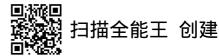
Deep learning Homework # 1 Weijun Zhu 191004254 210). The PDF of each observation has following form:  $f(x|a) = \begin{cases} \sqrt{a} : 0 \le x \le a \\ 0 : otherwise \end{cases}$ The likelihood function is:  $L(\alpha) = \prod_{i=1}^{m} f(x_i | \alpha) = \prod_{i=1}^{m} \frac{1}{\alpha} = \alpha^{-m}$ The log-likelihood is:  $lnL(\alpha) = -nLn(\alpha)$ . Setting its derivative with respect to a to zero. We get  $\frac{da}{da} \ln L(\alpha) = -\frac{da}{da} < 0$  for  $\alpha > 0$ Hence, L(a) is decreasing function and its maximized at  $a = max(X_1, X_2, ..., X_m)$ The likelihood function is:  $L(b,\alpha) = \underbrace{\text{if}}_{a} f(x_i \mid a,b) = \underbrace{\text{if}}_{b-\alpha} = (b-a)^{-m}$ The log-likelihood is: Lin(ba)=-min(b-a) Cetting its derivative with respect to a and b to zero, we get  $\frac{2a - \ln L(b, a) = -1 \cdot (-\frac{1}{b-a})}{= \frac{m}{b-a} > 0}$ Hence, this is increasing function and its maximized cit a=min(X1, X2, ..., Xm) The derivative of b, we get  $\frac{d}{db} \ln \ln (b, a) = 1 - (-\frac{1}{b-a})$ Hence, this is decreasing function and its maximized at b= max(X1, X2, ..., Xm).



(c).	Assume that X=(X1, X2,, Xn) is a point on N-dimension's space
	and a circle with center C= (C1,C2) and radius=r
	The PDF is: d is the distance between center of the circle and point $f(X C_1,C_2,\Gamma) = \begin{cases} \frac{1}{\pi}r^2(X_1-C_1)^2 + (X_2-C_2)^2 \end{cases}; d \leq \Gamma$ $; d > \Gamma$
	$f(x) = \frac{1}{2\pi r^2} ((x_1 - C_1)^2 + (x_2 - C_2)^2)$ ; $d \leq r$
	[(x/c1,c3,1) = 0 ; d>r
	The likelihood function of two dimension:
	like $f(X C_1,\widehat{C}_2,\Gamma) = arg \max_{r>0} \widehat{\pi}_r \widehat{\pi}_r^2 \left[ (X_1-C_1)^2 + (X_2-C_2)^2 \right]$
	The likelihood function of three dimension
	The likelihood function of three dimension like $f(X C_1,C_2,\Gamma) = argmox \frac{1}{4!} \frac{3}{4\pi \Gamma^3} [(X_1-C_1)^2 + (X_2-C_2)^2]$
	Then We do loy-likelihood function for both 2 and 3 dimensions.
	For more higher-dimensions, we can do in the similar scheme above.
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