**Algorithm 1** Proximal algorithm for fitting graph classifier

**Input:** $Z$, $\epsilon^{\mathrm{ADMM}}$, $\mu$

**function** ADMM($Z$, $\epsilon^{\mathrm{ADMM}}$, $\mu$)

$\tilde{B}^{(0)} \leftarrow Z$

$R^{(0)} \leftarrow Z$

$Q^{(0)} \leftarrow Z$

$U^{(0)} \leftarrow 0_{N \times N}$

$V^{(0)} \leftarrow 0_{N \times N}$

**repeat**

$\tilde{B}^{(l+1)} \leftarrow \frac{1}{1+2\mu}\left\{Z + \frac{\mu}{2}\left(Q^{(l)} + {Q^{(l)}}^T\right) + \mu R^{(l)} - U^{(l)} - V^{(l-1)}\right\}$ ▷ coordinate gradient descent

$Q_{(i)}^{(l+1)} \leftarrow \left(1 - \frac{t\lambda}{\mu\left\|\tilde{B}_{(i)}^{(l+1)} + \frac{1}{\mu}U_{(i)}^{(l)}\right\|_2}\right) + \left(\tilde{B}_{(i)}^{(l+1)} + \frac{1}{\mu}U_{(i)}^{(l)}\right)$

$R_{ij}^{(l+1)} \leftarrow \left(1 - \frac{t\lambda\rho}{\mu\left|\tilde{B}_{ij}^{(l+1)} + \frac{1}{\mu}V_{ij}^{(l)}\right|}\right) + \left(\tilde{B}_{ij}^{(l+1)} + \frac{1}{\mu}V_{ij}^{(l)}\right)$

$U^{(l+1)} \leftarrow U^{(l)} + \mu\left\{\tilde{B}^{(l+1)} - \frac{1}{2}\left(Q^{(l+1)} + {Q^{(l+1)}}^T\right)\right\}$

$V^{(l+1)} \leftarrow V^{(l)} + \mu\left(\tilde{B}^{(l+1)} - R^{(l+1)}\right)$

$\epsilon_{\mathrm{ADMM-p}}^{(l+1)} \leftarrow \mu(\|Q^{(l+1)} - Q^{(l)}\|_\infty + \|R^{(l+1)} - R^{(l)}\|_\infty)$ ▷ update primal and dual residuals

$\epsilon_{\mathrm{ADMM-d}}^{(l+1)} \leftarrow \mu(\|\tilde{B}^{(l+1)} - Q^{(l+1)}\|_2 + \|\tilde{B}^{(l+1)} - R^{(l+1)}\|_2)$

$l \leftarrow l + 1$

**until** $\epsilon_{\mathrm{ADMM-p}}^{(l)} < \epsilon^{\mathrm{ADMM}}$ and $\epsilon_{\mathrm{ADMM-d}}^{(l)} < \epsilon^{\mathrm{ADMM}}$

**end function**

**Output:** $\tilde{B} = \tilde{B}^{(l+1)}$