Maxent Conventions and Kernels

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1 Conventions

The Maxent project uses the following conventions:

$$G(i\omega_n) = \int_0^\beta d\tau e^{-i\omega_n \tau} G(\tau)$$

$$G(\tau) = \frac{1}{\beta} \sum_{i\omega_n} e^{-i\omega_n \tau} G(i\omega_n)$$

$$G(\tau) < 0 \,\forall \tau \in [0, \beta]$$

$$A(\omega) = -\frac{1}{\pi} \mathrm{Im}[G(\omega)]$$

$$i\omega_n = \begin{cases} \frac{(2n+1)\pi}{\beta} & \text{fermionic} \\ \frac{2n\pi}{\beta} & \text{bosonic} \end{cases}$$

For each discrete input point G_n, the error on that point is denoted as σ_n.

1.1 Particle-Hole Conventions

The following applies for data that is particle-hole symmetric:

- For Fermionic Matsubara data, $\mathrm{Re}[G(i\omega_n)] = 0$
- For Bosonic Matsubara data, $\mathrm{Im}[G(i\omega_n)] = 0$
- For Legendre data, points that have ℓ odd are 0, but Maxent can read them

2 Kernels

Dataspace	Kernel Name	Kernel
Frequency	Fermionic	$\frac{1}{i\omega_n - \omega}$
	Bosonic	$\frac{\omega}{i\omega_n + \omega}$
Without PH	Anomalous	$\frac{-\omega}{i\omega_n - \omega}$
Frequency	Fermionic	$-\frac{\omega_n}{\omega_n^2 + \omega^2}$
With PH	Bosonic	$\frac{\omega^2}{\omega_n^2 + \omega^2}$
	Anomalous	$\frac{\omega^2}{\omega_n^2 + \omega^2}$

Dataspace	Kernel Name	Kernel
Time	Fermionic	$-\frac{e^{-\tau\omega}}{1 + e^{-\omega\beta}}$
	Bosonic	$\frac{1}{2}\omega\frac{\left[e^{-\omega\tau} + e^{-\omega(\beta-\tau)}\right]}{1 - e^{-\omega\beta}}$
	TZero	$-e^{-\omega\tau}$
Legendre	Fermionic	$-\int_0^1 dx\sqrt{2\ell+1}\frac{e^{-(1+x)\frac{\beta\omega}{2}}}{1+e^{-\beta\omega}}P_\ell(x)$