop and submit an autonomous agent that runs on [NegMAS](#). NegMAS is a Python-based negotiation platform in which you can create simulated worlds, like the SCM world, populated with agents capable of engaging in multiple negotiations.

In NegMAS, the alternating offers protocol is implemented as a special bilateral case of the multilateral [Stacked Alternating Offers Protocol](#) (slightly modified to allow for a limited number of rounds).

Participants will need to install the [SCML](#) library that runs on top of NegMAS and includes the SCML2020World environment<sup>1</sup>. Using this library, you can run the SCM world with the same settings as the ones employed in ANAC 2020, or with personalized settings.

SCML also includes an implementation of few sample strategies, which can serve as a sample implementation of an agent to guide participating teams.

*A difference from SCML2019 is that Java is not supported anymore. All agents must be implemented in Python (or have a python adapter that is developed by the participant).*

## Submission and Live Competition

An unofficial live competition will be run this year, beginning February 20th. All participants are encouraged to upload early versions of their agents to the [online submission site](#) and are **required to upload a working agent by June 1st**. A leaderboard will be maintained, displaying the relative performance of all submitted agents, but no identifying information about the participating teams will be available. This website is also where the final versions of agents should be submitted for the official competition (at which point identifying information will become available).

Participants who fail to upload a preliminary version of their agent to the live competition website by June 1st will not be allowed to enter the official competition.

Participants must also submit the following (through the [online submission site](#)):

1. Team member names, affiliations, and contact information.
2. A single zip file containing the following (Please use the provided [skeleton](#)):

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<sup>1</sup> It is also possible to run simulations using the SCML 2019 league's settings (SCML2019World).

1. Agent source code.
2. Academic report describing the agent in PDF.

Finalists will be required to submit a poster presenting their agent for possible presentation at IJCAI. Submitted code and the academic report should be considered to be in the public domain, and may be incorporated in full or part in future releases of [NegMAS](#) and/or [SCML](#) or any other media. In such cases, all team members will receive proper attribution.

**Academic Report:** Each participating team must prepare a 2 page report describing the novel aspects of their agent according to academic standards (consider it an extended abstract). This report will be evaluated for soundness, novelty and presentation quality by the organizers of this league, but will not affect the possibility of winning (as long as the agent is not judged to be essentially a copy of an existing agent). Submission of this report is an integral part of the submission process, and agents without an associated report will be disqualified. *Additionally, agents with unusually interesting strategies — as described by the reports and judged by the organizing committee — may be invited to participate in the finals, regardless of their performance during the qualification round.*

At a minimum, the academic report should address the following points:

- **Negotiation choices:** how your agent chooses what to negotiate about, when, and with whom
- **Utility function(s):** how your agent calculates its utility for the various outcomes of its negotiations
- **Simultaneous negotiations coordination:** how your agent coordinates its behavior among multiple simultaneous negotiations (if it does)
- **Risk management:** any measures your agent takes to alleviate the risks involved in trading with other agents
- **Evaluation:** evaluate the performance of your agent against built-in default strategies.
- **Collusion (If employed):** Did your agent employ a collusive strategy? If so, how, and was it effective in your evaluations?

Moreover, finalists will be required to submit a poster presenting their agent for possible presentation at IJCAI.

## Rules of Encounter

Agents will be disqualified for violating the spirit of fair play. In particular, the following behaviors are strictly prohibited:

1. Accessing any information about the simulation or other agents that is not available through the bulletin-board or public methods and properties of the Agent-World-Interface (See Section 8.2 in the [detailed game description](#)).
2. Accessing/modifying any “private” method/member in python (these variable names are usually indicated by an initial underscore).
3. Hacking or exploiting bugs in the software.
4. Communicating with the agent during the competition.
5. Altering the agent during the competition.

Moreover, agents that wreak havoc on the simulator (intentionally or otherwise) may be disqualified. Agents may be qualified for violating the spirit of fair play. For more information, see [ANAC Rules](#).

Organizers of the ANAC 2020 SCML competition will enforce these rules. We also reserve the right to disqualify agents under ANAC’s usual circumstances.

Finally, note that ANAC’s competition rules allow multiple entries from a single institution, but require that each agent be developed independently.

