

# Solution methods for Heterogeneous Agents Models using a Julia Toolkit

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In the workshop we will discuss recent advances in the solution of heterogeneous agent models, with a focus on models including both continuous and discrete decisions, such as labor market participation, lumpy investment, durable goods purchases, etc. Some examples in the literature would be Chang and Kim (2007), Khan and Thomas (2008), Reiter, Sveen, and Weinke (2013), or a model as in Kaplan, Moll, and Violante (2018) with discrete housing choice. The resulting non-convexities pose substantial problems for solution algorithms. In particular, the recently popular linearization approaches have difficulties solving these models accurately. We will therefore study how to obtain global approximation solutions, using the linearized solution as a starting point.

To solve these models we use a new toolkit, implemented in Julia, which defines a convenient syntax for heterogeneous agent models, and provides efficient solution methods in discrete time. The method combines and further develops the techniques of linearization (Reiter 2009b), backward iteration (Reiter 2009c), and optimal state aggregation (Reiter 2009a).

Participants should be familiar with dynamic programming, and should have programming experience in either Matlab or Julia, or similar languages.

## References

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- Reiter, M. (2009a). Approximate and almost-exact aggregation in dynamic stochastic heterogeneous-agent models. Manuscript.
- Reiter, M. (2009b). Solving heterogenous agent models by projection and perturbation. *Journal of Economic Dynamics and Control* 33(3), 649–665.
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