Sequential Dynamics in Ising Spin Glasses

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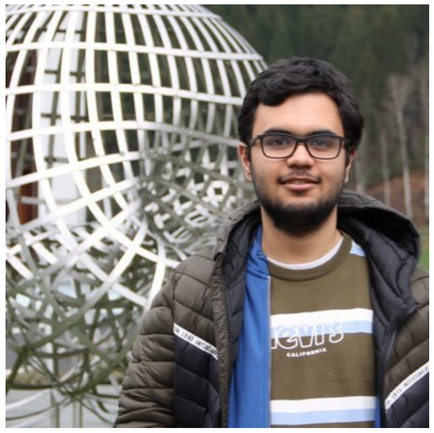
Joint with



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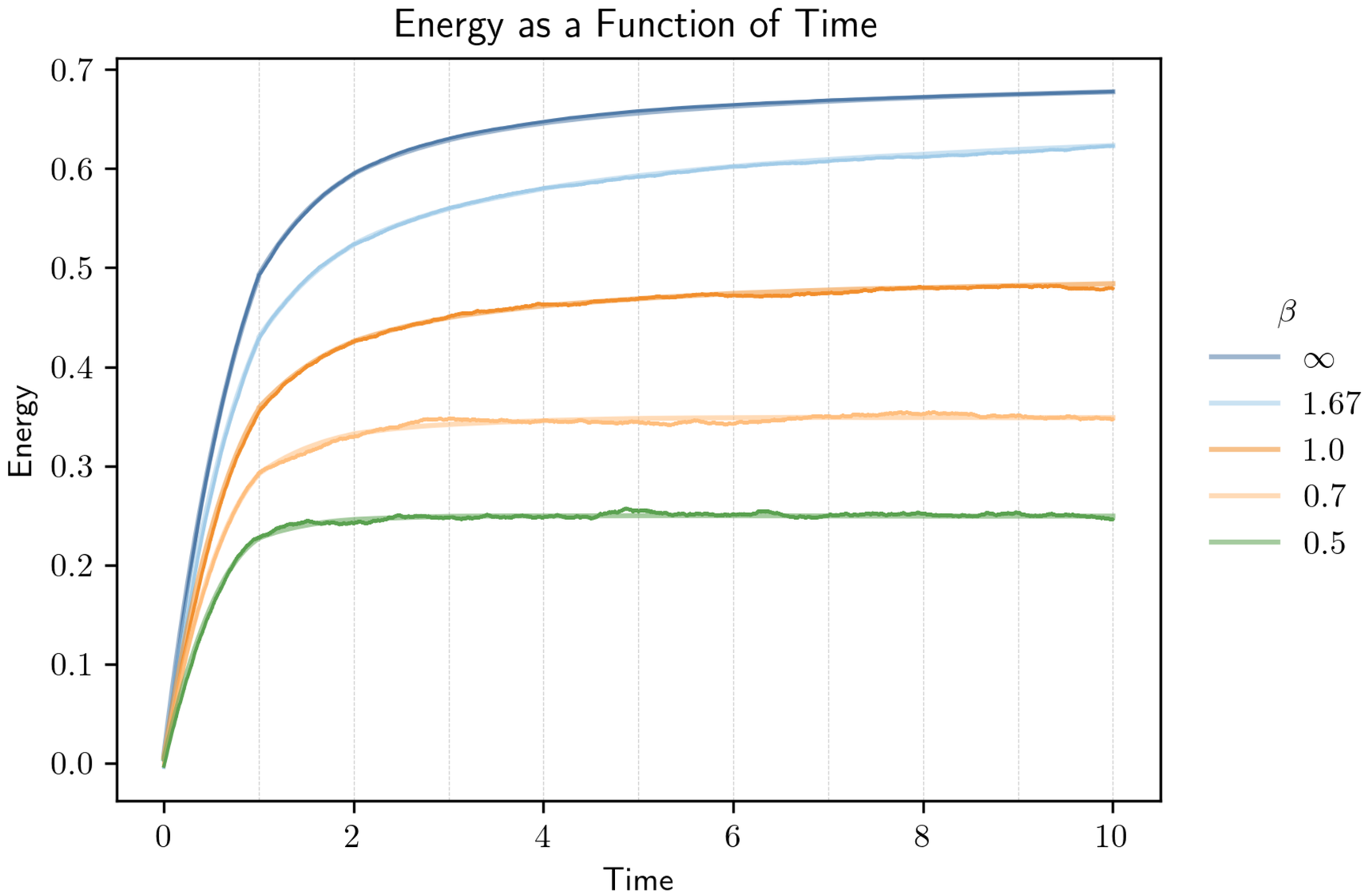
Outline

