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fred
@fredboehm1978

Post

Sam Power
@sp_monte_carlo

A healthy reminder: if you're interested in learning more about Markov processes, and you'd like to focus on aspects which allow you to start proving useful and insightful things relatively quickly, I can highly recommend looking at 'contractive' / 'curved' Markov processes.

9:42 AM · May 6, 2024 · **5,146** Views

1 3 75 65

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Sam Power @sp_monte_carlo · 6h
A Markov process satisfies a positive curvature condition if one can couple separate trajectories of the process such that on average, the two trajectories contract towards one another at a uniformly exponential rate, as measured in a suitable metric (think optimal transport).

1 8 303

Sam Power @sp_monte_carlo · 6h
Some appealing aspects of this approach are that

i) the condition genuinely and transparently holds for various processes of interest,
ii) the condition holds in more subtle ways for yet more complex processes of interest,
iii) the condition is relatively tangible and intuitive.

1 4 296

Sam Power @sp_monte_carlo · 6h
Moreover, under this assumption, one can often establish quantitative, non-asymptotic theoretical results for the processes in question, including study of convergence to equilibrium, convergence of ergodic averages, stability with respect to perturbations, and so on.

1 3 263

Sam Power @sp_monte_carlo · 6h
I recommend it as a great topic for self-study, on the basis that there is a lot of value in studying both

i) how one can establish this condition for a given Markov process of interest, and
ii) what the theoretical consequences of such a condition holding are.

1 4 230

Sam Power @sp_monte_carlo · 6h
There are many great references on the topic. Ollivier's early work in particular stands out as extremely readable and tutorial-like, especially for a research paper. Long-form references of M. Hairer, N. Bou-Rabee ∩ A. Eberle, M. Benaïm ∩ T. Hurth are all also valuable.

2 6 540

Sam Power @sp_monte_carlo · 6h
One can also learn a great deal by direct engagement with primary research on the topic, following works of the aforementioned authors, as well as M.F. Chen, A. Guillin, J. Mattingly, P. Monmarché, F. Münch, D. Paulin, D. Rudolf, J. Salez, F.Y. Wang, L. Wu, and numerous others.

1 7 1.2K

Sam Power @sp_monte_carlo · 5h
A slightly subtle addendum: this is not just about the coupling method for proof, which is extremely valuable, but arguably doesn't give the full story. For example, the implications for concentration inequalities benefit from taking a slightly broader view of things.

4 849

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Sam Power @sp_monte_carlo · 7h
Strong intro:

1 Introduction

It has been said that there are only ten big ideas in numerical analysis; all the rest are merely variations on those themes. One example of those big ideas is multi-scale computational approaches. A multi-scale motif reappears in numerous places including: multigrid for solving linear systems [51], wavelets for image processing [11], and in Multi-level Monte Carlo for the solution of stochastic differential equations [20]. Another of those big ideas could surely be *splitting* [42, 4, 57]: start with a complicated problem, split it into simpler constituent parts that can each be solved separately, and combine those separate solutions in a controlled way to solve the original overall problem. Often we solve the separate parts sequentially. The output of the first subproblem is the input to the next subproblem (within the time step).

Like all great ideas, splitting is a theme that continues to resurface in many places. Splitting principles have taken a number of generic forms:

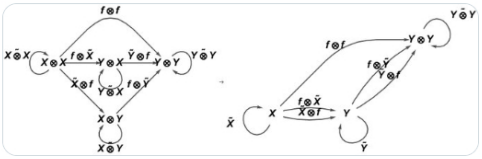
- Split linear from nonlinear.
- Split x-direction from y-direction (dimensional splitting).
- Split terms corresponding to different physical processes. For example, split convection from diffusion in ODEs or in PDEs.
- Split a large domain into smaller pieces. For example, domain decomposition helps to solve large PDEs in parallel.

- Split objective functions in optimization.
- Split resolvents when solving linear systems: Instead of working directly with $(\lambda I - (A+B))^{-1}$, we iterate between working separately with each of $(\lambda I - A)^{-1}$ and $(\lambda I - B)^{-1}$.

2 9 146 10K

Jonathan Gorard @getjonwithit · 21h

In the process of attempting to formalize and implement higher categories into Categorica, I've been thinking a lot about the microcosm principle, which I've always found rather fun. I certainly don't claim to understand it in its entirety, but here's the basic idea. (1/6)



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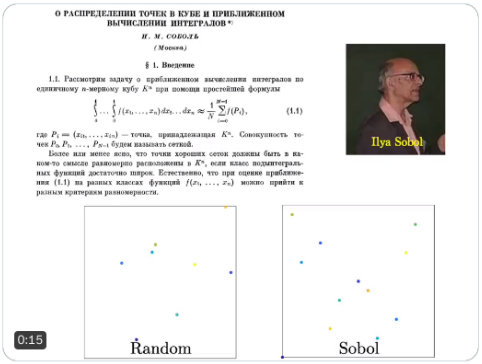
Gabriel Peyré @gabrielpeyre · 14h

Oldies but goldies: I.M. Sobol, Distribution of points in a cube and approximate evaluation of integrals, 1967. Introduces the most well-known low-discrepancy quasi-random sequence.
en.wikipedia.org/wiki/Sobol_seq...



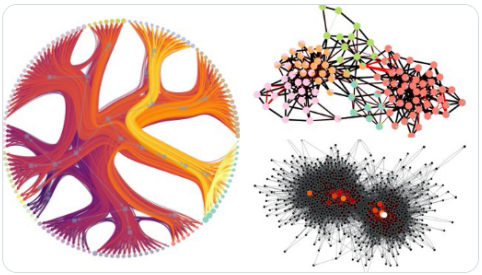
44 300 25K

Tiago Peixoto @tiagopeixoto · 9h

Good news everyone! A new version of graph-tool is just out! @graph_tool

graph-tool.skewed.de

@graph_tool is a comprehensive and efficient Python library to work with networks, including structural, dynamical, and statistical algorithms, as well as visualization. 1/N



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