Re: How Chapman−Kolmogorov implies Markov ??

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- *From*: "galathaea" <galathaea@xxxxxxxxx>
- *Date*: 10 Feb 2007 09:01:14 −0800

On Feb 10, 7:37 am, "Edward Green" <spamspamsp...@xxxxxxxxxxx> wrote:

> On Feb 9, 7:56 am, "rayoha...@xxxxxxxxxxxx" <juanp...@xxxxxxxxx>
> wrote:
>
>> It's easy to see that a stochastic process that follows the Markov property, then follows the Chapman−Kolmogorov equation. But the visce versa holds too, and I can find a proof of that. Some one of you can show me a proof ??
>
> Before you fade back into obscurity, perhaps you would help me understand the question.
>
> Starting with
>
> http://en.wikipedia.org/wiki/Chapman−Kolmogorov_equation
>
> I run into some conceptual problems. An "indexed set of random variables" is almost an empty concept, being, I suppose, a set of random variables each identified with an associated element of an index set. Perhaps the notation "f_i" is supposed to imply there is something equivalent about all of these random variables, though what this is is undefined. Identical marginal distributions?

the indices in the article are to associate with times

the interpretation of

f
n

is that it is the "state of the system"
at time

i
n

this is not the most common notation i have seen

since (f_n, i_n) defines a spacetime event
it is common to see these combined
in the transition function

> Now, when we begin labeling a set of the indexes, "i_1, i_2, ..., i_n", I get lost. We have in mind again, of course, an almost empty concept, that we index the index set iself, or else write a finite sequence in it, explicitly using the integers as our indices.
>
> It occurs to me now (for the first time? well... experience is infinite/life finite), that indexing a set by the integers and writing a sequence in it are related but distinct concepts: the sequence may reuse elements, while indexing implies a one−to−one relation −− we don't say "oh, x_3 and x_7 are the same variable... did I forget to mention that"?
>
> Which is intended?

usually here the spacetime events occur at different times

an immediate property of these transition probabilities is

p(x0, t | x1, t) = delta(x0, x1)

because the system can only be in one state at a time

> Anyway, I get the feeling, not unknown in mathematical arguments, that the formal exposition has run ahead of the sense −− the author knows what he is trying to capture, I don't! Rather than trying to reverse engineer his intentions through the ambiguities, would you possibly be so kind as to fill in story?
>
> Please assume I am just sophisticated enough to understand the intention, though not conversant with it.

wikipedia here is one of the poorer explanations i have seen

you already have the background on this one
edward
just in a different context:

quantum mechanics

here the transitions are often explained in dirac's bra−ket notation

which does the same sort of decomposition as here

p(x0, t0 | x1, t1)

is the probability the system will enter event

(x0, t0)

given that it enters (x1, t1)

it is a two−point correlation

the properties of this are familiar to feynmann path integrals

so you have
for instance

that the system always transitions
to some state at a given time

int(p(x, t | x0, t0), dx) = 1

and chapman−kolmogorov is a summation over intermediate states

−=−
galathaea: prankster, fablist, magician, liar

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