1. Numerical insights
2. Refresher on the equations, including randomized updates
3. Proof ideas behind new rigorous cavity argument

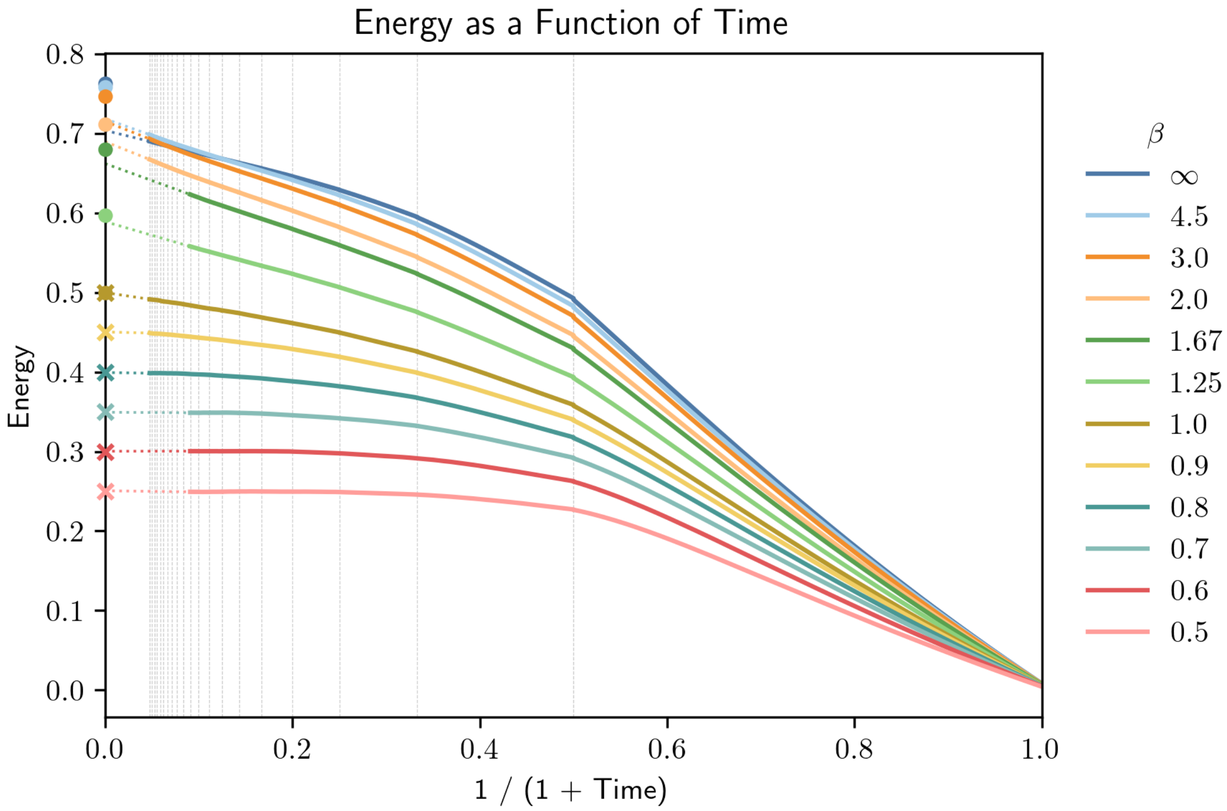
Numerical insights

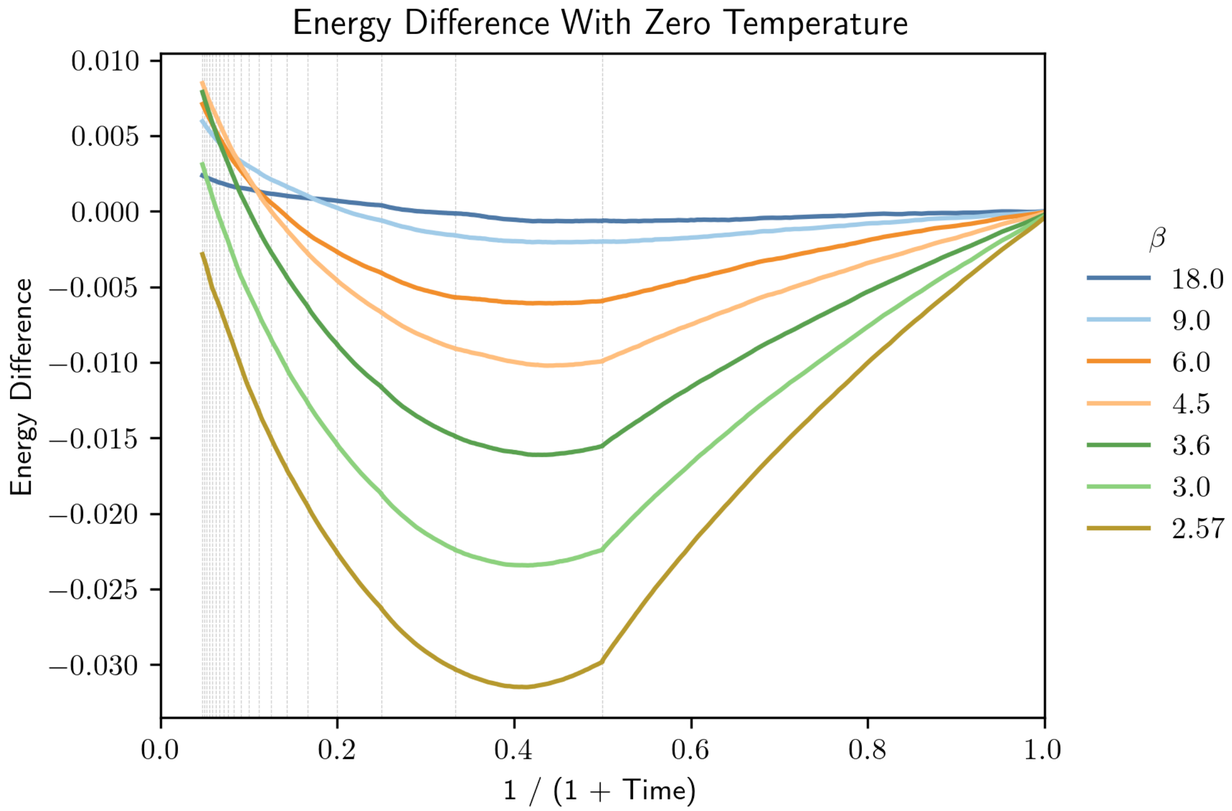
- **Equations can be written as sequence of explicit ODE**
- **Very tractable to solve numerically**
- **Lets one compute macroscopic observables efficiently with high accuracy: energy, overlap, etc**

Numerics: energy



Numerics: energy





- **Convergence to equilibrium energy happens iff at high temperature**
- **Several positive temperatures overtake zero-temperature energy in this regime**

Numerics: magnetization

- **Initialize on $\sigma^0 = 1$ and measure the magnetization as function of time**
- **For a pass $t \in [N]$ and coordinate $i = xN,$ the magnetization is**

$$
\begin{aligned}
m(t,x) &= \frac{1}{N}\sum_{j=1}^{i}\sigma_j^t + \frac{1}{N}\sum_{j=i+1}^{N}\sigma_j^{t-1} \\
&= \frac{1}{N}\langle \sigma^{t,i}, \sigma^0 \rangle \\
&\longrightarrow \int_0^x C_{0,t}(y)dy + \int_x^1 C_{0,t-1}(y)dy
\end{aligned}
$$

Numerics: magnetization