Given $\boldsymbol{\gamma} : M \to \mathbb{R}^3$, $\boldsymbol{\gamma} = \boldsymbol{\gamma}(s)$ (I suppose arc-length parameterised for simplicity), and functional $\mathcal{E} = \mathcal{E}(\boldsymbol{\gamma})$, characterize first derivative operator $\tilde{\nabla}$ as:

$$\left(\tilde{\nabla}\mathcal{E}(\boldsymbol{\gamma})\right)(s) = \underbrace{\frac{d\mathcal{E}(\boldsymbol{\gamma}(s))}{ds}}_{\text{Scalar}} \underbrace{\frac{d\boldsymbol{\gamma}(s)}{ds}}_{\text{Tangent Vector}} \tag{1}$$

Discretized versions are:

$$\tilde{\nabla}^{+}_{\boldsymbol{\Gamma}} E(\boldsymbol{\Gamma})[i] = \frac{E(\boldsymbol{\Gamma}[i+1]) - E(\boldsymbol{\Gamma}[i])}{|e_i|} (\boldsymbol{\Gamma}[i+1] - \boldsymbol{\Gamma}[i]) / |e_i| \tag{2}$$

$$\tilde{\nabla}^{-}_{\boldsymbol{\Gamma}} E(\boldsymbol{\Gamma})[i] = \frac{E(\boldsymbol{\Gamma}[i]) - E(\boldsymbol{\Gamma}[i-1])}{|e_{i-1}|} (\boldsymbol{\Gamma}[i] - \boldsymbol{\Gamma}[i-1]) / |e_{i-1}| \tag{3}$$

where $e_i \coloneqq \boldsymbol{\Gamma}[i+1] - \boldsymbol{\Gamma}[i]$.

Characterize second derivative operator $\tilde{\Delta}$ similarly by second derivative with respect to s? Discretization by applying the discretized version of first derivative operator in forward and backward form.