Generative Topographic Mapping (GTM)

GTM is a dimensionality reduction algorithm well described by Bishop *et al*.

Briefly speaking, the algorithm injects a 2D hypersurface (*manifold*) into an initial *D*dimensional data space. The manifold is fitted to the data distribution by the ExpectationMaximization (*EM*) algorithm which minimizes the log-likelihood of the training data.

Once the fitting is done, each item from the data space is projected to a 2D latent grid of *K* nodes.

Bishop CM, Svensén M, and Williams CKI (1998) GTM: The Generative Topographic Mapping. Neural Comput 10:215–234.
https://doi.org/10.1162/089976698300017953

GTM is a probabilistic extension of SOM where log-likelihood is utilized as an objective function.

The manifold used to bind a data point **t*** in the data space and its projection **x*** in the latent space is described by a set of *M* Radial Basis Function centers (*RBF*; Gaussian functions are generally used).

Latent space

Data space

t_n

t^*

x^*

t_1

t_2

RBF

Manifold