Re: Pair probabilities

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On 26 Sep, 21:03, Gareth Russell <russ...@xxxxxxxx> wrote:

> Hi,
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> An ecologist here straying abroad. My apologies if this is trivial, but it's outside my knowledge.
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> In classic probability example language...
>
> I have a set of objects of c different types (say colors). The number of objects of each type, n_1, n_2,... n_c is known.
>
> I also have an arbitrary, symmetric n by n binary matrix that describes 'acceptable' pairing of types.
>
> Pairs of objects are drawn at random from the set, and if they are an acceptable pair, they are retained, and if they are not acceptable, they are returned to the set.
>
> This continues until all objects have been paired, or there remain in the set only types that cannot be paired with each other.
>
> What I would like to know is the probability distribution of pairings (another symmetric matrix), plus the probability that an object of type t does not end up in a pair at all.
>
> You might guess that for me, the types are species that do or do not interact. But this problem could equally represent reaction rates in a well−mixed solution of many kinds of chemicals. I'm sure that it must have been studied already. I would appreciate any pointers.

The way you have presented the problem it is fairly trivial. What you will get at the end is pairings of one species, then pairings of another species etc. Each species being orthogonal. Each species mates as if the others wern't there.

If you postualate a more complicated problem where there is no clear species demarcation. A mouse can't go with an elephant but a horse can go with a donkey (a mule) you are in a radically different stuation. One where there is no clear solution.

It may seem presumptous of me to challenge your assumptions but personally I think the right model might be a much more thermodynamic one. For example you have a pairing. The match has a given suitability, given a more suitable pairing partners are swapped.

Reaction rates are described unambiguously by the Second Law of Thermodynamics. You have what might be termed "redox" reactions where a less reactive element is displaced by a more reactive. Chemistry is thus not the problem you describe.

Do populations make their selections thermodynamically? Does a dance floor have a "temperature"? Perhaps your researches might answer that question.

If you look at the travelling salesperson you will find that an acceptably short route (it may or may not be NP complete according to complexity) is found by permuting cities. Matching may be done in a similar way.

− Ian Parker

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