do these satisfy the Gibbs dulem ?

$$\bar{H}_1 = a_1 + b_1 x_1 \qquad \bar{H}_2 = a_2 + b_2 x_2$$
$$= a_2 + b_2(1 - x_1)$$

now taking the partials

$$\left(\frac{\partial \bar{H}_1}{\partial x_1}\right)_{T,P,x_{j\neq 1}} = b_1 \qquad \left(\frac{\partial \bar{H}_2}{\partial x_1}\right)_{T,P,x_{j\neq 1}} = -b_2$$

now into gibbs dulem for binary mixture

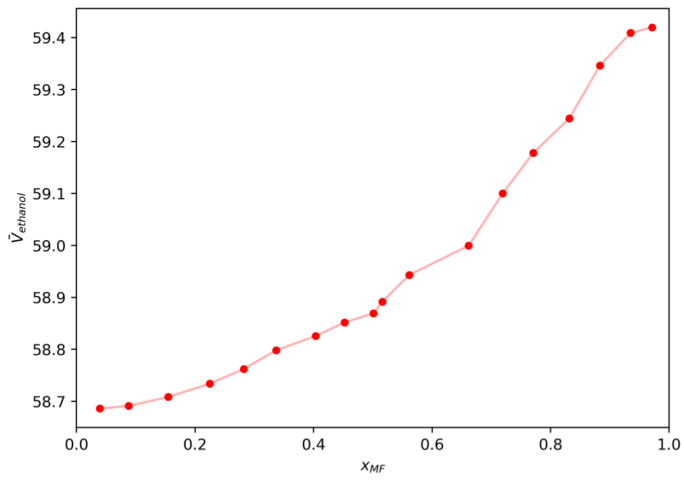
$$\sum x_i \left(\frac{\partial \bar{H}_i}{\partial x_1}\right)_{T,P,x_{j\neq 1}} = 0$$

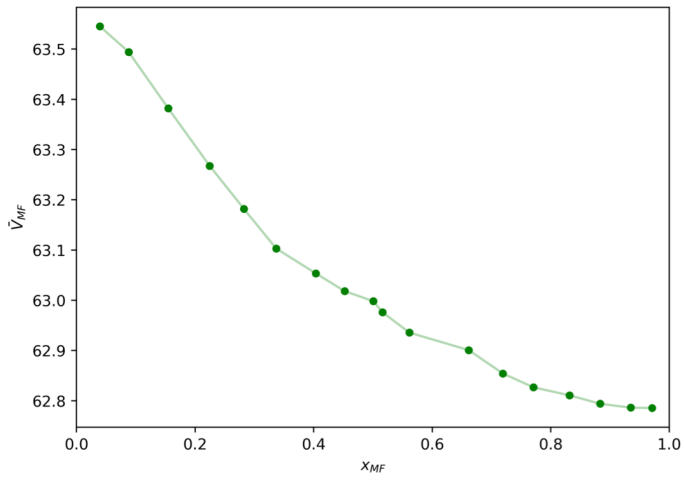
$$x_1 b_1 + (1 - x_1)(-b_2) \stackrel{?}{=} 0$$
$$x_1 b_1 - b_2 + x_1 b_2 \stackrel{?}{=} 0$$
$$x_1(b_1 + b_2) - b_2 \stackrel{?}{=} 0$$

which does not need to be true for fitted parameters $b_1, b_2$

illogically this fits partial molar properties to a line ($\bar{H} = a + bx$) and partial molar properties should not be expected to have linear relationships with respect to mole fraction.
back in the first homework I used some computer vision code modified from my research

and plotted the data myself and calculated the partial molar properties for the $\Delta_{mix}\underline{V}$ data




it's clear these partial molar properties do not follow linear relations from this data and the logic that if partial molar properties followed nice, linear relationships we probably would not spend so much time modeling / studying them

Doug is right