Algorithm 1: tGMM

Input:

$x \in R^{T\times d}$: the time-series data.

$\mu^0 \in R^{d\times c}$: an initial guess at the means.

$\Sigma^0 \in R^{d\times d\times C}$: an initial guess at the covariances.

$\pi \in R^{T\times C} : \sum_{c\in[C]} \pi[., c] = 1$: pi-vector indicating the weighted contributions of each condition.

$tol > 0$: the tolerance for defining convergence.

Result:

$\mu^n \in R^{d\times c}$: the tGMM estimated means.

$\Sigma^n \in R^{d\times d\times c}$: the tGMM estimated true covariance matrices.

$ll = loglikelihood(x, \mu^0, \Sigma^0)$
converged = FALSE
while *converged = FALSE* **do**
  // E step
  for *t in 1:T* **do**
    $s = \sum_{c'=1}^{C} \pi_{tc} \mathcal{N}(x_t|\mu'_c, \Sigma'_c)$
    for *c in 1:C* **do**
      $\tilde{w}_{tc} = \frac{1}{s} \pi_{tc} \mathcal{N}(x_t, \mu_c \Sigma_c)$
    end
  end
  $\bar{\tilde{w}} = \sum_{c=1}^{C} \tilde{w}(., c)$
  $w_{tc} = \bar{\tilde{w}}^{-1} \tilde{w}_{tc}$
  $\hat{\tilde{w}} = \sum_{t=1}^{T} \tilde{w}(t, .)$
  // M step
  for *c in 1:C* **do**
    $\mu_c = \hat{\tilde{w}}^{-1} w_c^T x$
    $\Sigma_c = \sum_{t=1}^{T} \hat{\tilde{w}}^{-1} w_{tc}(x_t - \mu_c)^T (x_t - \mu_c)$
  end
  $newll = loglikelihood(x, \mu, \Sigma)$
  if $newll - ll > tol$ **then**
    $ll = newll$
  else
    converged = TRUE
  end
end
$loglikelihood(x, \theta^i) \leftarrow \left(\sum_{i=1}^{nt} \log \left[\sum_{c=1}^{nc} \pi_{ic} \mathcal{N}(x_i|\mu_c^i, \Sigma_c^i) \right] \right)$