Report

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1 Labels

Every combination of SPE and IFE will be transformed into a 12-dimension 0-1 vector like [1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 1]. Above is the label of lgG λ situation.

component	1	2	3	4	5	6
related columns	lgG,κ	lgG,λ	lgA,κ	lgA,λ	lgM,κ	lgM,λ
wheather 0 or 1	1 if obvious peaks have same position					

component	0	7	8	9	10	11
related columns	overall	lgG	lgA	lgM	κ	λ
wheather 0 or 1	only 0 when 7-11 is 0	1 if obvious peaks are detected				

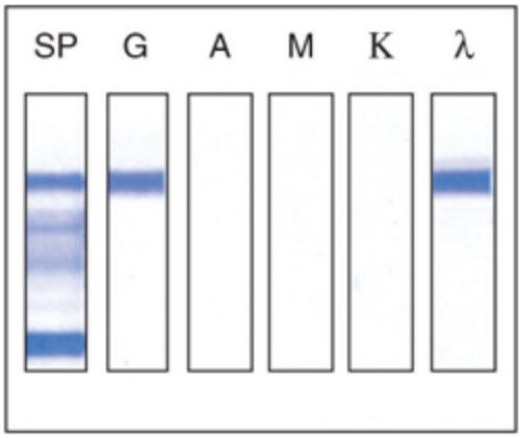
1. The first component is the overall judgement(1 if abnormal and 0 if normal).

2. The next 6 components are the links between heavy chain(lgG, lgA, lgM) and light chain(κ and λ). For example, if lgG and λ has the same peak position, then the third component will be 1, because the order is:Gκ, Gλ, Aκ, Aλ, Mκ, Mλ.

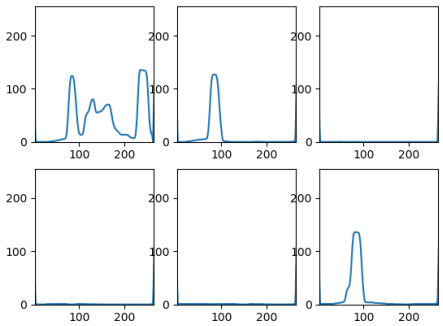
3. The last 5 components are wheather hard and strong edges(obvious peak) are detected in the corresponding column of IFE.

2 Classification Rules

After reading in a picture of SPE and IFE like:(lgG and λ situation)



cv2.fastNlMeansDenoising are applied to every column of the electrophoresis result. Six density plots are then analysed according to the columns.

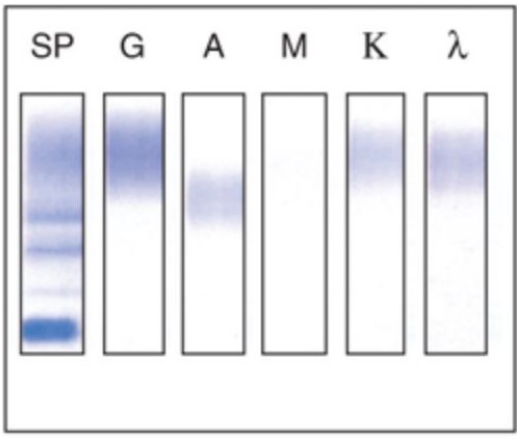


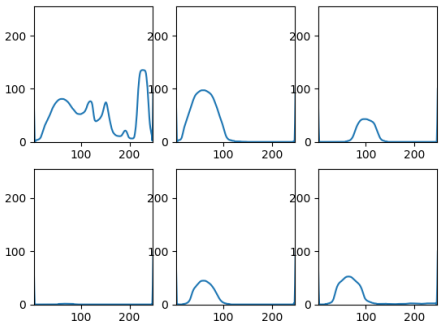
Afterwards, we apply cv2.Sobel(take derivative) to the density plots and find the max, max position, min, min position of the derivative curve. The column will be labelled as abnormal in the last five components of the label if the $\frac{max(f')+|min(f')|}{2}$ is higher than a formerly set threshold t_1. The link between certain kinds of heavy and light chain will be noticed if the difference of the peak position (which is determined by the mean of max position and min position) of the two chains are less than another threshold t_2, and both $\frac{max(f')+|min(f')|}{2}$ are higher than threshold t_3.

3 Instances

For normal and polyclonal increase instances:

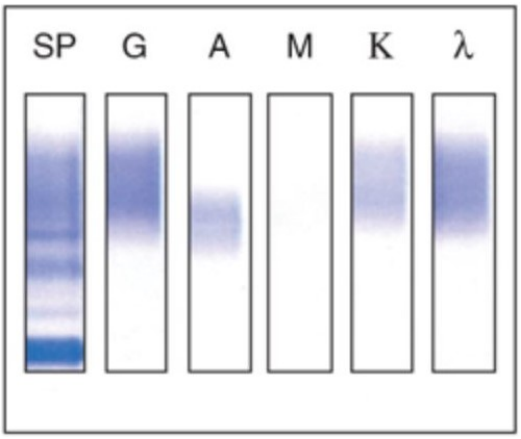
3.1 normal

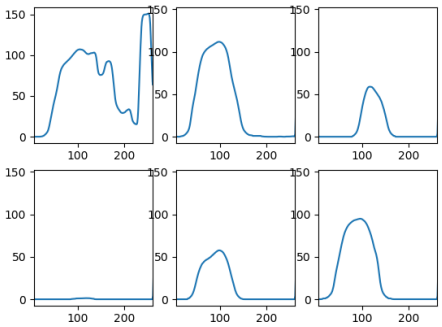




label: [0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0]

3.2 polyclonal increase





label:[0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0]