## Evaluation

There will be two separate tracks in the 2020 SCM league.

In the first, the basic (standard) track, at most one instantiation of each team’s agent will run in each simulation. Agents submitted by other teams will also participate, but again at most one instantiation of each. Some agents provided by the organizing committee may also participate.

In the second, the collusion track, multiple instantiations of the same team’s agent may run during a single simulation. The exact number of instantiations of each will vary across simulations, and will not be announced in advance. In this track, it is possible for instances of the same agent to collude with one another to try to corner the market, or exhibit other collusive behaviors.

An agent’s performance will be measured by its **score** which will be the **median** of the profits accrued by all its factories in all its instantiations in all simulations. *Note that this is different from SCML2019, which used the mean.*

The two tracks will be conducted in two rounds, a qualifying round and a final round. All entrants that are not judged to break any of the SCML and ANAC submission rules will

be entered into the qualifying rounds. Top-scoring agents in the qualifying round will then be entered in the final round.

The teams that built the top-scoring agents will be notified in June, with the final results and awards announced at IJCAI 2020. It is expected that finalists will send a representative to the ANAC workshop at IJCAI 2020 in Japan, where they will be given the opportunity to give a brief presentation describing their agent. Three awards will be announced at IJCAI 2020 (with associated monetary rewards) corresponding to the two tracks (standard and collusion).

The organizing committee will determine the number of simulations needed in each round to ensure a fair comparison among all submitted agents. All participating agents that achieve scores that are not statistically different from the winners' will be inducted into the SCM league's hall of fame.

The final version of the agent submitted by the competition deadline (May 15th) will be used in the two tracks of the SCM league.

## Resources

For more information about SCML, please refer to the following links:

1. [You tube tutorials](#): A set of tutorials to get you started.
2. [Project skeleton for starting up your development](#): You are not required to use this skeleton, but it should be helpful as you get started.
3. [A detailed description of the SCM world](#): Here, you can find the full description of the SCM world. This document also describes the specific settings of the simulator for the ANAC 2020 SCML competition.
4. [Participation Tutorial](#): Here, you can find a step-by-step description of the process of developing, testing, and submitting an agent for ANAC 2020 SCML.
5. [SCML source code on GitHub](#): Here, you can (but are by no means required to) read the source code of the SCML library.

## Questions and Answers

Please check our [FAQ](#). You can post your questions there (preferable), or address any concerns you prefer remain private to [Yasser Mohammad](#).

## Organizing Committee

- Yasser Mohammad, NEC & Assiut University (main contact)
- Katsuhide Fujita, Tokyo University of Agriculture and Technology & NEC-AIST
- Amy Greenwald, Brown University

- Mark Klein, MIT & NEC-AIST
- Satoshi Morinaga, NEC-AIST
- Shinji Nakadai, NEC-AIST

## Important Dates

<b>Official release of the league platform (python only)</b> <i>scml 0.2.3+ with negmas 0.6.1+</i>	February 15, 2020
<b>Website opens for submission</b> <i>A confirmation email will be sent upon successful submission (~2 business days)</i>	February 15, 2020 Tournaments start February 20, 2020
<b>Registration on the live competition website (Recommended)</b> <i>Optional but highly recommended</i>	<del>March 20, 2020</del> <b>May 15th, 2020</b>
<b>Preliminary submission deadline (REQUIRED)</b> <i>Servers may be busy near the deadline. Please do not wait until the last minute.</i>	<del>May 1st, 2020</del> <b>June 1st, 2020</b> (strict)
<b>Final submission deadline</b> <i>Servers may be busy near the deadline. Please do not wait until the last minute. <u>There will be no possibility to give any special extensions.</u></i>	<del>May 15th, 2020</del> <b>June 15th, 2020</b>
<b>Notification to finalists</b> <i>A representative from each finalist team is expected to attend ANAC 2020 @ IJCAI.</i>	<del>June 1st, 2020</del> <b>June 30, 2020</b> (tentative)
<b>Event</b> <i>Announcement of winners and league report during ANAC 2020.</i>	during IJCAI

## Sponsors



The organizing committee would like to thank Brown University for hosting the online submission website at <http://www.scml.cs.brown.edu>.