$$\Pr(\pi, \boldsymbol{\xi}^{\pi}) =$$

$$\frac{1}{Z_{\pi \cup C}} \exp \Bigg\{ - f_{\boldsymbol{\xi}^{\pi} \leftarrow \sigma} \mathrm{corr}_{\boldsymbol{\eta}} \Bigg[\mathrm{corr}_{t} \Big[\mathbb{E}_{|\boldsymbol{\xi}^{\sigma\pi}| \in \sigma} B^{\pi}(\boldsymbol{\xi}^{\sigma\pi}, t),\ B^{\pi}(\boldsymbol{\eta}^{\pi}, t) \Big],$$

$$\tanh \mathbb{E}_{\gamma \in C} \tanh^{-1} \mathrm{corr}_{t} \Big[\mathbb{E}_{|\boldsymbol{\xi}^{\sigma\gamma}| \in \sigma} B^{\gamma}(\boldsymbol{\xi}^{\sigma\gamma}, t),\ B^{\gamma}(\boldsymbol{\eta}^{\gamma}, t) \Big] \Bigg] \Bigg\}$$

is the probability that the functional connectivity of patient or subject π, at parenchymal voxels positions $\boldsymbol{\xi}^{\pi}$, is dissimilar from the functional connectivity of a control cohort C.

For patient or subject π, the BOLD times-series for parenchymal voxels, $\boldsymbol{\xi}$, enclosed by sphere $\sigma \in$ set S, which spans the parenchyma, is $B^{\pi}(\boldsymbol{\xi}^{\sigma\pi}, t)$. The expectation over those σ voxels, $\mathbb{E}_{|\boldsymbol{\xi}^{\sigma\pi}| \in \sigma}$, aims to provide nonlocal aggregation of functional information. The BOLD time-series for cortical voxels, $\boldsymbol{\eta}$, is $B^{\pi}(\boldsymbol{\eta}^{\pi}, t)$. The correlation matrix contracted over times, t, has size $|S| \times |\boldsymbol{\eta}^{\boldsymbol{\pi}}|$

Similarly, for each subject $\gamma \in$ control cohort C, the BOLD times-series for the expectation of parenchymal voxels enclosed by sphere σ is $\mathbb{E}_{|\boldsymbol{\xi}^{\sigma\gamma}| \in \sigma} B^{\gamma}(\boldsymbol{\xi}^{\sigma\gamma}, t)$, and the BOLD time-series for cortical voxels is $B^{\gamma}(\boldsymbol{\eta}^{\gamma}, t)$. The averaging over the control cohort is denoted by the innermost tanh $\mathbb{E}_{\gamma \in C}$ $\tanh^{-1}$, producing a correlation matrix of size $|S| \times |\boldsymbol{\eta}^{\gamma}|$.

The outermost $\mathrm{corr}_{\boldsymbol{\eta}}$ contracts over all cortical voxels $\boldsymbol{\eta}^{\pi}$ for the single subject with all cortical voxels $\boldsymbol{\eta}^{\gamma}$ which have already been averaged over the control cohort, producing a correlation vector of length $|S|$.

The outermost $f_{\sigma \rightarrow \boldsymbol{\xi}^{\pi}}$ surjectively maps all spheres back to parenchymal voxels positions, thereby producing for each parenchymal ξ^{π} a measure of similarity of the FC of patient or subject π with all subjects from the control cohort C. Low or negative similarity increases the softmax probability of dissimilarity over the ensemble of $\pi \cup C$.