

國立臺北科技大學

九十七學年第一學期電機系博士班資格考試

模型辨認試題

第一頁 共一頁

注意事項：

1. 本試題共【6】題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。
4. 考試時間：二小時。

1. (20 points) What is pattern recognition (PR)? Describe in detail, for example, definition of PR, PR system, PR design cycles, PR related fields and some PR examples.
2. (20 points) What is high-dimensional PR? Describe in detail, its definition, characteristics, applications, features and classification techniques.
3. (15 points) Likelihood Ratio: Prove that if $R(\alpha_1 | x) < R(\alpha_2 | x)$ is equivalent to
if $\frac{p\langle x | \omega_1 \rangle}{p\langle x | \omega_2 \rangle} > \frac{(\lambda_{12} - \lambda_{22}) p(\omega_1)}{(\lambda_{21} - \lambda_{11}) p(\omega_2)}$, then take action α_1 . Otherwise take action α_2 .
where x , ω and α denote feature vectors, states of nature and actions respectively, and $\lambda_{ij} = \lambda(\alpha_i | \omega_j)$ is the loss incurred for taking action α_i when the state of nature is ω_j .
4. (15 points) Prove the invariance property of maximum likelihood estimators, i.e., that if $\hat{\theta}$ is the maximum likelihood estimate of θ , then for any differentiable function $\tau(\cdot)$, the maximum likelihood estimate of $\tau(\theta)$ is $\tau(\hat{\theta})$.
5. (15 points) Prove that the Voronoi cells induced by the single-nearest neighbor algorithm must always be convex. That is, for any two points x_1 and x_2 in a cell, all points on the line linking x_1 and x_2 must also lie in the cell.
6. (15 points) Suppose we have two normal distributions (the same covariances but different means) $N(\mu_1, \Sigma)$ and $N(\mu_2, \Sigma)$. In terms of their *prior* probabilities $P(\omega_1)$ and $P(\omega_2)$, state the condition that the Bayes decision boundary **not** pass between the two *means*.