

Leveraging the Avida Digital Evolution Platform for Research in Evolving Cooperation

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Summary:

Cooperation between individuals is widespread in nature. For example, organisms as simple as bacteria cooperate to perform many behaviors such as building biofilms and coordinating pathogenic attacks. Understanding how these complex adaptive behaviors evolve is relevant to many fields, including Ecology, Biology, Sociology, Medicine, and Computer Science. Artificial life researchers have demonstrated that cooperation can be evolved in populations of digital organisms. Such systems allow detailed investigations into the evolution of cooperative behavior, such as altruism, that may be difficult, and sometimes impossible, to conduct in natural systems.

This tutorial will show attendees how to use Avida to study the evolution of cooperation. We will describe the Avida system and present research that leveraged Avida to learn about the evolutionary process, specifically the evolution of cooperative behaviors. Attendees will participate in the setup and execution of three Avida experiments. These experiments are designed to quickly introduce participants to many major features of Avida. Participants will leave the tutorial with the knowledge and experience needed to effectively leverage Avida in their own research.

This will be a hands-on tutorial. You may download and install Avida prior to attending. However, software bundles of Avida for Windows XP and OS X 10.5 & 6 will also be available via physical media during the tutorial. The most recent version of Avida can be obtained from a subversion repository by executing:

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svn co https://avida.devosoft.org/svn/development
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Time and Expense:

The tutorial will be held the afternoon of Tuesday, September 15th, in parallel with the two afternoon paper sessions. The tutorial will start at 15:05 (3:05 p.m.) and continue until midway through the final paper session, following the same schedule as the conference. There is **no** financial cost to attending the tutorial. Feel free to come and go as you please, as we understand your desire to attend other presentations.

Format and Agenda:

The tutorial will consist of six parts. Part one will introduce attendees to Avida and work being done with Avida. During part two, attendees will participate in experimenting with Avida while we provide hands-on instruction. The remainder of the tutorial will motivate research focused on the evolution of cooperation and present published works that use Avida to this end. Work on the evolution of collective cooperation will be presented during part three. Following, during part four, attendees will experiment with groups of cooperating organisms. After the afternoon break participants will be introduced to kin level cooperation. During part six, we will wrap up with attendees conducting their own experiment where digital organisms evolve to perform the ultimate sacrifice: they commit suicide to kill the enemies of their kin.

Part	Description	Duration
1	Introduction to Avida	30 minutes
2	Experimenting with Mutation Rates	20 minutes
3	Evolving a Cooperative Collective	25 minutes
4	Experimenting with Demes	25 minutes
	Break	15 minutes
5	Evolving Cooperating Digital Organisms	35 minutes
6	Cooperative Kin Experiment	25 minutes
Exit	Participant Feedback	5 minutes
	Total:	3 hours

Plans for Dissemination:

All materials used in the tutorial will be made available. While we may have a few computers for attendees to use, we encourage you to bring your laptop or share with others, as all three experiments are visually oriented. The slides used during the tutorial will be available on the personal websites of the presenters and via email upon request. All experimental configurations used are currently available within the consistency tests directory that is packaged with Avida.

We hope to see you in Budapest!