Submission for Apoorv Malia and Marco Lagos

A3 Q4

$$E_{bag} = E_x[\varepsilon_{bag}(x)^2] = E_x\left[\left(\left(\frac{1}{L}\sum_{l=1}^{L}(f(x)+\varepsilon_l(x)\right) - f(x)\right)^2\right]$$

$$= E_x\left[\left(\frac{1}{L}\sum_{l=1}^{L}(\varepsilon_l(x))\right)^2\right] = \frac{1}{L^2}E_x\left[\left(\sum_{l=1}^{L}(\varepsilon_l(x))\right)^2\right]$$

$$= \frac{1}{L^2}E_x\left(\sum_{l=1}^{L}\varepsilon_l^2(x) + \sum_{1\le i,j\le L\,(i\neq j)}\varepsilon_i(x)\varepsilon_j(x)\right)$$

$$= \frac{1}{L^2}E_x\left(\sum_{l=1}^{L}\varepsilon_l^2(x)\right) + \frac{1}{L^2}E_x\left(\sum_{1\le i,j\le L\,(i\neq j)}\varepsilon_i(x)\varepsilon_j(x)\right)$$

$$= \frac{1}{L^2}\sum_{l=1}^{L}E_x(\varepsilon_l^2(x)) + \frac{1}{L^2}\sum_{1\le i,j\le L\,(i\neq j)}E_x(\varepsilon_i(x)\varepsilon_j(x))$$

$$= \frac{1}{L^2}\sum_{l=1}^{L}E_x(\varepsilon_l^2(x))$$

$$= \frac{1}{L}E_{av}$$