Cloudy distributed evolutionary computation

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Instructor

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Course Agenda

- Introduction.
- What is virtualization and how can use it.
- Using Docker containers for reproductible science.
- Best practices in cloud development and deployment.
- Deploying evolutionary algorithms applications to the cloud.
- Cloudy evolutionary algorithms and paradigms.
- Volunteer computing for evolutionary algorithms.

Virtualization

- Virtualization concepts and paradigms.
- Virtual machines, containers, cloud resources.
- Physical support for virtualization.
- Evolutionary algorithms for virtualization optimization.

Containers

- Using containers for evolutionary algorithms
- Deploying containers to the cloud.
- Data and computing containers, and how they can be used for reproductible science.

Best practices

- Application development for the cloud: DevOps
- Software-defined infrastructure
- Open Science: start here

Cloud deployment

- Commercial products.
- Build your own
- Software-defined infraestructure.
- Open Science: start here

Cloudy Evolution

- Distributed evolutionary computing, cloud edition
- Volunteer computing.
- Cloudy GA features: asynchrony, churn, heterogeneity.
- Case studies: examples of evolutionary algorithms in the cloud.

References

- J. G. Peñalver and JJ Merelo. *Optimizing web page layout using an annealed genetic algorithm as client-side script*. In Proceedings PPSN V, pages 1018–1027. Springer-Verlag, 1998.
- J. L. J Laredo, P. A. Castillo, A. M. Mora, C. M. Fernandes, and J. J. Merelo. *Resilience to churn of a peer-to-peer evolutionary algorithm*. IJHPSA, 1(4):260–268, 2008.
- Juan-Luis Jiménez-Laredo, A. E. Eiben, Maarten van Steen, and Juan-Julián Merelo: *EvAg: a scalable peer-to-peer evolutionary algorithm*. GPEM, 11(2):227–246, 2010.
- J. J. Merelo, Antonio Mora García, Juan Luis Jiménez Laredo, Juan Lupión, and Fernando Tricas. Browser-based distributed evolutionary com-putation: performance and scaling behavior. In GECCO ’07, pages 2851–2858, 2007.
- J.-J. Merelo, M. García-Valdez, P. A. Castillo, P. García-Sánchez, P. de las Cuevas, and N. Rico. NodIO, a JavaScript framework for volunteer-based evolutionary algorithms : first results. ArXiv e-prints, January 2016.

References

- Alife in the clouds: a short review of applications of artificial life to cloud computing and back. JJ Merelo, PA Castillo, M García-Valdez - Frontiers in Robotics and AI, 2017
- Dennis Wilson, Kalyan Veeramachaneni, and Una-May O’Reilly. *Cloud scale distributed evolutionary strategies for high dimensional problems*. In EvoApplications, pages 519–528, 2013.
- Sergio Di Martino, Filomena Ferrucci, Valerio Maggio, and Federica Sarro. *Towards migrating genetic algorithms for test data generation to the cloud.* In Software Testing in the Cloud: Perspectives on an Emerging Discipline., pages 113–135. IGI Global, IGI Global, 2013.
- Jon Klein and Lee Spector. *Unwitting distributed genetic programming via asynchronous JavaScript and XML*. In GECCO ’07, pages 1628–1635.